Fiskeriforskning

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Process mapping; Analysis of traceability of herring, tuna and salmon

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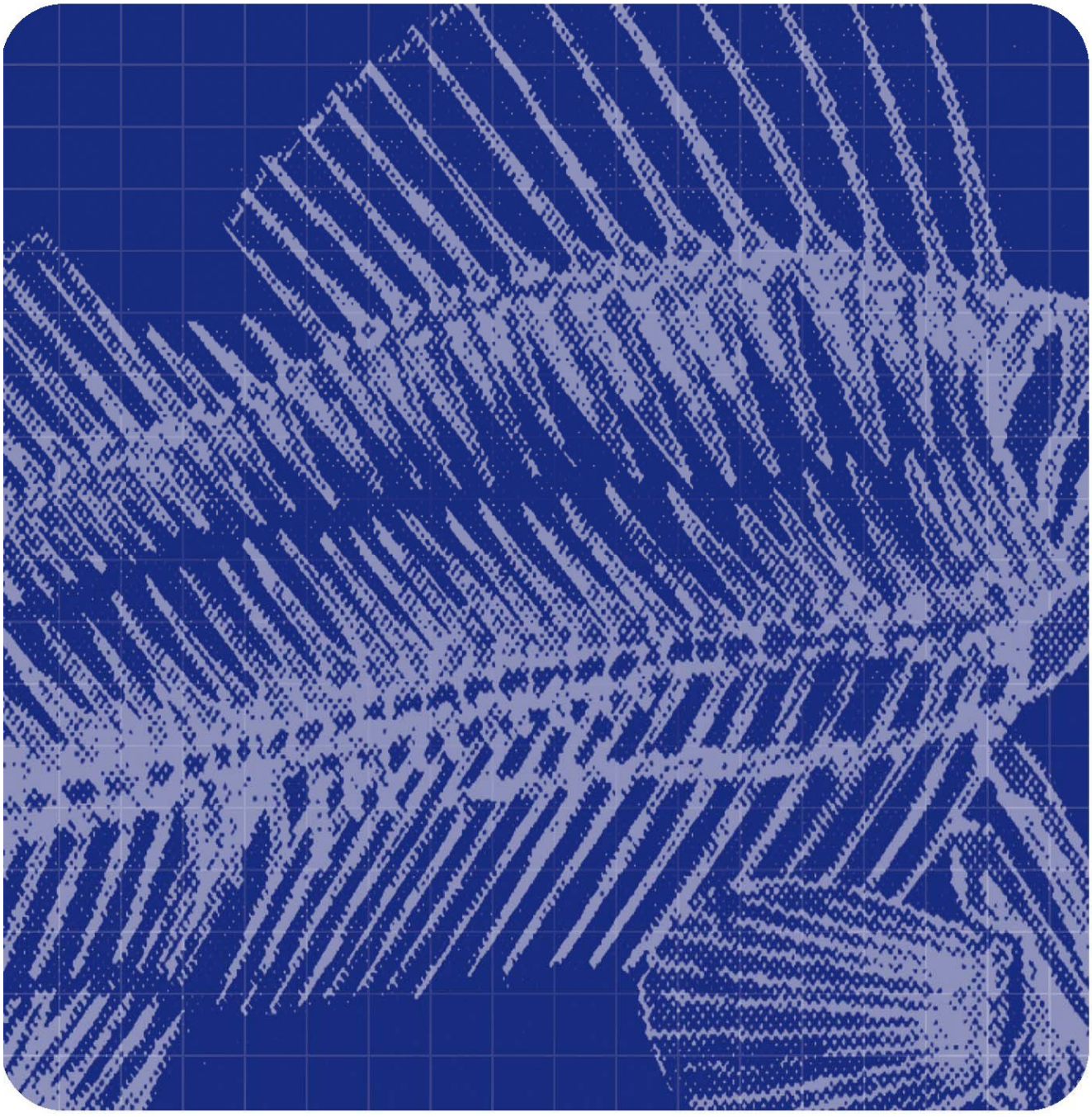

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Summary:
Traceability will be an immensely important subject for the food and fish industry the forthcoming years. From August 12th 2004, registration and prior notice sent in electronic form with a wealth of traceability information is required for all food shipments to the US (Bioterrorism Act PL107-188). The EU Common Food Law (178/2002) came into effect on January 1st 2005 and requires one-up, one-down traceability.

The Seafood Plus R&D project is a European joint effort between fish industry and solution providers, assisted by research institutes and financed by the European Commission, to ensure that the fish industry is ready to meet these challenges.

Companies in a pelagic supply chain in Denmark, a tuna supply chain in Spain and a farmed salmon supply chain in Norway were chosen to be pilot companies in SeafoodPLUS. The study included a kick-off meeting (D8), first visit - analysis (D9), second visit - mapping info loss (D10), common meeting – plan ahead (D11), plan for changes needed (D12), evaluation of changes done and quantification of information loss in each supply chain (D13). This report describes the material flow and information flow, points out where information is lost in the current system, recommends changes to existing routines and practices, and briefly evaluates the relevant changes voluntarily undertaken by the pilot companies as a result of the recommendations.

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1 Background

Traceability will be an immensely important subject for the food and fish industry the forthcoming years. From August 12th 2004, registration and prior notice sent in electronic form with a wealth of traceability information is required for all food shipments to the US (Bioterrorism Act PL107-188). The EU Common Food Law (178/2002) came into effect on January 1st 2005 and requires one-up, one-down traceability, and the Japanese Directorate for Fisheries have established a 'Traceability Group' to harmonize the minimum required documentation for all seafood produced in, and imported to Japan.

The SeafoodPLUS R&D project is a European joint effort between fish industry and solution providers, assisted by research institutes and financed by the European Commission, to ensure that the fish industry is ready to meet these challenges.

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2 Objective

The objective in the traceability pillar of Seafood Plus is to ensure that the information loss in the pilot chains from catch/farming, through processing to export and consumption, is minimal, and that the fish/product can be traced both forwards and backwards through all links. Tracing back from consumption / processing to catch / farming / origin may be useful if undesirable product properties originating from previous links are discovered. On the positive side, trace back may also be used to access particularly desirable qualities of the fish (the feed received, the ingredients in the feed, density in cage, medication use, other ethical or ecological properties) and then to disseminate these to the discerning consumer. Tracking forward from catch/ farm / origin to processing / product to find where the fish went is used in connection with recalls (both to effectuate, to reduce the scope of, and to avoid), but also to study the application further down the chain, and in particular to get feedback with respect to how the quality in the earlier links in the chain influence the quality of the product as it reaches the consumer (colour, fat content, treatment, processing, etc.)

The outcome of this project is improved access to timely, relevant and accurate data about the fish or product, from any point in the chain to any point in the chain. In addition, a significant tangible benefit for the users in the fish sector will be reduced transaction costs and less re-punching of data. A significant benefit for the solution providers will be interoperability, platform independence, and increased value of the services and products they already offer.

3 Definitions

3.1 Traceability

The International Organization for Standardization (ISO) defines traceability as follows (ISO, 1994):*'Ability to trace the history, application or location of an entity by means of recorded identifications.'* In a product sense, it may relate to;

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

There are two types of traceability (Moe, 1998):

3.1.1 Internal traceability

Is the ability to trace the product information internally in a company.

3.1.2 Chain traceability

Is the ability to trace the product information through the links in a supply chain, in other words the product information a company gets and gives away. Traceability is not the product information itself, but it is a tool that makes it possible to trace this information through the supply chain.

3.2 Trade Unit (TU)

Also referred to as Trade Item. Defined by EAN as any item upon which there is a need to retrieve predefined information and that may be priced, or ordered, or invoiced at any point in any supply chain (EAN, 2002). TU is a generic term, and it may be atomic or it may be clustered. Note that per definition, all logistic units are TUs, as there may certainly be a need to retrieve predefined information on a logistic unit.

TU is the general term. It can refer to a very small unit ('one bottle of Coke'), but it can also refer to a six-pack, a case, a pallet, a truck, or whatever. As the definition says, a trade unit is any unit for which there is a need to retrieve predefined information and which may be priced, or ordered, or invoiced at any point in any supply chain.

3.3 Logistic Unit (LU)

Defined by EAN as an item of any composition established for transport and/or storage that needs to be managed through the supply chain (EAN, 2002}.

Logistic Unit is a type of TU, and it designates the grouping that you do before transportation or storage. The classic LU is a pallet, but it may also designate a container, a boat load, or similar.

Note that the relationship between TU and LU cannot in general be quantified. A pallet of bottles that we send from A to B is certainly a LU, and at the same time each individual bottle might be a TU, or each six-pack, or each case, or indeed the whole shipment of pallets. This observation highlights the need for defining at least one new type of TU.

3.4 Batch

A batch is defined as the quantity that has gone through the same processes (ERC 2004; Forås *et al* 2004). In this document batch is synonymous with lot. Some examples of batches are a pallet of fish, a container of fish, 24 hours production and 12 hours production. Common usage differentiates between ingredient (or raw material) batches and production batches; se chapter 8 for more details.

3.5 TraceFish and TraceFood

TraceFish was a concerted action EU project and ran from 2000-2002, the full name ”Traceability of Fish Products” (QLK1-2000-00164). The outcome of the project was three standards for voluntary recording and exchange of traceability information in the seafood chains;

1. The TraceFish farmed fish standard describes what information should be recorded, how and where in the farmed fish supply chain (CEN, 2002 a).

2. The TraceFish captured fish standard describes what information should be recorded, how and where in the captured fish supply chain (CEN, 2002 b).

3. The TraceFish technical standard describes how the information should be coded, transmitted or made available in electronic form. The first application of the standard was in the fish industry, later on it has been extended to apply to food in general; TraceCore eXtensible Markup Language (XML) is now a widely supported traceability standard for electronic interchange of traceability information in the food industry, and it is based on the original TraceFish technical standard.

The information in the farmed and captured fish standards are categorized in “shall”, “should” and “may”. “Shall” are information elements necessary to identify and trace the movement of the products as they move through the supply chain. “Should” are important parameters relating to food safety, labelling or quality. In the “may” category optional data elements possibly relevant for internal or external reporting may be found.

TraceFish is incorporated into the TraceFood framework (Figure 1). This is a framework for traceability which consists of principles, standards and methods for implementing traceability in the food industry. TraceFood is based on work done in EU projects TraceFish, SeafoodPlus and TRACE, funded by the European Commission under the in the 5 Framework Programmes and 6 Framework Programmes. Guidelines and standards have been, and are being developed for numerous food sectors, including fish.

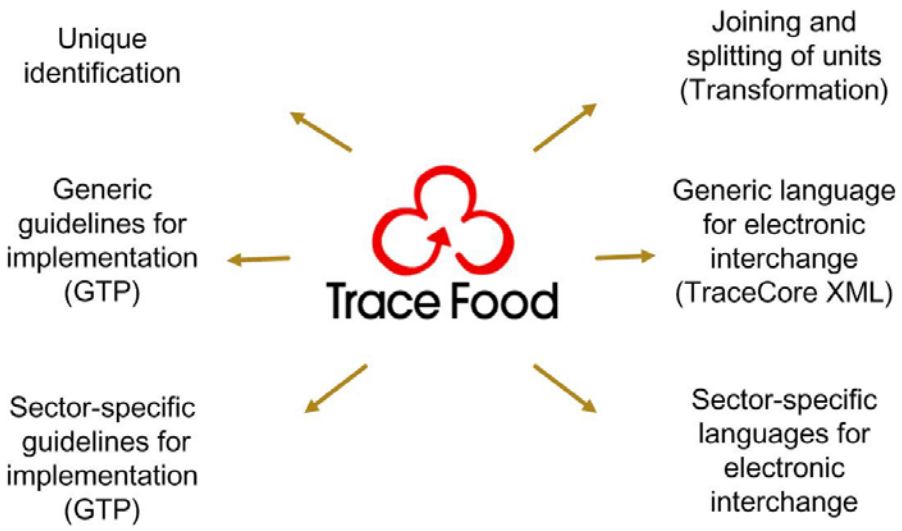


Figure 1 The TraceFood framework components

The TraceFood Framework components are as follows:

Unique identification
To achieve referential integrity and true traceability, TraceFood requires globally unique identification of each trade unit. The number series chosen for this purpose is referred to as GTIN+ (Global Trade Item Number plus unique sequential number, represented by GS1 as Serial Global Item number (SGTIN)). Definition and unique identification of the traceable units are obtained using GS1 codes.

Documentation of joining and splitting the units (transformation)
Recording the relationship between batch, trade unit and logistic unit is an important traceability principle that enables the tracing of a product both back and forward in the supply chain. This requires a unique numbering system and method for keeping track of transformations.

Generic Guidelines for implementation (GTP)
Generic Good Traceability Practice in the food industry in general.

Sector-specific guidelines for implementation (GTP)
Additional guidelines for Good Traceability Practice in specific food sectors, addressing the particular needs and considerations in the given sector, supplementing the generic guidelines including GTP for fish.

Generic language for electronic interchange (TraceCore XML)
TraceCore XML is a standard way of exchanging traceability information electronically in the food industry, both format and data.

Sector-specific language for electronic interchange
The sector-specific XMLs are used to extend the TraceCore XML and contain a specification of the data elements only relevant in that particular food sector. Sector specific data related to origin, properties and processes are named and defined so that communication with other supply chain partners becomes possible. A so called “ontology” is developed for the terms in each food sector, where ontology is defined as “a controlled vocabulary that describes objects and the relations between them in a formal way, and has a grammar for using the vocabulary

terms to express something meaningful within a specified domain of interest. The vocabulary is used to make queries and assertions". The existence of an ontology in a food sector helps facilitate unambiguous communication in general, not only related to traceability.

4 The method

The objective of the process mapping is to analyze the material flow and the information flow, and in particular to identify systematic information loss.

The overall steps for process mapping are outlined in figure 2.

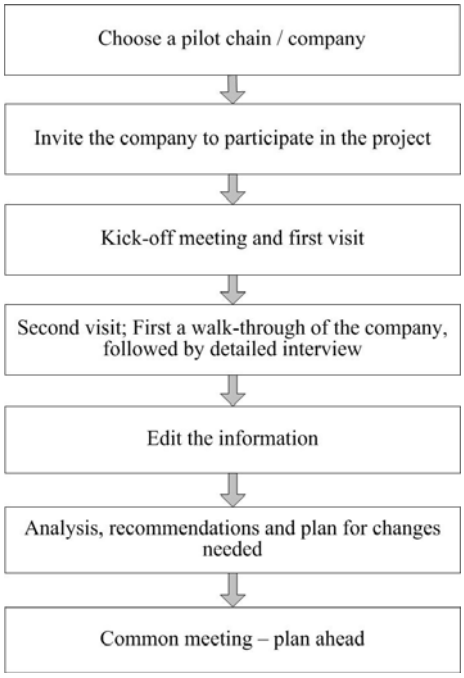


Figure 2 Overview of the steps in the process mapping

Companies in a pelagic supply chain in Denmark, a tuna supply chain in Spain and a farmed salmon supply chain in Norway were chosen to be pilot companies in SeafoodPLUS. These companies were visited in 2002 and 2004, and the process mapping study was carried out.

A walk-through of the each company was followed by detailed interviews of the staff. The first step in process mapping of this type was to identify the end product.

The method “Analysis of traceability in food supply chains - Standard method” was used (Olsen, submitted). This method was developed for exactly this type of analysis.

The principle and sequence of events can be illustrated as follows:

When performing process studies to document material and information flow of the food, each of the 9 steps in figure 3 can be converted to a form to be used in the mapping or interview. The tables with questions in the appendix are quite extensive, and not all questions will apply to all links. In addition, some products or links may have special attributes that it is relevant to record in addition. These may easily be appended to the respective forms.

Note that steps 2, 4, 6 and 8 deals with the transformation information; the documentation of what happens exactly at the point and time when the product moves from one context to the next.

Steps 1, 3, 5, 7, and 9 deals with durations; what happens or what is the state during transportation, pre-processing, production and packaging of the product.

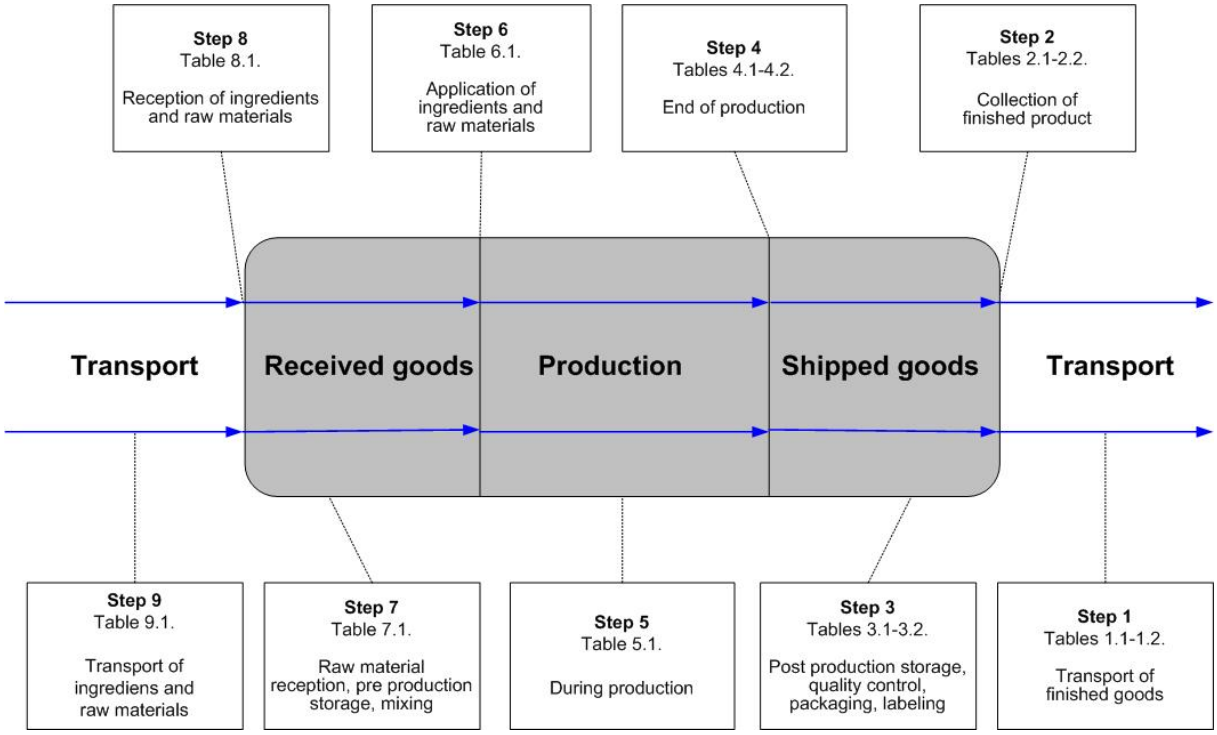


Figure 3 Overview of the method in process mapping to analyze the material flow and the information flow.

The diagram above and the tables with questions in the appendix 2, 3 and 4 show how to map one product, starting with a form or table where the information about the transportation of it to the next link is recorded. As the process mapping moves against the material flow, it is likely that multiple tables or forms will be needed. In particular this is true when moving from mapping the process parameters (step 5) to the application of raw materials and ingredients (step 6). If only one product, process and transportation route is documented, there will be only one set of questions to ask (one form or table) in steps 1, 2, 3, 4, and 5. If multiple raw materials or ingredients are used then each of these will be documented on a separate form 6, and each of these form 6's will then have to be traced through steps 7, 8 and 9.

5 Results of process mapping of herring

5.1 Material flow and identification

A pelagic supply chain from vessel to supermarket has been studied in Denmark (Figure 4). The four grey links in the supply chain have been analyzed by using the analysis schemes in appendix 2.

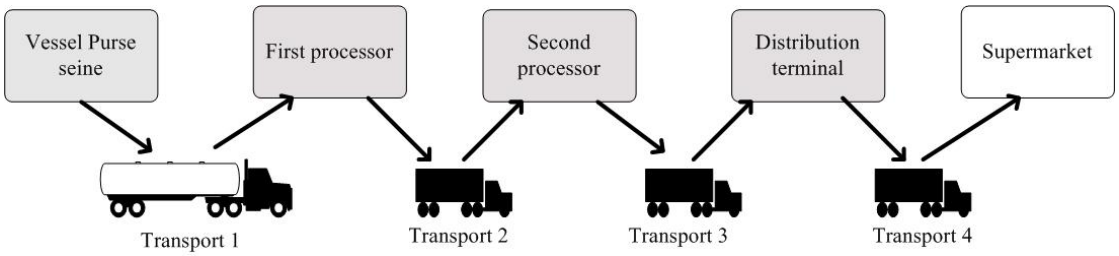


Figure 4 Overview of the analysed pelagic supply chain from vessel to supermarket (pickled herring in glass) in Denmark. The grey links have been studied. Appendix 1 describes the supply chain in more detail.

The first step in process mapping of this type is to identify the end product. The product chosen to map was 6-packs of pickled herring in glass.

5.1.1 Vessel

Herring caught by purse seine vessels (surrounding net) was kept in Refrigerated Sea Water (RSW) in tanks onboard until unloaded at the harbour. One batch consisted of several catches. The single catch was documented in the EU standard logbook. The Food and Agriculture Organization (FAO) catch area, the fish species, the catch date and estimated amount were documented in the book. The catch was kept in 12 tanks onboard and was chilled to around 0 °C with RSW. The water in the tanks was mixed between all tanks during one journey.

5.1.2 Transport 1

The herring from the vessels were transported by tank trucks to the first processor. There was no mixing of batches in this link.

5.1.3 First processor

The catch from one vessel was divided between two factories. The deliveries from each vessel were kept separate, and for each vessel the catch from each date were also kept separate. Colour notes were used to indicate the separation; one colour for each combination of vessel and catch date. In other words, herring delivered from two vessels could maximum be in the company at the same day. Herring was graded in four sizes, filleted and pre-salted for 24 hours. The day after the fish was transferred to 100 little barrels and brine was added. The identification numbers of the ingredients (salt, sugar, vinegar, and species) or packaging material were not recorded. The herring in barrels was identified by a batch number, 6 barrels packed on one pallet, stored for at least four months and transported to the second processor

when needed. The pallets were not identified with a Serial Shipping Container Code (SSCC) code. All recordings during the production were paper-based.

5.1.4 Transport 2

Whole pallets with herring in barrels were transported to the second processor.

5.1.5 Second processor

The second processor recorded the batch numbers of the herring in barrels made by the first processor, drained the barrels for brine and repacked the 100 little barrels. Herring in barrels were not mixed with other raw materials. One batch was one day's production. There were no recordings of identification of ingredients (salt, sugar, vinegar, and species) or packaging material during the production. The finished product, pickled herring in glass, was identified with a batch number (date/time based). The pickled herring in glass were packed into 6-packs. The 6-packs were collected in one pallet. The finished pallet was wrapped with plastic and identified with a production code. The pallets were not identified with a SSCC code.

5.1.6 Transport 3

Whole pallets with 6-packs of pickled herring in glass were transported to the distribution terminal.

5.1.7 Distribution terminal

The distribution terminal received the pallets with the 6-packs of pickled herring in glass. The 6-packs were kept whole. The pallets were placed at the "pick position" in the storage room. 6-packs were picked directly from the pallet. All picked products, including other product types, were collected on a pallet identified with the supermarket's name. The identifier of each glass of herring was still the batch number assigned by the second processor. Whole mixed pallets were transported to the supermarkets. The pallets were not identified with a SSCC code.

5.1.8 Transport 4

The pallets with 6-packs of pickled herring in glass were transported to the supermarkets.

5.2 Discussion and conclusions

In general, traceability of herring is relatively good. The companies in the herring supply chain had relatively good ability to trace and track the herring. The companies meets with 178/2002 Common Food Law requirements for traceability, and also to some degree fulfil the additional recommendations made in the accompanying guidance document. When it comes to other ingredients the traceability is not sufficient; the first and second processors did not record the identification of used ingredients and the companies had continuous batches of vinegar, salt, brine and pickle.

The companies did not meet with TraceFish requirements, mainly because globally unique identifiers are not systematically used to document the relationship between received goods and shipped goods. TraceFish requires each shipped trade unit to have a globally unique identifier where as here trade units shipped from the company may be identically marked if they stem from the same production batch. The GS1 codes were only used on the pickled herring in glass from the second processor. The pallets shipped from the first processor, the second processor and the distribution terminal were not identified with SSCC codes. TraceFish requires production parameters, ingredients and raw materials used to be keyed to globally unique trade units; for many of the companies in the herring supply chain these data were either keyed to local batch numbers or not keyed at all. The identification of ingredients and packaging material were not recorded and the "mother brine" at the second processor had never-ending batches. Many of the companies recorded information manually (paper-based). This will limit the companies' ability to send information in structured or standardised manner. Subsequent queries or requests for more information would always have to specify the local batch number, as some information was keyed to this.

5.3 Recommendations

5.3.1 A plan to improve the traceability for the vessel could look as follows:

1. The catch was split up, thus each trade unit shipped would need a unique identification. Extend the use of GS1 codes so that each trade unit gets a unique GTIN, add a serial number (or a guaranteed unique date/time stamp) to the GTIN to get unique identification of each trade unit (TU) shipped.
2. Develop a freeware pelagic information programme for the vessels. The programme records the content of each tank and transfers the information via the Internet to the processor using the TraceCore XML. More exact information can then be retrieved by the first processor.

5.3.2 A plan to improve the traceability for the first processor and the second processor could look as follows:

1. Encourage suppliers of ingredients to use globally unique numbers when identifying their shipments. Having the number in standard format would act as an enabler for electronic dissemination of information, both from supplier to the first and second processor, and from the first and second processor to customer.
2. Reception: Record identification of ingredients (salt, sugar, vinegar, and species) and packaging materials.
3. Decide on the level of traceability wanted for vinegar, salt, brine and pickle.
4. Record the relationship between the identification of ingredients and packaging material and an internal batch number.
5. Extend the use of GS1 codes so that respectively herring of barrels and pickled herring in glass gets a unique GTIN.
6. Record the relationship between the uniquely identified herring of barrels / pickled herring in glass and an internal production number.
7. Extend the use of GS1 codes so that each pallet gets a unique SSCC code.

5.3.3 A plan to improve the traceability for the distribution terminal could look as follows:

1. Record the SSCC code of the received pallets.
2. Extend the use of GS1 codes so that each mixed pallet gets a unique SSCC code.
3. Record the relationship between the identification of pickled herring in glasses and the SSCC code of the mixed pallet.

5.4 Changer carried out

Based on the recommendations to the companies in the herring supply chain, all companies have changed and started manual registration and recording of all ingredients and packaging materials. The use of the GTIN in all steps of the chain will not be introduced right away because their manual, paper based systems live up to the industries and customers present needs and short time goals (low costs and no investments at all). The developed Pelagic Information Program (PIP) have enabled the use of GS1 onboard the vessels with only the costs for registering the GS1 Number at the GS1 organization for the single vessel. The PIP will be introduced in the beginning of 2008 for all pelagic vessels with no regard of country of origin for free download from the SEAFOODplus and DIFRES homepage. The long term impact is that pelagic vessels and producers that want to utilize chain information are able to do it. The market situation for the actual pelagic chain chosen for the analyses is very hard at the moment. Therefore they are not able to introduce anything that involves investments at present. However the developed PIP makes standardized information transfer possible from the vessel to shore and can in the future ensure that the necessary information are generated to enable utilization of chain information in the pelagic sector.

6 Results of process mapping of tuna

6.1 Material flow and identification

A tuna fish supply chain in Spain have been analysed in Denmark (Figure 5). The grey link in the supply chain has been studied by using the analysis scheme in appendix 3.

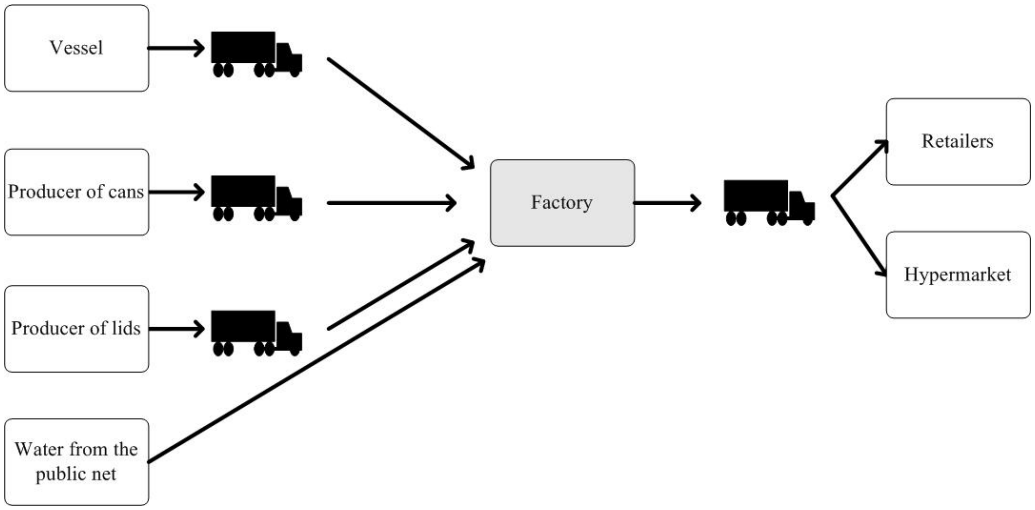


Figure 5 Overview of the tuna supply chain in Spain. A tuna fish canning factory was studied.

The first step in process mapping of this type is to identify the end product. The product chosen to map was 3-packs of 85 mm tuna cans in water.

6.1.1 Tuna fish canning factory

The following raw materials and ingredients were identified:

1. Tuna fish
2. Cans
3. Lids
4. Water

The company made new identification numbers for the tuna fish when they received it, they did not use the number received from the supplier. Both numbers were written down on a paper. When the tuna fish in one container was split, the new batches got new and separate batch numbers. The local batch number consisted of year code, shift number and a sequential number. It was written on a plastic tag, and this tag followed the production batch through the processing. The company made new identification numbers for the cans. The labels from the supplier were kept together with the company's labels, the production date was written down. The company made new identification numbers for the lids. The labels from the supplier were kept together with the company's labels, the production date was written down. The company received the water from the public net. The water had never-ending batches. The 3-packs

were packed into boxes, and the boxes grouped into pallets. Both the boxes and the pallets were labeled and identified with the internal production number. The canned tuna was sold to hypermarkets and retailers. Identification of shipped product was by product type and production date, with production number explicitly recorded on the shipped goods.

6.2 Discussion and conclusions

In general, traceability was good, the information loss was acceptable, and traceability knowledge and consciousness among the company employees seemed sufficient. The company meets with 178/2002 Common Food Law requirements for traceability, and also to some degree fulfil the additional recommendations made in the accompanying guidance document.

The company did not meet with TraceFish requirements, mainly because globally unique identifiers were not systematically used to document the relationship between received goods and shipped goods. TraceFish requires each shipped trade unit to have a globally unique identifier (identified by GTIN+); trade units shipped from the company could be identically marked if they stemmed from the same production batch. TraceFish requires production parameters and raw materials used to be keyed to globally unique trade units; at the company these data were keyed to the local production numbers. This will limit the company's ability to send information in structured or standardised manner. Queries or requests for more information would always have to specify the local production number, as all information was keyed to this.

6.3 Recommendations

6.3.1 A plan to improve the traceability at the tuna fish canning factory could look as follows:

1. Encourage suppliers of tuna fish, cans and lids to use globally unique numbers when identifying their shipments.
2. Extend the use of GS1 codes so that each product type gets a unique GTIN.
3. Record the relationship between the uniquely identified TUs and the internal production number; each TU should link to only one production number, but one production number may have many TUs.
4. Provide information to customers and consumers keyed to the unique number on the TU. Information can be supplied on request, it can be transmitted on paper or electronically along with the product, it can be put on a web site, etc.

7 Results of process mapping of salmon

7.1 Material flow and identification

A salmon supply chain from breading to production of salmon filets in Norway has been studied (Figure 6), including production of vitamins and pigment colour and production of salmon feed. The grey links in the supply chain have been analyzed by using the forms in appendix 4.

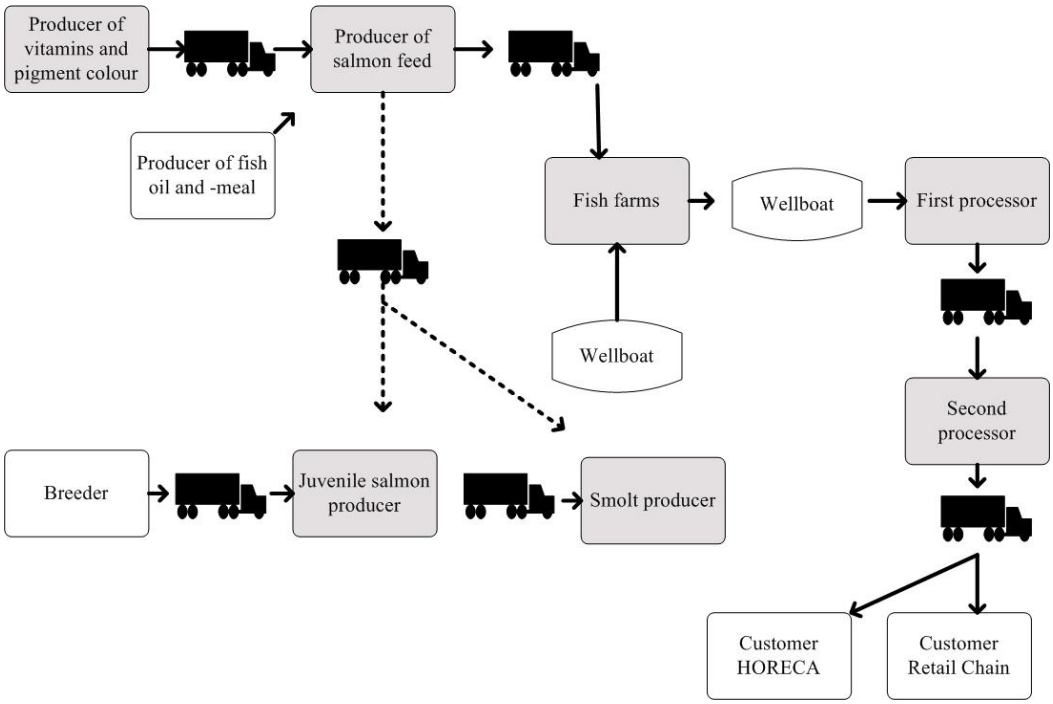


Figure 6 Overview of the salmon supply chain in Norway

The first step in process mapping of this type is to identify the end product. The product chosen to map was salmon filets.

7.1.1 Producer of vitamins and pigment colour

The producer of vitamins and pigment colour was a supplier of vitamins to the producer of salmon feed. The vitamins were based on chemical products. All the steps, including the natural gas supply were internal in the company. The internal traceability in production of vitamin by the company was not evaluated in this study. This evaluation will only focus on chain traceability out from the producer of vitamins and pigment colour. The transformation information in the Enterprise Resource Planning system (ERP) between producerID, production batchID and CostumerID indicated that the producer of vitamins and pigment colour had the possibilities to trace each batch of an article to a defined number of customers. A barcode labelling and reading system was implemented and running .The system was based on EAN 128 code identification, which has the capability for globally unique identification.

7.1.2 Producer of salmon feed

The producer of salmon feed received raw materials from more than 100 different suppliers. The sizes of the received batches could vary between a few kilos in a single box of vitamin to several tons in a bulk cargo of fishmeal. The study focused on the methods and systems for receiving raw materials from the producer of vitamins and pigment colour. Traceability between the producer of vitamins and pigment colour and producer of salmon feed was based on manual recordings of identifications and additional traceability information. The identifications used were only partly based on an internationally standardised system.

7.1.3 Breeder

The breeder produced salmon roe and delivered it to the juvenile salmon producer. This link was not analyzed in this study.

7.1.4 Juvenile salmon producer

The juvenile salmon producer received salmon roe. Feed, water and oxygen was added to make the salmon grow into juveniles, and temperature and light was controlled to optimize the growing conditions. During the production only splitting of the original fish groups were made. The identification of TU's was unique both for reception and dispatch of fish groups. Input factors such as feed was not recorded with unique TU/LU ID's. Traceability of feed was therefore only possible at the feed type level. For the salmon itself, developing from roe to juvenile, the information loss was not significant. Salmon of one origin/generation was kept separate from other salmon in all stages through this link, from roe to juvenile. The roe could be distributed across numerous cylinders, and the juveniles in many tanks, but the splitting, mixing and joining that happened did not cause significant information loss, as the fish was uniform. There is a concern, however, that relevant information pertaining to the feed could be lost unnecessarily; if recall based on feed batch ID happened, for the juvenile salmon producer to show "No fault" might be problematic.

7.1.5 Smolt producer

The smolt producer received salmon juveniles. Feed and water was added to make the salmon grow from juveniles to smolt (ready for salt water), temperature and light was controlled to optimize the growing conditions, and the fish was vaccinated against disease. Salmon smolt was delivered to fish farms either in September/October of the same year as when received (0 yearlings) or in April/May the following year (1 yearlings). Traceability of the fish TU's were considered to be good. During the production only splitting of the original fish groups were made. The ID of TU's were unique both for reception and dispatch of fish groups. The input factor feed was not recorded with unique TU/LU ID's at reception. At consumption, feed name and batch ID were linked to the actual fish groups. Traceability of feed was therefore possible at feed batch level pr fish group. The software, however, was not capable of reporting these references. Because of this the traceability was not electronic. The input factor vaccine was recorded with unique TU/LU ID's. Traceability of vaccine was possible at the TU/LU level pr fish group.

7.1.6 Fish farms

The fish farms received smolt. Feed was added to make the salmon grow from smolt to 4-6 kg salmon. Temperature and light was controlled to optimize the growing conditions, and the fish was chemically treated against lice. Salmon smolt was received at fish farms either in

September/October or in April/May. It took 10-18 months to grow from smolt to 4-6 kg. Traceability of the fish TU's were considered to be good. During the production only splitting of the original fish groups were made. The ID of TU's were unique both for reception of smolt and dispatch of salmon for harvesting. These ID's were internal, proprietary and were not used as a link by the live fish transporters. Input factors such as feed was not recorded with unique TU/LU ID's. Traceability of feed was therefore only possible for feed type pr fish group.

7.1.7 Well boat

Well boats transported live salmon from the fish farms to the first processor. This link was not analyzed in this study.

7.1.8 First processor

Live salmon was received from well boats and placed in waiting cages. The salmon in each cage was assigned a production batch ID and processed one cage at a time. Salmon from the cages were pumped one cage at a time to a cooling tank. The production lines were emptied between batches to make sure that batches were not mixed. To keep the salmon calm, CO_2 was added in the cooling tank. From the cooling tank, the salmon was pumped to a station for 'throat cutting', and then on to a bleeding tank. The salmon was then sent through a grader for sorting by size, and sent to the appropriate gutting line.

- Gutted fresh packed in boxes with ice
- Fresh fillet packed in boxes with ice
- Gutted frozen packed in boxes

Gutted fresh flow:
The packaging of fresh salmon in boxes was done automatically according to customer orders. The boxes were then filled with ice, labeled and strapped. Palletizing was done by a robot, sorting the boxes by quality and size. Pallets were transferred to the terminal area by pallet truck.

Fresh fillet flow:
Filleting was done by customer order, and the required size/quality is sent to a manual fillet line. Fillets were manually packed in boxes, labeled and strapped. The boxes were stacked on pallets and transferred by pallet truck to the terminal area.

Gutted frozen flow:
From the grader, the salmon was transported by pallet truck in 400 kg containers. After stacking in racks, the salmon was placed in freeze tunnels. Frozen salmon was packed in boxes, labeled and strapped. After palletizing, pallets were transported to freeze storage. Picking from storage was done by customer order, using the FIFO principle as much as possible. The process of loading onto trucks was common for all the product flows. The pallet labels were placed on top of the pallets. This made it possible to find errors discovered after loading by crawling on top of the cargo. The transport to customers either went directly or via terminal/other transport modes.

The salmon in each waiting cage was treated as one separate batch. When a new batch was started, the production plant information system assigned a batch ID. The operator chose a supplier (fish farm) from a list, and could also enter the fish farm cage number. The batch

number assigned to the salmon from each waiting cage was kept through the production plant, and was printed on both box labels and pallet labels.

7.1.9 Transport

The transport company transported salmon from the first processor to the second processor. The loading of each customer order at the second processor by a freight manifest, printed from the plant IT system. This was a standardized document with basic information about the transport, and each manifest has a unique consignment number. This number was also printed on the document as a barcode. The processing plant printed the customer order number on the freight manifest as a reference between the transport and the customer order. The document was signed by sender, transporter and receiver, each party kept their own copy. For each transport order, the transport company assigned a transport order number. This was used as the internal reference in the transport company for tracing the transport. As an external reference, the transport company normally linked the second processor's customer order number to each transport order number. The invoice number was also linked to the transport order number. One transport (transport order) consisted of one or several trips, identified by a unique trip number. The trip numbers were linked to the transport order number. The information stored for each trip was origin and destination, date/time of start and arrival, truck registration number etc. For international transports, the transport company issued an international freight manifest. In addition to the name of the receiver, the reference to the second processor's customer order on this document was the transport company transport order number. When the transport company stored salmon on the terminals, the transport company kept track of pallets/boxes by assigning a physical area for each client. The location of individual pallets/boxes was not managed by a Warehouse Management System (WMS). When a sale was made, the transport company received an order with a picking list with reference to individual boxes.

7.1.10 Second processor

Fresh salmon was received from first processor (above) in 20 kg styrofoam boxes on pallets. The transport was mad by refrigerated trucks. The outgoing products could vary between a few kilos to several tons of smoked salmon in 10 kg styrofoam boxes.

The level of external traceability was poor, as they missed traceability links at both ends of their internal chain – that is, the reception of raw materials and the expedition of outgoing products.

At the reception of raw materials, there is no scanning of box or pallet labels. But some data from the box labels are entered manually into paper forms. However, nothing that can be used as unique backward links [to the slaughtering plant or to the transporter] is entered.

The situation is similar at the out-expedition. Production lot-numbers are stamped on the boxes using ink-stampers, but the numbers are not globally unique, and not even internally unique. The boxes receive printed labels from the Marel system too, but the labels only identify the customer and transporter at a generic level (name only), and does not contain the production lot number (as this is being stamped on the box). In general, the internal traceability was pretty good along their production chain. However, the processes are purely manual and therefore error prone.

7.2 Discussion and conclusions

In general, traceability of salmon in this chain is fairly good, and this is to a large degree due to the fact that most of the links analyzed are part of the same vertically integrated company, and this company has established its own names, numbers and databases. All links in the chain meet with 178/2002 Common Food Law requirements for traceability, and also to some degree fulfil the additional recommendations made in the accompanying guidance document. When it comes to salmon the traceability is good, for feed it is OK (ID of feed bags not recorded or linked to production batches), and for other ingredients the traceability is not so good.

The companies did not in general meet with TraceFish requirements, mainly because globally unique identifiers are not systematically used to document the relationship between received goods and shipped goods. TraceFish requires each shipped trade unit to have a globally unique identifier where as here trade units shipped from the company may be identically marked if they stem from the same production batch. TraceFish requires production parameters, ingredients and raw materials used to be keyed to globally unique trade units; for many of the companies in the salmon supply chain these data were either keyed to local batch numbers or not keyed at all.

7.3 Recommendations

7.3.1 General recommendations for the salmon supply chain

1. For each unit received from the fish farms and other suppliers, the SSCC, supplier ID (GLN) and transporter ID should be recorded and linked to the internal production batch ID.
2. For each unit dispatched to customer, a SSCC should be used as an ID and linked to an internal production batch ID, customer ID (GLN) and transporter ID.
3. For recording SSCC numbers on pallets when loading trucks, a logistic unit ID data capture system should be in place at the plant. The data capture system must be integrated with the company's ERP system.

7.4 General comments

It is assumed that the ERP systems for each link in the chain have functionality for linking logistic units (SSCC) and trade units (GTIN+) to customer orders.

7.4.1 A plan to improve the traceability at the producer of vitamins and pigment colour could look as follows:

1. Redefine the barcode on the trade unit labels to include the following EAN 128 AI's
    a. AI (01) GTIN
    b. AI (10) Lotnumber
    c. AI (21) Serial number or (8008) Date time and of production
2. If trade units are assembled into a logistic unit:
    a. Labelling and identification on the logistic units including EAN-UCC's SSCC in a barcode

b. Links between ID of each trade unit on the logistic unit, (1a,b and c), and the SSCC
c. Link between SSCC and order number in SAP

3. Labelling and identification of producer on trade units and logistic units by using the EAN-UCC Global Identification Number (GLN) AI 410-415 in barcode.

7.4.2 A plan to improve the traceability at producer of salmon feed could look as follows:

1. Scanning of SSCC and GLN at raw material reception. Automatic data capture may be the most efficient improvement to improve traceability in the raw material reception. This is only possible through the use of standardised company and batch ID's from suppliers according to the TraceFish standard for identification of company and batch/trade units.
2. Use the GTIN article numbers instead of proprietary raw material numbers
3. Apply GLN in product labels using EAN-UCC 128 coding at all production sites.
4. Identification of small bags with GTIN (AI 01), batch number (AI 10) and Serial number (AI 21) or date time and of production (AI 8008)
5. Links between ID of each trade unit on the logistic unit (ref. 4. above) and the SSCC
6. If small bags are dispatched as single bags, they should be labelled as a logistic unit with a SSCC
7. To ensure the link between trade unit/logistic unit and customer (fish farmer), a logistic unit ID data capture system should be in place at the transporter or alternatively at the fish farm.

7.4.3 A plan to improve the traceability at the juvenile salmon producer, the smolt producer, the fish farms and the first processor could look as follows:

1. For each unit received from the suppliers (previous link, feed, chemicals etc), the SSCC, transporter ID and supplier ID (GLN) should be recorded and linked to the internal fish group ID
2. For recording SSCC numbers, a logistic unit ID data capture system should be in place at the fish farm. The data capture system must be integrated with the company’s ERP system.
1. For each unit dispatched to customer, a SSCC should be used as an ID and linked to an internal fish group number, customer ID (GLN) and transporter ID.

7.4.4 A plan to improve the traceability at the transport company could look as follows:

1. Loading: For each unit received from the first processor, the SSCC, supplier ID (GLN) and freight manifest ID should be recorded and linked to the internal transport company order number.
2. For recording SSCC numbers during loading, a logistic unit ID data capture system should be in place at the first processor /the transport company vehicle.
3. Unloading: For each unit unloaded at a distribution terminal or at the customer site, the SSCC of the logistic unit and the GLN of the destination should be recorded.

7.4.5 A plan to improve the traceability at the second producer could look as follows:

1. For each unit received from the suppliers, the SSCC, transporter ID and supplier ID (GLN) should be recorded and linked to the internal production batch ID. This also includes the received SSCC or other appropriate ID for packaging.
2. For recording SSCC numbers, a logistic unit ID data capture system should be in place at the fish farm. The data capture system must be integrated with the producer's of salmon filets ERP system.
1. For each unit dispatched to customer, a SSCC should be used as an ID and linked to an internal production batch ID, customer ID (GLN) and transporter ID.

7.5 Evaluation of changes done

In 2002 process mappings where carried out in the companies in the salmon supply chain (Forås, Storøy et al. 2004) revealed the following shortcomings:

- Not standardised, and unstructured identification of generations of fish groups
- Insufficient labelling of batch ID on trade units
- Absence of recording of feed ID when used
- A high degree of mixing of different fish groups from diverse suppliers and with unlike genetic characteristics.
- No data is recorded at the live fish carriers between farm sites and harvesting sites.

The production practice was not influenced by traceability principles. Recommendations to the companies in the salmon supply chain were to:

- Reengineer production processes in order to reduce the size of their traceable units. Reduce the number of size grading and mixing of fish groups in the smolt, ongrowing and live fish carrying kinks.
- Implement global unique identification keys for the traceable units.
- Implement recording routines of ID's at raw materials and input factors at reception, production and delivery
- Develop integration modules for traceability information exchange between software applications
- Develop a software application for recording of traceability

In the period of 2003-2004 many of the fish farmers experienced challenges that required improved product traceability. The problems occurred as inexplicable mortality, customers complaining on product quality caused by factors early in the supply chain etc. Tracing back to the causal factors and tracing forward to all the batches that were influenced was described as problematical by many of the farmers.

New process mappings of the companies in the salmon supply chain were carried out in 2004 and displayed a change in practice. The new production practices gave smaller traceability units in the chain from smolt to harvesting due to:

- Substantial reengineering in production practices avoiding mixing of different fish groups in the smolt, ongrowing and live fish carrying links
- Improved records on reception and use of input factors such as vaccines and feed
- Improved traceability records documenting transformation information between links in the chain

The same process reengineering as mentioned above has been adapted by the majority of the fish farming industry during the period 2003-2005 (Authors opinion).

During the same period of time the actual feed producer implemented globally unique identification on their trade units. They also started keeping records of which batch numbers that were delivered to what customer.

Despite of these improvements, the process mappings done in 2004 revealed that the reengineering only to a certain degree reduced the traceable units. The feeding records pr fish group did not include the unique ID on the feed bags or the feed batch numbers. This gave complex relations between feed and fish groups which gave a high traceability granularity.

Regarding globally unique ID, none of the fish farmers had implemented such on the fish groups.

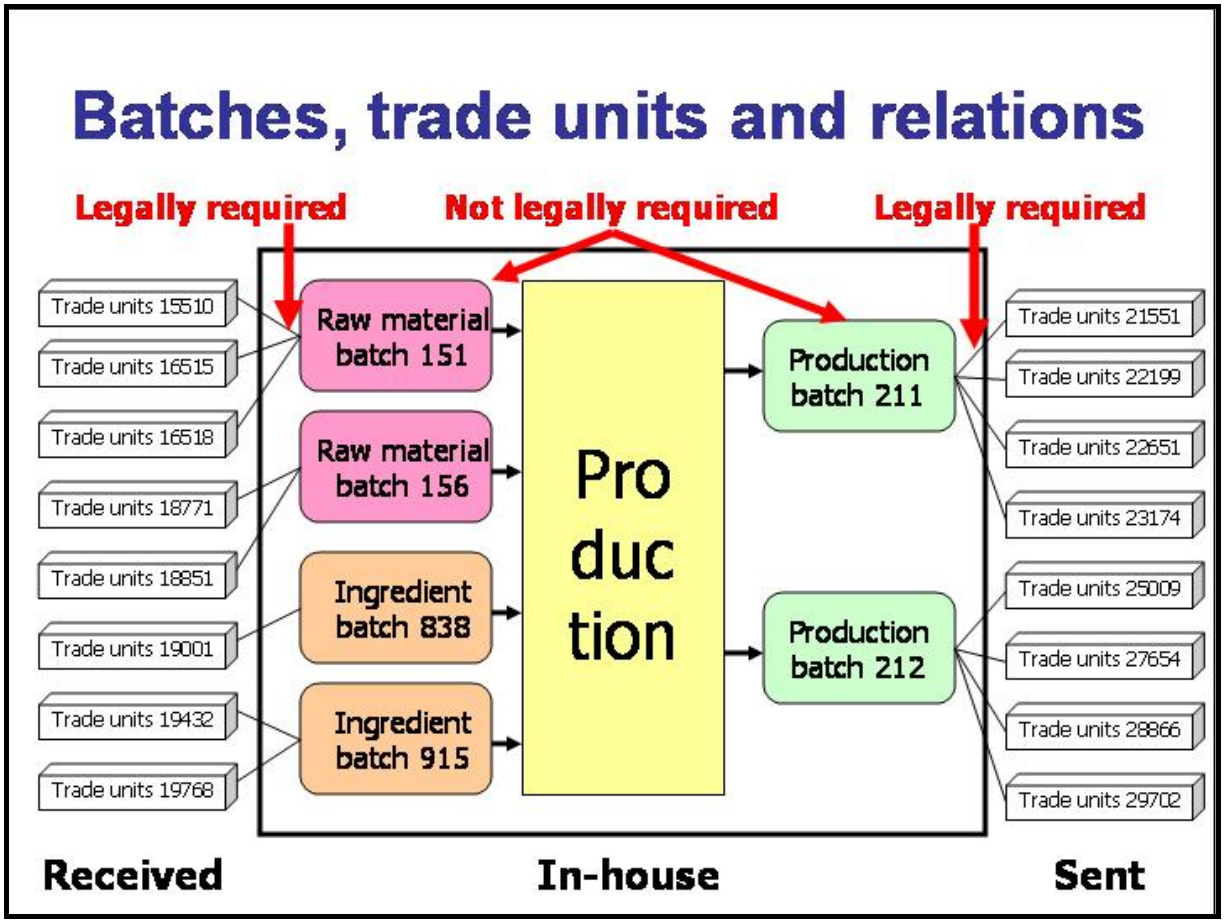
The live fish carriers still had minimal recording of traceability information and none of this were available electronically.

There has been substantial production processing reengineering in the salmon farming industry in Norway between 2002 and 2004. This reengineering has led to an improved granularity of traceability. At the same time there are still multiple challenges towards optimal chain traceability. Further focus should be made on implementing globally unique ID’s and an improved solution for the live fish carrier.

8 Overall conclusion

Although there were degrees of variance between the chains examined, there were more similarities than differences in the degree of traceability.

Generically, each process looked something like the following:



The legal requirement with respect to inputs is as follows: "*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.*". Each of the pilots mapped satisfy the minimum requirement here in that they can identify who their suppliers are. When it comes to recording what was supplied from each; that is the recording of the relationship between the identifier of the received ingredient and the identifier of the local ingredient batch the situation was worse. Some pilots did not record this relationship at all, and some only recorded it for their main ingredient (what they considered their main raw material). As an example, in the diagram above, this means recording the ID of trade unit 15510, and also recording the fact that TU 15510 went into our local raw material batch 151. If this relationship is not recorded, traceability is compromised. If a recall is issued on all trade units numbered from 15000 to 16000, there is then no way of knowing which raw material batches they went into, and everything has to be recalled. This is similar to what happened in Belgium related to the dioxin contamination in 1999. The feed producers knew the production code of the contaminated feed bags, but the farmers had not recorded these numbers, so everything had to be recalled. Obviously tracing back to origin

also becomes a lot more difficult. If you know that raw material batch 151 is somehow contaminated, you cannot easily narrow down the list of suspects when it comes to identifying where the contamination comes from if you haven't recorded the identifiers of the trade units that went into it.

The legal requirement with respect to outputs is as follows: "*Food and feed business operators shall have in place systems and procedures to identify the other businesses to which their products have been supplied.*". Each of the pilots mapped satisfy the minimum requirement here in that they can identify who their customers are. When it comes to recording what was delivered to each; that is the recording of the relationship between the identifier of the produced batch and the identifier of the trade unit or logistic unit delivered situation varied. Some pilots had good routines and systems for recording this information; some had not so good systems. As above, if this information is not recorded the ability to trace back or forward is compromised.

Both for inputs and for outputs uniqueness and standard number series are vital components of the traceability system. If the identifier of trade units received cannot be guaranteed to be unique there is no way to distinguish one unit received from another unit received, possibly through a different route (although from the same source). Suppliers should be encouraged to mark their units with unique numbers so that if two otherwise identical units take different routes, it is possible to record which unit took which route. For this same reason, the products delivered should also be marked with unique numbers. Since these numbers will be used both by the supplier and the customer, the numbers should be in standard format, as specified by GS1. None of the pilots investigated used unique numbers in standard format in or out, and so none of the pilots met the TraceFish requirements where this is a key issue.

Another important requirement with respect to traceability is that there is some recording done with respect to what inputs where used to create what outputs. This is not a legal requirement in "178/2002 Common Food Law", but all guidelines to the law strongly recommend recording this relationship. The "Standing Committee on the Food Chain and Animal Health" say the following in their "Guidance on the Implementation of Articles 11, 12, 16, 17, 18, 19 and 20 of Regulation (EC) N° 178/2002 on General Food Law" document:

"*Without prejudice to more detailed rules, the Regulation does not compel operators to establish a link (so called internal traceability) between incoming and outgoing products. Nor is there any requirement for records to be kept identifying how batches are split and combined within a business to create particular products or new batches.*"

"*In summary, food business operators should be encouraged to develop systems of internal traceability designed in relation to the nature of their activities (food processing, storage, distribution etc). The decision on the level of detail of the internal traceability should be left upon the business operator, commensurate with the nature and size of the food business.*"

All pilots to some degree recorded the relationship between inputs and outputs; the main weakness was that the inputs and outputs were locally identified, and as indicated above, there was not necessarily any explicit connection to the identity of the ingredients received. All pilots identified their product with some sort of local batch number, but that means that traceability to the next link in the chain is dependent on the customer recording that (for him meaningless) number.

The overall recommendation for all the pilots is then:

1. Start using unique and standard numbers on trade units delivered

2. Record the relationship between production batch and delivered trade unit explicitly; which production batch generated which trade units?

3. Record all production information keyed to production batch number.

4. Start assigning locally unique numbers to own ingredient batches.

5. Record the relationship between ingredient batch and received trade unit explicitly; which ingredient batch incorporated which trade units? If there already are unique identifiers on the received trade units they should be recorded and used, if not a unique identifier should be assigned upon reception. Suppliers should be encouraged to use unique and standard numbers (GS1) to simplify this process.

6. Record relationship between input batch and production batch explicitly whenever possible.

7. Disseminate information keyed to identity of delivered trade unit (or production batch number) widely. Send information to customer or consumer upon request, or put it in searchable form on the company website so that anyone can trace the attributes, processes, constituents and respective origin of the product and all its parts.

This recommendation is in line with the GS1 Traceability Standard, and it is also in line with the more detailed TraceFood Framework (which incorporates the TraceFish standard).

9 Biography

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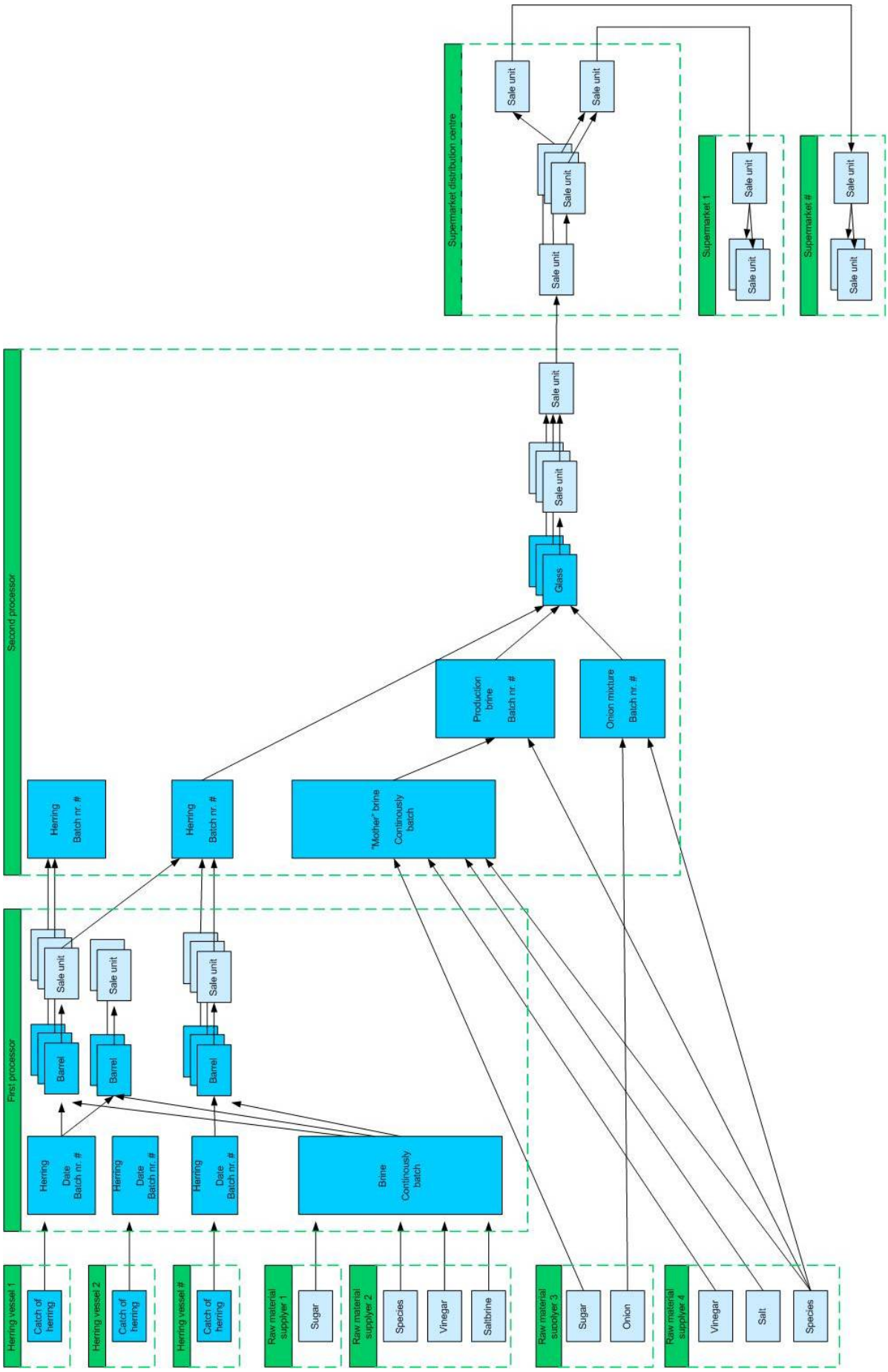
Appendix 1 - The analysed pelagic chain (herring product)



Appendix 2 – The analysis scheme for herring

Seine vessel

1. Transport of finished goods to distribution terminal or directly to customer

Question to transporter of finished goods	Answer, fill in	Description or example
What type of transport is used?	Truck	Truck / vessel/ air plane / post / courier / etc.
What type of delivery is it?	Directly to supplier	Distribution terminal or directly to supplier, either
How is the vehicle identified?	None	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	Date of unloading	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	No	No / Yes, indirectly / Yes, directly
Which temperature control method was used?	None	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	None	No / Yes manually / Yes electronically

2. Collection of finished product

Transformation questions, shipping	*Answer, fill in*	Description or example
To whom are shipments of this type delivered?	Confidential information	Name and address / GLN
From where are shipments of this type shipped?	Vessel name	Name and address / GLN
Description of the total amount collected?	Number of tanks Estimated weight	Full/part containers, full/part trucks, full/part holds / etc
Range of total amount collected every time?	Ton	From-to in kg / ton / other number relating to TU/LU
How often does collection take place?	Weekly	Daily / weekly / etc
How is the total collected amount identified? What type of code and media?	Logbook	Trip number / SSCC[1] / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.

[1] Each logistic unit is often marked with a ***Serial Shipping Container Code*** **(SSCC)** which uniquely identifies the company and the particular logistic unit.

What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	Logbook Species Catch date Estimated weight			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If collected amount is divided into LUs; how is each LU identified? What type of code and media?	No			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to each LU?	No			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	-			Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	-			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If LU is divided into TUs; how is each TU identified? What type of code and media?	Logbook			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	No			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	-			Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	-			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
Does a temperature log accompany the shipment?	Yes			No / Yes
Is the temperature of the shipment measured on collection?	Yes			No / Yes

3. Post production storage, quality control, packaging, labelling

Questions post-production	***Answer, fill in***		**Description or example**
What is the name/type of the product?	Fresh herring Whole, ungutted		Identifying description or name of the product
What is the product condition?	Chilled		Ambient / chilled / frozen / etc
Which storage method is used post-production?	RSW tanks		Boxed / bulked / seawater tanks / brine tanks / cold storage / etc.
What type of transport from process to packaging is used?	No		Not needed / Flow line / Fork-lift / By hand / etc.
Is a label used, if so, what type?	No		Clear text, barcode / Radio Frequency Identification-number (RFID) / none / etc.
If a label is used, what information is on it?	-		Name of the company / date and time of production / date of durability etc
What quality control checks are linked to the finished product? How are they recorded; on paper, punched into computer system, automated data gathering?	Temperature recording- paper record		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	Refrigerated		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	Recorded on paper record		No / Shown only / Recorded manually / Recorded electronically

4. Production ends

Transformation questions, from production	***Answer, fill in***	**Description or example**
What type of lot / batch is used for finished product?	Logbook	Daily / weekly / etc
What is the lot / batch amount?	The total catch	From-to in kg / ton / etc
How is the lot / batch identified?	Logbook	Unique / Non-unique. Code structure. Internal / Visible number
Can the producer link from identification of lot / batch to shipment of finished product?	Yes	No / Yes indirectly / Yes directly (Lot / batch-ID recorded after production and linked to TU-ID)
If the answer above is yes, how is it linked?	Manual (logbook)	Electronic / manual

What parameters are linked to the finished production batch? How are they recorded; on paper, punched into computer system, automated data gathering?	Species Catch date Catch area (FAO area 27)		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Is the finished lot / batch split up, joined together or	Kept as one		Split up / joined together / kept as one

kept as one?		

5. During production

Questions production	***Answer, fill in***	**Description or example**
How are the batches separated during production?	Continuous mixing	Physically, staged mixing, continuous mixing, etc
1 batch only or many in parallel?	One	One / Many
If many, are they ever mixed?	-	No / Yes
How are batches identified during production?	None	Unique / Non-unique. Code structure. Internal / Visible number
Is this identifier retained or referred to after production?	No	No / Yes

6. Application of ingredients and raw materials - Each type one table

Transformation questions, into production	***Answer, fill in***	**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	No	No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	-	Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	Joined together	Split up / joined together / kept as one

7. Raw material / ingredient unpacking, pre production storage, mixing – Each type one table

Questions pre-production	***Answer, fill in***	**Description or example**
Storage type for this raw material / ingredient as it enters production?	In RSW tanks	Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	Mixed	1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.

Identification of this raw material / ingredient as it enters production?	No	As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?	No	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	Refrigerated	None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	Recorded on paper record	No / Shown only / Recorded manually / Recorded electronically

8. Reception of ingredients and raw materials – Each type one table

Transformation questions, reception	***Answer, fill in***	**Description or example**
From whom are shipments of this type received?	-	Name and address / GLN
Where are shipments of this type received?	FAO catch area	Name and address / GLN
Description of total amount received?	Logbook	Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	Estimated	From-to in kg, ton / etc
How often does reception take place?	?	Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	Date FAO catch area Yes logbook	Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	Logbook	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	No	Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	No	No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	-	Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label,	Species, paper FAO Area Date	List of parameters. For each parameter, indicate L/P/F/E/O for type of

paper, fax, electronically, other? Are they recorded on reception?	Estimated weight			transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	No			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	No			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	-			Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	-			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	No			No / Yes
Is the temperature of the shipment measured on reception?	No			No / Yes

9. Transport of ingredients and raw materials - Each type one table

Question to transporter of ingredients and raw materials	**Answer, fill in**	**Description or example**
What type of transport is used?	Vessel	Truck / vessel / air plane / post / courier / etc.
What type of delivery is it?	Catch	Distribution terminal or directly from supplier, either
How is the vehicle identified?	Logbook	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	Logbook	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	No	No / Yes, indirectly / Yes, directly
Which temperature control method was used?	No	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	No	No / Yes manually / Yes electronically

Processor 1

1. Transport of finished goods to distribution terminal or directly to customer

Question to transporter of finished goods	**Answer, fill in**	**Description or example**
What type of transport is	Refrigerated truck	Truck / vessel/ air plane /

used?		post / courier / etc.
What type of delivery is it?	Directly to supplier	Distribution terminal or directly to supplier, either
How is the vehicle identified?	Company name	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	Delivery note	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	Yes, indirectly	No / Yes, indirectly / Yes, directly
Which temperature control method was used?	Refrigerated	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	No	No / Yes manually / Yes electronically

2. Collection of finished product

Transformation questions, shipping	***Answer, fill in***	**Description or example**
To whom are shipments of this type delivered?	Confidential information	Name and address / GLN
From where are shipments of this type shipped?	Confidential information	Name and address / GLN
Description of the total amount collected?	Number of barrels	Full/part containers, full/part trucks, full/part holds / etc
Range of total amount collected every time?	Ton	From-to in kg / ton / other number relating to TU/LU
How often does collection take place?	Weekly	Daily / weekly / etc
How is the total collected amount identified? What type of code and media?	Paper based Manual	Trip number / SSCC[2] / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	Delivery note Paper	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If collected amount is divided into LUs; how is each LU identified? What type of code and media?	Product type Batch number	Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total	Yes	No / Yes indirectly / Yes directly (LU-ID recorded

[2] Each logistic unit is often marked with a ***Serial Shipping Container Code*** **(SSCC)** which uniquely identifies the company and the particular logistic unit.

amount to each LU?		upon collection)
If the answer above is yes, how is it linked?	Manual	Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	Product type, paper	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If LU is divided into TUs; how is each TU identified? What type of code and media?	Batch number, paper Product type	GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	Yes	No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	Manual	Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	Batch number, paper Product type	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
Does a temperature log accompany the shipment?	No	No / Yes
Is the temperature of the shipment measured on collection?	No	No / Yes

3. Post production storage, quality control, packaging, labelling

Questions post-production	***Answer, fill in***	**Description or example**
What is the name/type of the product?	"Syrnet fillet 00 Nr 11"	Identifying description or name of the product
What is the product condition?	Chilled	Ambient / chilled / frozen / etc
Which storage method is used post-production?	Pickled in barrels	Boxed / bulked / seawater tanks / brine tanks / cold storage / etc.
What type of transport from process to packaging is used?	Forklift	Not needed / Flow line / Fork-lift / By hand / etc.
Is a label used, if so, what type?	Colour (one single colour on each production day) with clear text	Clear text, barcode / Radio Frequency Identification-number (RFID) / none / etc.
If a label is used, what information is on it?	Name of the company Date of production Description of goods Customer name Batch number	Name of the company / date and time of production / date of durability etc
What quality control checks are linked to the finished product? How are they recorded; on paper, punched into computer system, automated data gathering?	Salt% Histamine <<200ppm Acid% of pickle	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	Refrigerated	None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	No	No / Shown only / Recorded manually / Recorded electronically

4. Production ends

Transformation questions, from production	***Answer, fill in***	**Description or example**
What type of lot / batch is used for finished product?	Daily Batch Number	Daily / weekly / etc
What is the lot / batch amount?	One vessel, up to 200 ton	From-to in kg / ton / etc
How is the lot / batch identified?	Coloured note (one colour one day) Batch number	Unique / Non-unique. Code structure. Internal / Visible number
Can the producer link from identification of lot / batch to shipment of finished product?	Yes Batch Number	No / Yes indirectly / Yes directly (Lot / batch-ID recorded after production and linked to TU-ID)
If the answer above is yes, how is it linked?	Manual	Electronic / manual
What parameters are linked to the finished production batch? How are they recorded; on paper, punched into computer system, automated data gathering?	Landing date, Paper Batch Number, paper	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Is the finished lot / batch split up, joined together or kept as one?	Split up	Split up / joined together / kept as one

5. During production

Questions production	***Answer, fill in***	**Description or example**
How are the batches separated during production?	Physically	Physically, staged mixing, continuous mixing, etc
1 batch only or many in parallel?	One	One / Many
If many, are they ever mixed?	-	No / Yes
How are batches identified during production?	Colour Batch number	Unique / Non-unique. Code structure. Internal / Visible number
Is this identifier retained or referred to after production?	Yes	No / Yes

6. Application of ingredients and raw materials - Each type one table

Transformation questions, into production	***Answer, fill in***	**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	Raw material, yes Raw material, no	No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	Manual	Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	Raw material, kept as one	Split up / joined together / kept as one

7. Raw material / ingredient unpacking, pre production storage, mixing – Each type one table

Questions pre-production	***Answer, fill in***	**Description or example**
Storage type for this raw material / ingredient as it enters production?	Buffer tank with conveyer	Whole shipment as received / each LU as received / each TU as received, in local

		tank, etc.
Relationship from the above to received shipments?	1:1	1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	As before	As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?	No	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	No	None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	No	No / Shown only / Recorded manually / Recorded electronically

8. Reception of ingredients and raw materials – Each type one table

Transformation questions, reception	***Answer, fill in***	**Description or example**
From whom are shipments of this type received?	Fishing vessel	Name and address / GLN
Where are shipments of this type received?	Confidential information	Name and address / GLN
Description of total amount received?	Number of trucks, weight	Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	Ton	From-to in kg, ton / etc
How often does reception take place?	Daily	Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	Date of unloading Batch Number	Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	No	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	No	Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	No	No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	-	Electronic / manual

What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	No			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	No			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	No			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	-			Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	No			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	No			No / Yes
Is the temperature of the shipment measured on reception?	No			No / Yes

9. Transport of ingredients and raw materials - Each type one table

Question to transporter of ingredients and raw materials	**Answer, fill in**	**Description or example**
What type of transport is used?	Truck	Truck / vessel / air plane / post / courier / etc.
What type of delivery is it?	Directly from supplier	Distribution terminal or directly from supplier, either
How is the vehicle identified?	No	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	Date of unloading Batch number	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	Yes	No / Yes, indirectly / Yes, directly
Which temperature control method was used?	No	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	No	No / Yes manually / Yes electronically

Processor 2

1. Transport of finished goods to distribution terminal or directly to customer

Question to transporter of finished goods	**Answer, fill in**	**Description or example**
What type of transport is used?	Truck	Truck / vessel/ air plane / post / courier / etc.
What type of delivery is it?	Distribution terminal	Distribution terminal or directly to supplier, either
How is the vehicle identified?	Name	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	Delivery note	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	Yes, indirectly	No / Yes, indirectly / Yes, directly
Which temperature control method was used?	Refrigerated	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	No	No / Yes manually / Yes electronically

2. Collection of finished product

Transformation questions, shipping	***Answer, fill in***	**Description or example**
To whom are shipments of this type delivered?	Confidential information	Name and address / GLN
From where are shipments of this type shipped?	Confidential information	Name and address / GLN
Description of the total amount collected?	Glass jar on pallets	Full/part containers, full/part trucks, full/part holds / etc
Range of total amount collected every time?	Ton	From-to in kg / ton / other number relating to TU/LU
How often does collection take place?	Weekly	Daily / weekly / etc
How is the total collected amount identified? What type of code and media?	Dessinnumber Expiry date Production date	Trip number / SSCC[3] / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	No	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If collected amount is	No	Trip number / SSCC / none /

[3] Each logistic unit is often marked with a ***Serial Shipping Container Code*** **(SSCC)** which uniquely identifies the company and the particular logistic unit.

divided into LUs; how is each LU identified? What type of code and media?		etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to each LU?	No	No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	No	Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	No	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If LU is divided into TUs; how is each TU identified? What type of code and media?	No	GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	No	No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	No	Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	No	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
Does a temperature log accompany the shipment?	No	No / Yes
Is the temperature of the shipment measured on collection?	No	No / Yes

3. Post production storage, quality control, packaging, labelling

Questions post-production	***Answer, fill in***	**Description or example**
What is the name/type of the product?	Confidential information	Identifying description or name of the product
What is the product condition?	Chilled	Ambient / chilled / frozen / etc
Which storage method is used post-production?	In glass jars	Boxed / bulked / seawater tanks / brine tanks / cold storage / etc.
What type of transport from process to packaging is used?	Flow line	Not needed / Flow line / Fork-lift / By hand / etc.
Is a label used, if so, what type?	Paper Clear text	Clear text, barcode / Radio Frequency Identification-

	Lot number		number (RFID) / none / etc.
If a label is used, what information is on it?	Name of the company Date of durability Band name Content		Name of the company / date and time of production / date of durability etc
What quality control checks are linked to the finished product? How are they recorded; on paper, punched into computer system, automated data gathering?	One sample taken and stored; only to be used if requested		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	Refrigerated		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	Shown only		No / Shown only / Recorded manually / Recorded electronically

4. Production ends

Transformation questions, from production	***Answer, fill in***		**Description or example**
What type of lot / batch is used for finished product?	Daily Lot code		Daily / weekly / etc
What is the lot / batch amount?	Ton		From-to in kg / ton / etc
How is the lot / batch identified?	Unique		Unique / Non-unique. Code structure. Internal / Visible number
Can the producer link from identification of lot / batch to shipment of finished product?	Yes directly		No / Yes indirectly / Yes directly (Lot / batch-ID recorded after production and linked to TU-ID)
If the answer above is yes, how is it linked?	Manual		Electronic / manual
What parameters are linked to the finished production batch? How are they recorded; on paper, punched into computer system, automated data gathering?	No		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Is the finished lot / batch split up, joined together or kept as one?	Split up		Split up / joined together / kept as one

5. During production

Questions production	***Answer, fill in***	**Description or example**
How are the batches separated during production?	Physically	Physically, staged mixing, continuous mixing, etc
1 batch only or many in parallel?	One	One / Many
If many, are they ever mixed?	-	No / Yes
How are batches identified during production?	No	Unique / Non-unique. Code structure. Internal / Visible number
Is this identifier retained or referred to after production?	No	No / Yes

6. Application of ingredients and raw materials - Each type one table

Transformation questions, into production	***Answer, fill in***	**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	Yes directly	No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	Manual	Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	Split up	Split up / joined together / kept as one

7. Raw material / ingredient unpacking, pre production storage, mixing – Each type one table

Questions pre-production	***Answer, fill in***	**Description or example**
Storage type for this raw material / ingredient as it enters production?	In barrels to open tank	Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	1:1 with shipment	1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	As before	As before, by date/time, by tank number, by other reference

What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?	Manual inspection		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	None		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	No		No / Shown only / Recorded manually / Recorded electronically

8. Reception of ingredients and raw materials – Each type one table

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	Confidential information			Name and address / GLN
Where are shipments of this type received?	Confidential information			Name and address / GLN
Description of total amount received?	Number of barrels			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	Ton			From-to in kg, ton / etc
How often does reception take place?	Weekly			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	Batch number. Product type			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	Product type- paper label Batch number			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	None			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	No			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	-			Electronic / manual

What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	-			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	-			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	-			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	-			Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	-			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	No			No / Yes
Is the temperature of the shipment measured on reception?	No			No / Yes

9. Transport of ingredients and raw materials - Each type one table

Question to transporter of ingredients and raw materials	**Answer, fill in**	**Description or example**
What type of transport is used?	Truck	Truck / vessel / air plane / post / courier / etc.
What type of delivery is it?	Directly from supplier	Distribution terminal or directly from supplier, either
How is the vehicle identified?	Name	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	Delivery note	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	Yes, indirectly	No / Yes, indirectly / Yes, directly
Which temperature control method was used?	Refrigerated	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	No	No / Yes manually / Yes electronically

Distribution centre for supermarket chain

1. Transport of finished goods to distribution terminal or directly to customer

Question to transporter of finished goods	**Answer, fill in**	**Description or example**
What type of transport is used?	Truck	Truck / vessel/ air plane / post / courier / etc.
What type of delivery is it?	Directly to supplier	Distribution terminal or directly to supplier, either
How is the vehicle identified?	Registration number of vehicle and name	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	Supermarket number Electronic delivery note	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	Yes, directly	No / Yes, indirectly / Yes, directly
Which temperature control method was used?	None	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	No	No / Yes manually / Yes electronically

2. Collection of finished product

Transformation questions, shipping	***Answer, fill in***	**Description or example**
To whom are shipments of this type delivered?	Supermarket number	Name and address / GLN
From where are shipments of this type shipped?	Confidential information	Name and address / GLN
Description of the total amount collected?	Pallets	Full/part containers, full/part trucks, full/part holds / etc
Range of total amount collected every time?	No. of pallets	From-to in kg / ton / other number relating to TU/LU
How often does collection take place?	3 times per week	Daily / weekly / etc
How is the total collected amount identified? What type of code and media?	Label, Supermarket number/name	Trip number / SSCC[4] / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.

[4] Each logistic unit is often marked with a ***Serial Shipping Container Code*** **(SSCC)** which uniquely identifies the company and the particular logistic unit.

What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	No			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If collected amount is divided into LUs; how is each LU identified? What type of code and media?	No			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to each LU?	No			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	No			Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	No			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If LU is divided into TUs; how is each TU identified? What type of code and media?	No			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	No			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	No			Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	No			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
Does a temperature log accompany the shipment?	No			No / Yes
Is the temperature of the shipment measured on collection?	No			No / Yes

3. Post production storage, quality control, packaging, labelling (not applicable)
4. Production ends (not applicable)
5. During production (not applicable)
6. Application of ingredients and raw materials - Each type one table (not applicable)
7. Raw material / ingredient unpacking, pre production storage, mixing – Each type one table (not applicable)

8. Reception of ingredients and raw materials – Each type one table

Transformation questions, reception	***Answer, fill in***	**Description or example**
From whom are shipments of this type received?	Confidential information	Name and address / GLN
Where are shipments of this type received?	Confidential information	Name and address / GLN
Description of total amount received?	Pallets	Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	No. of pallets	From-to in kg, ton / etc
How often does reception take place?	Weekly	Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	No of trade units, best before on paper	Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	No	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	No	Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	No	No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	No	Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	No	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	No	GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.

Can the producer link from TU-ID to LU-ID?	No	No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	No	Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	No	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	No	No / Yes
Is the temperature of the shipment measured on reception?	No	No / Yes

9. Transport of ingredients and raw materials - Each type one table

Question to transporter of ingredients and raw materials	**Answer, fill in**	**Description or example**
What type of transport is used?	Truck	Truck / vessel / air plane / post / courier / etc.
What type of delivery is it?	Directly from supplier	Distribution terminal or directly from supplier, either
How is the vehicle identified?	Company name	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	Delivery note	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	Yes, directly	No / Yes, indirectly / Yes, directly
Which temperature control method was used?	Refrigerated	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	No	No / Yes manually / Yes electronically

Appendix 3 – The analysis scheme for tuna

1.1 Transport of finished goods - canned tuna

Question to transporter of finished goods	***Answer, fill in***	**Description or example**
What type of transport is used?	Truck	Truck / vessel/ air plane / post / courier / etc.
What type of delivery is it?	Distribution terminal	Distribution terminal or directly to customer, either
How is the vehicle identified?	Registration number of vehicle	Registration number of vehicle or name and address (or GLN)
How is the trip identified?		SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	Yes, indirectly through the CMR	No / Yes, indirectly / Yes, directly
What parameters are linked to this transport? How are they recorded; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the buyer or given back to the supplier?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Buyer" or "Suppl".
Which temperature control method was used?	Not relevant	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	Not relevant	No / Yes manually / Yes electronically

2.1 Collection of finished product

Transformation questions, shipping	***Answer, fill in***		**Description or example**
To whom are shipments of this type delivered?	Retailer		Name and address / GLN
From where are shipments of this type shipped?	Confidential information		Name and address / GLN
Description of the total amount collected?	Full/part trucks		Full/part containers, full/part trucks, full/part holds / etc
Range of total amount collected every time?	A full truch contains 33 pallets of R-85. 72 boxes per pallet, 90 cans per box (maximum 24 Tons)		From-to in kg / ton / other number relating to TU/LU
How often does collection take place?	5-6 daily		Daily / weekly / etc
How is the total collected amount identified? What type of code and media?	Manually is disconted from stock and in a close future it will be done automatically (Bar-code EAN 128)		Trip number / SSCC[i] / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	Histamine, Hg, only by request Information Is for their own use.	F	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If collected amount is divided into LUs; how is each LU identified? What type of code and media?	LU is a pallet. Pallet is identified by Bar code (EAN 128)		Trip number / SSCC / none / etc. Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to each LU?	Yes, indirectly		No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer is yes, how is it linked?	Manual		Electronic / manual
What parameters are linked to each LU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If LU is divided into TUs; how is each TU identified? What type of code and	If pallet is guaranteed to remain whole until it reaches customer, then the pallet itself is the TU, no lower level. If the pallet may be split		GTIN+ / other Unique / Non-unique. Sequential / Structured

media?	up before it is delivered (into boxes, most likely), then each box is a TU.			Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	Yes, they can			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer is yes, how is it linked?	Automatically			Electronic / manual
What parameters are linked to each TU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	Same parameters tha LU-ID			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
Does a temperature log accompany the shipment?	Not relevant			No / Yes
Is the temperature of the shipment measured on collection?	Not relevant			No / Yes

3.1 Post production storage, quality control, packaging, labelling

Questions post-production	***Answer, fill in***	**Description or example**
What is the name/type of the product?	Confidential information	Identifying description or name of the product
What is the product condition?	Canned	Ambient / chilled / frozen / etc
Which storage method is used post-production?	Not relevan	Boxed / bulked / seawater tanks / brine tanks / cold storage / etc.
What type of transport from process to packaging is used?	Flow line	Not needed / Flow line / Fork-lift / By hand / etc.
Is a label used, if so, what type?	Clear text Barcode	Clear text, barcode / Radio Frequency Identification-number (RFID) / none / etc.
If a label is used, what information is on it?	Name of the company / date and time of production / date of durability	Name of the company / date and time of production / date of durability etc
What quality control checks are linked to the finished product? How are they recorded; on paper, punched into computer system, automated data gathering?	Firstable they record on paper, afterwards the punch the figures into computer system	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	Not relevant	None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	Not relevant	No / Shown only / Recorded manually / Recorded electronically

4.1 End of production

Transformation questions, from production	***Answer, fill in***		**Description or example**
What type of lot / batch is used for finished product?	Daily		Daily / weekly / etc
What is the lot / batch amount?	6.000 kgs		From-to in kg / ton / etc
How is the lot / batch identified?	Internal (LH 123L)		Unique / Non-unique. Code structure. Internal / Visible number
Can the producer link from identification of lot / batch to shipment of finished product?	Yes		No / Yes indirectly / Yes directly (Lot / batch-ID recorded after production and linked to TU-ID)
If the answer is yes, how is it linked?	Electronic		Electronic / manual
What parameters are linked to the finished production batch? How are they recorded; on paper, punched into computer system, automated data gathering?	Same		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Is the finished lot / batch split up, joined together or kept as one?	Split up		Split up / joined together / kept as one

5.1 During production

Questions production	***Answer, fill in***	**Description or example**
How are the batches separated during production?	Physically	Physically, staged mixing, continuous mixing, etc
1 batch only or many in parallel?	One	One / Many
If many, are they ever mixed?	No	No / Yes
How are batches identified during production?	Internal (LH 123L)	Unique / Non-unique. Code structure. Internal / Visible number
Is this identifier retained or referred to after production?	Until product enter into can	No / Yes

6.1 Application of ingredients and raw materials – tuna fish

Transformation questions, into production	***Answer, fill in***	**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	Yes, directly. The company keeps the same batch number for the tuna fish under the production	No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer is yes, how is it linked?	Manual	Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	Tuna fish from one container can be splitted up, but can also be kept as one	Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

6.2 Application of ingredients and raw materials - cans

Transformation questions, into production	***Answer, fill in***	**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	Yes indirectly via the date.	No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer is yes, how is it linked?	Manual	Electronic / manual

Is the ingredient / raw material split up, joined together or kept as one?	Split up		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

6.3 Application of ingredients and raw materials - lids

Transformation questions, into production	***Answer, fill in***		**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	Yes indirectly via the date.		No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer is yes, how is it linked?	Manual		Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	Split up		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

6.4 Application of ingredients and raw materials - water

Transformation questions, into production	***Answer, fill in***		**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	No Never-ending-batches The water used in production of canned tuna fish can link to the date		No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer is yes, how is it linked?			Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	Never-ending batches		Split up / joined together / kept as one
What parameters are recorded to document the			List of parameters. For each parameter, indicate

application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?			"Paper", "ComPunch" or "ComAuto".

7.1 Raw material reception, pre production storage, mixing – tuna fish

Questions pre-production	***Answer, fill in***	**Description or example**
Storage type for this raw material / ingredient as it enters production?	Whole shipment as received, container	Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	1:1 with shipment	1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	Batch number made by the company (5L 1234 - year, shift and batch number)	As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?	Histamine, T[a]	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	Termometer	None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	Yes	No / Shown only / Recorded manually / Recorded electronically

7.2 Raw material reception, pre production storage, mixing - cans

Questions pre-production	***Answer, fill in***	**Description or example**
Storage type for this raw material / ingredient as it enters production?	*Each TU as received, a pallet*	Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*Added in queue*	1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*Batch number made by the company*	As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display		No / Shown only / Recorded

temperature shown or recorded?		manually / Recorded electronically

7.3 Raw material reception, pre production storage, mixing - lids

Questions pre-production	***Answer, fill in***		**Description or example**
Storage type for this raw material / ingredient as it enters production?	Each TU as recived, a pallet		Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	Added in queue		1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	Batch number made by the company		As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?			None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?			No / Shown only / Recorded manually / Recorded electronically

7.4 Raw material reception, pre production storage, mixing - water

Questions pre-production	***Answer, fill in***		**Description or example**
Storage type for this raw material / ingredient as it enters production?	None		Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?			1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	By date		As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system,			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

automated data gathering?			
Which temperature control method was used?			None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?			No / Shown only / Recorded manually / Recorded electronically

8.1 Reception of ingredients and raw materials – the tuna fish

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	Confidential information			Name and address / GLN
Where are shipments of this type received?	Confidential information			Name and address / GLN
Description of total amount received?	Full/parts vessels and trucks			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	Max 25 Tons			From-to in kg, ton / etc
How often does reception take place?	Daily			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	Direct reference (label)			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?	By e-mail T^a, Histamine			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	Yes, with metal notices			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	Indirectly			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer is yes, how is it linked?	Manual			Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?	Kept			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or

				"Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	Yes			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	Yes			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer is yes, how is it linked?	Manual			Electronic / manual
What parameters are linked to the each TU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?				No / Yes
Is the temperature of the shipment measured on reception?				No / Yes

8.2 Reception of ingredients and raw materials - cans

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?				Name and address / GLN
Where are shipments of this type received?	Confidential information			Name and address / GLN
Description of total amount received?	Full/parts trucks			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?				From-to in kg, ton / etc
How often does reception take place?				Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?				Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is				Trip number / SSCC / none /

divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?		etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?		No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer is yes, how is it linked?		Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?		GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?		No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer is yes, how is it linked?		Electronic / manual
What parameters are linked to the each TU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?		No / Yes
Is the temperature of the shipment measured on reception?		No / Yes

8.3 Reception of ingredients and raw materials - lids

Transformation questions, reception	***Answer, fill in***	**Description or example**
From whom are shipments of this type received?		Name and address / GLN
Where are shipments of this type received?		Name and address / GLN
Description of total amount received?	Full/parts trucks	Full/part containers, full/part trucks, full/part holds, etc
Range of total amount		From-to in kg, ton / etc

received every time?		
How often does reception take place?		Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?		Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?		Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?		No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer is yes, how is it linked?		Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?		GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?		No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer is yes, how is it linked?		Electronic / manual
What parameters are linked to the each TU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?		No / Yes
Is the temperature of the		No / Yes

shipment measured on reception?		

8.4 Reception of ingredients and raw materials - water

Transformation questions, reception	***Answer, fill in***	**Description or example**
From whom are shipments of this type received?	The public net	Name and address / GLN
Where are shipments of this type received?		Name and address / GLN
Description of total amount received?		Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?		From-to in kg, ton / etc
How often does reception take place?		Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?		Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?		Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?		No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer is yes, how is it linked?		Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier		GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct

discarded or recorded and kept?		reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?		No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer is yes, how is it linked?		Electronic / manual
What parameters are linked to the each TU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?		No / Yes
Is the temperature of the shipment measured on reception?		No / Yes

9.1 Transport of ingredients and raw materials – tuna fish

Question to transporter of ingredients and raw materials	***Answer, fill in***	**Description or example**
What type of transport is used?	Vessel and truck	Truck / vessel / air plane / post / courier / etc.
What type of delivery is it?	Directly from supplier	Distribution terminal or directly from supplier, either
How is the vehicle identified?	Registration number of vehicle	Registration number of vehicle or name and address (or GLN)
How is the trip identified?		SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	Yes	No / Yes, indirectly / Yes, directly
What parameters are linked to this transport? How are they recorded; on Label, Paper, Fax, Electronically, Other? Are they received but ignored, re-recorded for own use only, given to the buyer or given back to the supplier?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Ignore", "Own", "Buyer" or "Suppl".
Which temperature control method was used?		None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?		No / Yes manually / Yes electronically

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9.2 Transport of ingredients and raw materials – cans

Question to transporter of ingredients and raw materials	***Answer, fill in***	**Description or example**
What type of transport is used?	Truck	Truck / vessel / air plane / post / courier / etc.
What type of delivery is it?		Distribution terminal or directly from supplier, either
How is the vehicle identified?		Registration number of vehicle or name and address (or GLN)
How is the trip identified?		SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?		No / Yes, indirectly / Yes, directly
What parameters are linked to this transport? How are they recorded; on Label, Paper, Fax, Electronically, Other? Are they received but ignored, re-recorded for own use only, given to the buyer or given back to the supplier?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Ignore", "Own", "Buyer" or "Suppl".
Which temperature control method was used?		None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?		No / Yes manually / Yes electronically

9.3 Transport of ingredients and raw materials - lids

Question to transporter of ingredients and raw materials	***Answer, fill in***	**Description or example**
What type of transport is used?	Truck	Truck / vessel / air plane / post / courier / etc.
What type of delivery is it?		Distribution terminal or directly from supplier, either
How is the vehicle identified?		Registration number of vehicle or name and address (or GLN)
How is the trip identified?		SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?		No / Yes, indirectly / Yes, directly
What parameters are linked		List of parameters.

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to this transport? How are they recorded; on Label, Paper, Fax, Electronically, Other? Are they received but ignored, re-recorded for own use only, given to the buyer or given back to the supplier?				For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Ignore", "Own", "Buyer" or "Suppl".
Which temperature control method was used?				None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?				No / Yes manually / Yes electronically

9.4 Transport of ingredients and raw materials - water

Question to transporter of ingredients and raw materials	***Answer, fill in***			**Description or example**
What type of transport is used?	None, the company received the water from the public net			Truck / vessel / air plane / post / courier / etc.
What type of delivery is it?	None			Distribution terminal or directly from supplier, either
How is the vehicle identified?	None			Registration number of vehicle or name and address (or GLN)
How is the trip identified?	None			SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	None			No / Yes, indirectly / Yes, directly
What parameters are linked to this transport? How are they recorded; on Label, Paper, Fax, Electronically, Other? Are they received but ignored, re-recorded for own use only, given to the buyer or given back to the supplier?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Ignore", "Own", "Buyer" or "Suppl".
Which temperature control method was used?				None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?				No / Yes manually / Yes electronically

[i] Each logistic unit is often marked with a ***Serial Shipping Container Code*** **(SSCC)** which uniquely identifies the company and the particular logistic unit.

Appendix 4 – The analysis scheme for salmon

Producer of vitamins and pigment colour

A modified version of Olsen's method was used to analyse this link, since the questions in the analysis schemes in the method was not finished.

Producer of salmon feed

A modified version of Olsen's method was used to analyse this link, since the questions in the analysis schemes in the method was not finished.

Juvenile salmon producer

1. Transport of Salmon Juveniles to distribution terminal or directly to customer

A tank truck collected the salmon juveniles. They were pumped from the production tanks into the truck, and were transported (in fresh water) by the truck to the smoltification plant.
Not investigated further in this study.

2. Collection of finished product - Salmon Juveniles

Transformation questions, shipping	***Answer, fill in***			**Description or example**
To whom are shipments of this type delivered?	*Confidential information*			Name and address / GLN
From where are shipments of this type shipped?	*Confidential information*			Name and address / GLN
Description of the total amount collected?	*One tank truck all with juveniles of same origin*			Full/part containers, full/part trucks, full/part holds / etc
Range of total amount collected every time?	*30000-50000 individuals* *1100-1200 kg*			From-to in kg / ton / other number relating to TU/LU
How often does collection take place?	*Intensive and frequent collection (up to twice per day) after June 1st every year*			Daily / weekly / etc
How is the total collected amount identified? What type of code and media?	*Unique code with Year + Collection Number* *Indirect reference*			Trip number / SSCC[1] / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	*Shipment date and time* *Transporter name* *Number of individuals* *Average weight* *Biomass* *Species* *Age* *Genetic origin* *Health certificate attached?* *Name of veterinarian* *Salinity 0/00*	*P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P*	*Sent* *Sent* *Sent* *Sent* *Sent* *Sent* *Sent* *Sent* *Sent* *Sent* *Sent*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".

[1] Each logistic unit is often marked with a ***Serial Shipping Container Code*** **(SSCC)** which uniquely identifies the company and the particular logistic unit.

	Light type *Treated for parasites?* *Vaccinated?* *Length of starving period* *Feed type*	*P* *P* *P* *P* *P*	*Sent* *Sent* *Sent* *Sent* *Sent*	
If collected amount is divided into LUs; how is each LU identified? What type of code and media?	*No further splitting*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to each LU?				No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If LU is divided into TUs; how is each TU identified? What type of code and media?	*No further splitting*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?				No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
Does a temperature log accompany the shipment?	*Daydegrees are specified*			No / Yes
Is the temperature of the shipment measured on collection?	*No*			No / Yes

3. Post production storage, quality control, packaging, labelling

Questions post-production	***Answer, fill in***	**Description or example**
What is the name/type of the product?	*Salmon juveniles*	Identifying description or name of the product

What is the product condition?	*Live in fresh water*		Ambient / chilled / frozen / etc
Which storage method is used post-production?	*Salmon juveniles stay in production tanks until collected*		Boxed / bulked / seawater tanks / brine tanks / cold storage / etc.
What type of transport from process to packaging is used?	*Not needed*		Not needed / Flow line / Fork-lift / By hand / etc.
Is a label used, if so, what type?	*None*		Clear text, barcode / Radio Frequency Identification-number (RFID) / none / etc.
If a label is used, what information is on it?	-		Name of the company / date and time of production / date of durability etc
What quality control checks are linked to the finished product? How are they recorded; on paper, punched into computer system, automated data gathering?			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method is used?	*Temperature controlled fresh water*		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*Recorded electronically*		No / Shown only / Recorded manually / Recorded electronically

4. Production ends – Salmon Juveniles

Transformation questions, from production	***Answer, fill in***		**Description or example**
What type of lot / batch is used for finished product?	*All juveniles in a tank constituted a batch*		Daily / weekly / etc
What is the lot / batch amount?	*10000-30000 individuals* *100-10000kg*		From-to in kg / ton / etc
How is the lot / batch identified?	*Unique, Year + Collection Number + Fish Group Number, example 0401.318* *Internal number*		Unique / Non-unique. Code structure. Internal / Visible number
Can the producer link from identification of lot / batch to shipment of finished product?	*Partly and indirectly. The Year + Collection Number was retained, but the Fish Group Number disappeared.*		No / Yes indirectly / Yes directly (Lot / batch-ID recorded after production and linked to TU-ID)
If the answer above is yes, how is it linked?	*Electronic*		Electronic / manual
What parameters are linked to the finished production batch? How are they recorded; on paper, punched into computer system, automated data gathering?	*Number of individuals* *Biomass* *Average weight* *Number of dead* *Density* *Last day sorted*	*ComAuto* *ComAuto* *ComAuto* *ComPunch* *ComAuto* *Com Auto*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Is the finished lot / batch split up, joined together or kept as one?	*Fish from the different tanks were joined together, as long as they have the same Year + Collection Number.*		Split up / joined together / kept as one

5. During production – Salmon Juveniles

Questions production	***Answer, fill in***	**Description or example**
How are the batches separated during production?	*A batch was a tank, and fish from separate tanks were physically separate during production*	Physically, staged mixing, continuous mixing, etc
1 batch only or many in parallel?	*Many tanks, so many batches*	One / Many
If many, are they ever mixed?	*No*	No / Yes
How are batches identified during production?	*Locally unique (at a given time) tank number, visible*	Unique / Non-unique. Code structure. Internal / Visible number
Is this identifier retained or referred to after production?	*No*	No / Yes

6a. Application of ingredients and raw materials – Salmon Roe

Transformation questions, into production	***Answer, fill in***	**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*Yes, partly and directly.* *Each production batch (tank) was identified by Year + Collection Number + Fish Group Number.* *One delivery of roe was identified by Year + Collection Number.*	No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	*Electronic*	Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Split up*	Split up / joined together / kept as one

6b. Application of ingredients and raw materials – Feed for Juvenile Salmon

Transformation questions, into production	***Answer, fill in***	**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*No, only by feed type, not by ID.*	No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	-	Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Mixed up into feed containers, no link from feeding to feed ID*	Split up / joined together / kept as one

6c. Application of ingredients and raw materials – Oxygen

Not investigated further in this study.

6d. Application of ingredients and raw materials – Water

Water samples sent away for analysis once a month. Not investigated further in this study

7a. Raw material / ingredient unpacking, pre production storage, mixing – Salmon Roe

Questions pre-production	***Answer, fill in***	**Description or example**
Storage type for this raw material / ingredient as it enters production?	*Salmon roe was taken from cylinders into tanks, each TU as received.*	Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*Shipment was split, never mixed.*	1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*As before for whole shipment, LU and TU information discarded.*	As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	*Temperature controlled cylinders*	None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*Recorded manually*	No / Shown only / Recorded manually / Recorded electronically

7b. Raw material / ingredient unpacking, pre production storage, mixing – Feed

Questions pre-production	***Answer, fill in***	**Description or example**
Storage type for this raw material / ingredient as it enters production?	*First storehouse in 25kg bags, as received.* *Then bags were put into small feed silos.*	Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*Storehouse 1:1 with received bags* *Bags were joined and split across feed silos*	1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*By date/time and feed type, no link to ID.*	As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	*None*	None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*No*	No / Shown only / Recorded manually / Recorded electronically

7d. Raw material / ingredient unpacking, pre production storage, mixing – Water

Not investigated further in this study.

8a. Reception of ingredients and raw materials – Salmon Roe

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	*Confidential information*			Name and address / GLN
Where are shipments of this type received?	*Confidential information*			Name and address / GLN
Description of total amount received?	*One generation of salmon roe in a number of cases on a single truck, divided into cylinders*			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	*500-1000 litre* *100-150 cases* *3.000.000-5.000.000 individuals*			From-to in kg, ton / etc
How often does reception take place?	*3 times per year*			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Year + Collection Number, example 0401.* *Unique local code, indirectly identifying one delivery.* *This locally unique identifier was the basis for all future reference to this fish, even after it left this FBO and went further on in the chain.*			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Number of roe per litre* *Fertilization date* *Delivery time* *Incubation temperature* *Average parent weight* *Genetic origin* *Health certificate expiry date* *Disinfectant used* *Disease record*	*P* *P* *P* *P* *P* *P* *P* *P* *P*	*Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate “Discarded”, “Kept” or “Repunched”.
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*LU was each case, no unique ID.* *Reference to LU was discarded.*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	*Yes, indirectly* *All cases belonging to a shipment were received at the same time, in the same delivery by a particular truck*			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	*Manual*			Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*None*			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate “Discarded”, “Kept” or “Repunched”.
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*TU was each cylinder.* *ID of TU was discarded.*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	*Yes, indirectly* *All cylinders belonging to a shipment were*			No / Yes indirectly / Yes directly (TU-ID recorded

	received at the same time, in the same delivery by a particular truck			upon LU-ID)
If the answer above is yes, how is it linked?	*Manual*			Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Day degrees*	*P*	*Kept*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	*Yes, day degrees were specified for each range of cylinders*			No / Yes
Is the temperature of the shipment measured on reception?	*No*			No / Yes

8b. Reception of ingredients and raw materials – Feed for Juvenile Salmon

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	*Confidential information*			Name and address / GLN
Where are shipments of this type received?	*Confidential information*			Name and address / GLN
Description of total amount received?	*A number of pallets, each containing a fixed number of 25kg feed bags*			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	*2000-15000 kg*			From-to in kg, ton / etc
How often does reception take place?	*1-3 times per month*			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Delivery number on delivery note.* *Feed delivery number was discarded (or cannot be linked to application of feed).*			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Date and time received* *Total quantity delivered* *Name of feed producer* *Feed type/name* *Feed production date* *Storage code* *Pellet size* *Price*	*O* *P* *P* *P* *P* *P* *P* *O*	*Rep.* *Rep.* *Rep.* *Rep.* *Rep.* *Rep.* *Rep.* *Rep.*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*LU was pallet, label marked with SSCC.* *ID of LU was discarded.*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	*Yes, indirectly*			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	*Manual*			Electronic / manual

What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Pallet only for transportation. Beyond SSCC, no further information linked to pallet.*			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*TU was feed bag, label marked with code identifying production batch number.* *ID of TU was discarded.*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	*Yes, indirectly*			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	*Manual*			Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Diverse label information*	L	Disc	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	*No, not relevant*			No / Yes
Is the temperature of the shipment measured on reception?	*No, not relevant*			No / Yes

Smolt producer

1. Transport of Salmon Smolt to distribution terminal or directly to customer

A well boat collected the salmon smolt. They were pumped from the production tanks into the boat, and were transported (in seawater) to the fish farm.
Not investigated further in this study.

2. Collection of finished product - Salmon Smolt

Transformation questions, shipping	***Answer, fill in***			**Description or example**
To whom are shipments of this type delivered?	*Confidential information*			Name and address / GLN
From where are shipments of this type shipped?	*Confidential information*			Name and address / GLN
Description of the total amount collected?	*A well boat collected about 100.000 individuals. A fish farm received 400.000 – 800.000 individuals, so the well boat made 4-8 collections per farm. Annual production 2.000.000 – 2.500.000 individuals.*			Full/part containers, full/part trucks, full/part holds / etc
Range of total amount collected every time?	*100.000 individuals*			From-to in kg / ton / other number relating to TU/LU
How often does collection take place?	*Daily in September/October and April/May.*			Daily / weekly / etc
How is the total collected amount identified? What type of code and media?	*Fish group number*			Trip number / SSCC[2] / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	*Delivery date* *Sample tank number* *Sample number of fish* *Sample total weight* *Sample average weight* *Treated for parasites?* *Starved for at least 2 days?* *Counting method used*	*P* *P* *P* *P* *P* *P* *P* *P*	*Sent* *Sent* *Sent* *Sent* *Sent* *Sent* *Sent* *Sent*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate “Own”, “Tran”, “Sent” or “Via”.
If collected amount is divided into LUs; how is each LU identified? What type of code and media?	*No further splitting*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to each LU?				No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?				Electronic / manual

[2] Each logistic unit is often marked with a ***Serial Shipping Container Code*** **(SSCC)** which uniquely identifies the company and the particular logistic unit.

What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If LU is divided into TUs; how is each TU identified? What type of code and media?	*No further splitting*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?				No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
Does a temperature log accompany the shipment?	*Min and max temperature were indicated*			No / Yes
Is the temperature of the shipment measured on collection?	*Yes*			No / Yes

3. Post production storage, quality control, packaging, labelling

Questions post-production	***Answer, fill in***		**Description or example**
What is the name/type of the product?	*Salmon smolt*		Identifying description or name of the product
What is the product condition?	*Live in sea water*		Ambient / chilled / frozen / etc
Which storage method is used post-production?	*Salmon smolt stayed in production tanks until collected*		Boxed / bulked / seawater tanks / brine tanks / cold storage / etc.
What type of transport from process to packaging is used?	*Not needed*		Not needed / Flow line / Fork-lift / By hand / etc.
Is a label used, if so, what type?	*None*		Clear text, barcode / Radio Frequency Identification-number (RFID) / none / etc.
If a label is used, what information is on it?	-		Name of the company / date and time of production / date of durability etc
What quality control checks are linked to the finished product? How are they			List of parameters. For each parameter, indicate "Paper", "ComPunch" or

recorded; on paper, punched into computer system, automated data gathering?			"ComAuto".
Which temperature control method is used?	*Temperature controlled sea water*		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*Recorded electronically*		No / Shown only / Recorded manually / Recorded electronically

4. Production ends – Salmon Smolt

Transformation questions, from production	***Answer, fill in***		**Description or example**
What type of lot / batch is used for finished product?	*All smolt in a tank constituted a batch*		Daily / weekly / etc
What is the lot / batch amount?	*Around 100.000 individuals*		From-to in kg / ton / etc
How is the lot / batch identified?	*Tank number was a unique local identifier, there were 24 numbered tanks. In addition, all fish in one tank had the same fish group number (but the same fish group number could be in many tanks).*		Unique / Non-unique. Code structure. Internal / Visible number
Can the producer link from identification of lot / batch to shipment of finished product?	*Partly and indirectly. The tank number was lost, but the fish group number was retained.*		No / Yes indirectly / Yes directly (Lot / batch-ID recorded after production and linked to TU-ID)
If the answer above is yes, how is it linked?	*Electronic*		Electronic / manual
What parameters are linked to the finished production batch? How are they recorded; on paper, punched into computer system, automated data gathering?	*Number of individuals* *Biomass* *Average weight* *Genetic origin* *Name of roe supplier* *Name of juvenile supplier* *Day degrees* *Hatching date* *Start feeding date* *Name of veterinarian* *Vaccine type, method, date* *Anaesthetic used* *Disinfectants used* *Disease record* *Chloride measurements* *Fresh water source/type* *Sea water source/type* *Lighting conditions* *Tank type* *Max and min temperature*	*ComAuto* *ComAuto* *ComAuto* *ComPunch* *ComAuto* *ComAuto* *ComAuto* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Is the finished lot / batch split up, joined together or kept as one?	*Fish from the different tanks were joined together, as long as they have the same fish group number*		Split up / joined together / kept as one

5. During production – Salmon Smolt

Questions production	***Answer, fill in***	**Description or example**

How are the batches separated during production?	*In 24 tanks*	Physically, staged mixing, continuous mixing, etc
1 batch only or many in parallel?	*Many tanks, so many batches*	One / Many
If many, are they ever mixed?	*No, not during production*	No / Yes
How are batches identified during production?	*Locally unique (at a given time) tank number, visible*	Unique / Non-unique. Code structure. Internal / Visible number
Is this identifier retained or referred to after production?	*No*	No / Yes

6a. Application of ingredients and raw materials – Salmon Juveniles

Transformation questions, into production	***Answer, fill in***		**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*Yes, partly and directly.* *Each production batch (tank) was identified by Year + Collection Number + Tank Number.* *One delivery of juveniles was identified by Year + Collection Number.*		No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	*Electronic*		Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Split up*		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?	*Date of reception*	*ComPunch*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

6b. Application of ingredients and raw materials – Feed for Salmon Smolt

Transformation questions, into production	***Answer, fill in***		**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*Yes, directly. Batch ID for feed bag was recorded*		No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	*Electronic*		Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Split up*		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into	*Date of feeding* *Feed amount* *Feed type* *Feed batch number*	ComAuto ComAuto ComAuto ComAuto	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

computer system, automated data gathering?			

6c. Application of ingredients and raw materials –Vaccine

Transformation questions, into production	***Answer, fill in***		**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*Yes, directly* *Batch number for the vaccine was recorded when vaccination was recorded*		No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	*Electronic*		Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Split up, one vaccine used on many fish groups / tanks*		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?	*Date/time of vaccination* *Tank number* *Fish group number* *Number vaccinated* *Name of vaccine* *Dosage* *Total vaccine amount used* *Batch number of vaccine* *Length of needle*	*ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

6d. Application of ingredients and raw materials – Water

Not investigated further in this study

7a. Raw material / ingredient unpacking, pre production storage, mixing – Salmon Juveniles

Questions pre-production	***Answer, fill in***		**Description or example**
Storage type for this raw material / ingredient as it enters production?	*Salmon juveniles were taken from truck tank into production tanks, whole shipment distributed.*		Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*Shipment was split, never mixed.*		1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*As before for fish group number; whole shipment had unique fish group number and each production tank had unique fish group number.*		As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	*Day degrees given for received juveniles.*		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*Recorded manually*		No / Shown only / Recorded manually / Recorded electronically

7b. Raw material / ingredient unpacking, pre production storage, mixing – Feed

Questions pre-production	*Answer, fill in*		Description or example
Storage type for this raw material / ingredient as it enters production?	*First storehouse in 400 kg bags, as received. Then bags were put into small feed silos.*		Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*Storehouse 1:1 with received bags* *Bags were joined and split across feed silos*		1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*Production batch ID was recorded when feed was used*		As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?	*Breakage*		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	*None*		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*No*		No / Shown only / Recorded manually / Recorded electronically

7c. Raw material / ingredient unpacking, pre production storage, mixing – Vaccine

Questions pre-production	*Answer, fill in*		Description or example
Storage type for this raw material / ingredient as it enters production?	*As received*		Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*1:1*		1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*By vaccine batch number*		As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	*Not relevant*		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*Not relevant*		No / Shown only / Recorded manually / Recorded electronically

7d. Raw material / ingredient unpacking, pre production storage, mixing – Water

Not investigated further in this study.

8a. Reception of ingredients and raw materials – Salmon Juveniles

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	*Confidential information*			Name and address / GLN
Where are shipments of this type received?	*Confidential information*			Name and address / GLN
Description of total amount received?	*One part of generation of salmon juveniles in a fresh water tank on a truck*			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	*30000-50000 individuals* *1100-1200 kg*			From-to in kg, ton / etc
How often does reception take place?	*Intensive and frequent reception (up to twice per day) after June 1st every year*			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Unique code with Year + Collection Number* *Indirect reference*			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Shipment date and time* *Transporter name* *Number of individuals* *Average weight* *Biomass* *Species* *Age* *Genetic origin* *Health certificate attached* *Name of veterinarian* *Salinity 0/00* *Light type* *Treated for parasites* *Vaccinated* *Length of starving period* *Feed type*	*P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P*	*Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*No further splitting*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?				No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate

reception?				"Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*No further splitting*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?				No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	*Day degrees were specified*			No / Yes
Is the temperature of the shipment measured on reception?	*Yes*			No / Yes

8b. Reception of ingredients and raw materials – Feed for Salmon Smolt

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	*Confidential information*			Name and address / GLN
Where are shipments of this type received?	*Confidential information*			Name and address / GLN
Description of total amount received?	*A number of 400-500 kg feed big bags*			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	*3000-25000 kg*			From-to in kg, ton / etc
How often does reception take place?	*0-3 times per month*			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Delivery number, feed type number and feed batch number was on delivery note.* *Feed batch number was recorded as a 'Note' attached to the feed delivery registration*			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Date and time received* *Total quantity delivered* *Name of feed producer* *Feed name* *Feed type number* *Feed batch number* *Order number*	*O* *P* *P* *P* *P* *P* *P*	*Rep.* *Rep.* *Rep.* *Rep.* *Rep.* *Rep.* *Rep.*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is	*No further splitting*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured

this identifier discarded or recorded and kept?		Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?		No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?		Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*No further splitting*	GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?		No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?		Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	*No, not relevant*	No / Yes
Is the temperature of the shipment measured on reception?	*No, not relevant*	No / Yes

8c. Reception of ingredients and raw materials – Vaccine

Transformation questions, reception	***Answer, fill in***	**Description or example**
From whom are shipments of this type received?	*Confidential information*	Name and address / GLN
Where are shipments of this type received?	*Confidential information*	Name and address / GLN
Description of total amount received?	*A number of 500 ml or 1000 ml bottles*	Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	*50-200 bottles*	From-to in kg, ton / etc
How often does reception take place?	*A few times per year*	Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or	*Unique delivery number and order number on freight note / invoice.*	Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct

recorded and kept?				reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Date/time*	*P*	*Kept*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*The LU was the set of bottles of one type of vaccine, although not necessarily originating from the same production batch.* *Vaccine type number was the unique ID, on the freight note and also physically on each bottle.*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	*Yes, directly. The link was recorded on the freight note.*			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	*Manual*			Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Vaccine name* *Bottle size* *Number of bottles delivered*	P P P	Kept Kept Kept	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*The TU was each individual bottle.* *Vaccine batch production number was the non-unique ID, on the freight note and also physically on each bottle.*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	*Yes, directly. The link was recorded on the freight note.*			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	*Manual*			Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Vaccine batch number*	O	Rep.	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	*No, not relevant*			No / Yes
Is the temperature of the shipment measured on reception?	*No, not relevant*			No / Yes

8d. Reception of ingredients and raw materials – Water

Not investigated further in this study.

9a. Transport of Salmon Juveniles from distribution terminal / supplier

A truck delivered salmon roe in cylinders inside cases from the internal supplier to the FBO. Not investigated further in this study.

9b. Transport of Feed from distribution terminal / supplier

A truck delivered feed bags from the external supplier to the FBO. Not investigated further in this study.

9c. Transport of Vaccine from distribution terminal / supplier

Not investigated further in this study.

9d. Transport of Water from distribution terminal / supplier

Not investigated further in this study.

Fish farms

1. Transport of Salmon directly to customer, harvesting plant.

A well boat collected the salmon. They were pumped from the fish cages into the boat, and were transported to the harvesting plant.

Question to transporter of finished goods	***Answer, fill in***			**Description or example**
What type of transport is used?	*All transports were carried out with well boats*			Truck / vessel/ air plane / post / courier / etc.
What type of delivery is it?	*Directly to costumer*			Distribution terminal or directly to costumer, either
How is the vessel identified?	*Name and address*			Registration number of vehicle or name and address (or GLN)
How is the trip identified?	*Well boat name + trip number* *The "project code number" supposed to be used was reported not in use by well boat.*			SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	*Yes directly, paper scheme with waiting cage number and name of harvesting plant.*			No / Yes, indirectly / Yes, directly
What parameters are linked to this transport? How are they recorded; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the buyer or given back to the supplier?	*Fish farming company* *Phone number company* *Contact person* *Phone number contact person* *Site name* *Site number* *Fish type, specie* *Year of input* *Well boat name* *Phone number well boat* *Estimated average size* *Number of fish* *Estimated amount of fish ordered for freight* *Loading date* *Permit number of fish farm* *Fish cage number* *Start date starving* *Loading completed* *Use of closing net* *Harvesting enrolment sent* *Use of medicine (yes/no)* *Comments* *Oxygen log during transport* *Sea temperature during transport* *Wave size during transport* *Time of recording of oxygen, temperature and waves* *Time of arrival harvesting plant* *Estimated number of mortalities or unconscious fish at arrival (yes/no)* *Number of mortalities and unconscious fish during transport*	*P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P*	*Via* *Via* *Via* *Via*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Buyer" or "Suppl".

	Start of unloading *End of unloading* *Sea temperature at unloading* *Loaded into waiting cage number* *Comments* *Comments at loading* *Observations during bleeding* *Date of bleeding started* *Time of bleeding started* *Time of bleeding ended* *Bleeding made by:* *Number of selections for bleeding* *Batch ID bleeding* *Date* *Kg*	 *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P*	 *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via*	
Which temperature control method was used?	*None*			None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	*Yes electronically*			No / Yes manually / Yes electronically

2. Collection of finished product - Salmon

Transformation questions, shipping	***Answer, fill in***			**Description or example**
To whom are shipments of this type delivered?	*Confidential information*			Name and address / GLN
From where are shipments of this type shipped?	*Confidential information*			Name and address / GLN
Description of the total amount collected?	*One well boat with salmon of same batch*			Full/part containers, full/part trucks, full/part holds / etc
Range of total amount collected every time?	*Usually 90-100 tons for this well boat.* *Approximately 20-30000 individuals*			From-to in kg / ton / other number relating to TU/LU
How often does collection take place?	*Intensive collection 12-18 months after production start*			Daily / weekly / etc
How is the total collected amount identified? What type of code and media?	*Indirect reference, unique* *Cage number + fish farm name,* *Trip number; Well boat ID + year, week, trip number (yy,ww,nnn)*			Trip number / SSCC[3] / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent	*Fish farming company* *Phone number company* *Contact person* *Phone number contact person* *Site name* *Site number* *Fish type, specie*	*P* *P* *P* *P* *P* *P* *P*	*Via* *Via* *Via* *Via* *Via* *Via* *Via*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".

[3] Each logistic unit is often marked with a ***Serial Shipping Container Code*** **(SSCC)** which uniquely identifies the company and the particular logistic unit.

directly to the buyer, or sent to the buyer via the transporter?	*Year of input* *Well boat name* *Phone number well boat* *Estimated average size* *Number of fish* *Estimated amount of fish ordered* *for freight* *Loading date* *Permit number of fish farm* *Fish cage number* *Start date starving* *Loading completed* *Use of closing net* *Harvesting enrolment sent* *Use of medicine (yes/no)* *Comments* *Oxygen log during transport* *Sea temperature during transport* *Wave size during transport* *Time of recording of oxygen,* *temperature and waves* *Time of arrival harvesting plant* *Estimated number of mortalities* *and unconscious fish during* *transport* *Start of unloading* *End of unloading* *Sea temperature at unloading* *Loaded into waiting cage number* *Comments* *Estimated number of mortalities* *or unconscious fish at arrival* *(yes/no)* *Comments at loading* *Observations during bleeding* *Date of bleeding started* *Time of bleeding started* *Time of bleeding ended* *Bleeding made by:* *Number of selections for bleeding* *Batch ID bleeding* *Date* *Kg*	*P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P*	*Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via*	
If collected amount is divided into LUs; how is each LU identified? What type of code and media?	*Not divided into LU's*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total				No / Yes indirectly / Yes directly (LU-ID recorded

amount to each LU?				upon collection)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	*Same as above*			List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If LU is divided into TUs; how is each TU identified? What type of code and media?	*No dividing*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?				No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
Does a temperature log accompany the shipment?	*No*			No / Yes
Is the temperature of the shipment measured on collection?	*Yes*			No / Yes

3. Post production storage, quality control, packaging, labelling

Questions post-production	***Answer, fill in***	**Description or example**
What is the name/type of the product?	*Salmon*	Identifying description or name of the product
What is the product condition?	*Live in sea water*	Ambient / chilled / frozen / etc
Which storage method is used post-production?	*Salmon smolt stayed in production tanks until collected*	Boxed / bulked / seawater tanks / brine tanks / cold storage / etc.
What type of transport from process to packaging is used?	*Not needed*	Not needed / Flow line / Fork-lift / By hand / etc.
Is a label used, if so, what type?	*None*	Clear text, barcode / Radio Frequency Identification-number (RFID) / none / etc.
If a label is used, what information is on it?	-	Name of the company / date and time of production / date of durability etc

What quality control checks are linked to the finished product? How are they recorded; on paper, punched into computer system, automated data gathering?			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method is used?	*Temperature controlled sea water*		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*Recorded electronically*		No / Shown only / Recorded manually / Recorded electronically

4. Production ends – Salmon

Transformation questions, from production	***Answer, fill in***		**Description or example**
What type of lot / batch is used for finished product?	*All salmon in a cage constituted a batch*		Daily / weekly / etc
What is the lot / batch amount?	*Around 50- 100.000 individuals*		From-to in kg / ton / etc
How is the lot / batch identified?	*Cage number was a unique local identifier, there were 8 -20 numbered cages. In addition, all fish in one cage had the same fish group number e.g "0104 123" the first 4 digits were the ID of the input group and the last 3 digits were the serial number within the input group. The fish group number remained the same until there was a split or a merge.*		Unique / Non-unique. Code structure. Internal / Visible number
Can the producer link from identification of lot / batch to shipment of finished product?	*Partly and indirectly. The cage number was lost, but the fish group number was retained.*		No / Yes indirectly / Yes directly (Lot / batch-ID recorded after production and linked to TU-ID)
If the answer above is yes, how is it linked?	*Electronic*		Electronic / manual
What parameters are linked to the finished production batch? How are they recorded; on paper, punched into computer system, automated data gathering?	*Number of individuals* *Biomass* *Average weight* *Genetic origin* *Name of juvenile supplier* *Vaccine type, method, date* *Disease record* *Feed types*	*ComAuto* *ComAuto* *ComAuto* *ComAuto* *ComAuto* *ComAuto* *ComAuto* *ComAuto*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Is the finished lot / batch split up, joined together or kept as one?	*Fish from the different cages were joined together, as long as they were of the same input group.*		Split up / joined together / kept as one

5. During production – Salmon

Questions production	***Answer, fill in***	**Description or example**
How are the batches separated during production?	*Physically, in 8-20 cages*	Physically, staged mixing, continuous mixing, etc
1 batch only or many in parallel?	*Many*	One / Many
If many, are they ever	*Yes*	No / Yes

mixed?		
How are batches identified during production?	*Locally unique (at a given time) cage number.*	Unique / Non-unique. Code structure. Internal / Visible number
Is this identifier retained or referred to after production?	*No*	No / Yes

6a. Application of ingredients and raw materials – Salmon Smolt

Transformation questions, into production	***Answer, fill in***		**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*Yes, directly.* *Each production batch (cage) was identified by a cage number.* *One cage of smolt was identified by fish group number and the cage number.*		No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	*Electronic*		Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Split up*		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?	*Date of reception* *Number of individuals* *Biomass* *Average weight* *Genetic origin* *Name of roe supplier* *Name of juvenile supplier* *Day degrees* *Hatching date* *Start feeding date* *Vaccine type, method, date* *Anaesthetic used* *Disinfectants used* *Disease record* *Chloride measurements* *Max and min temperature* *etc*	*ComPunch* *ComAuto* *ComAuto* *ComAuto* *ComAuto* *ComPunch* *ComPunch* *ComPunch* *ComAuto* *ComAuto* *ComAuto* *ComAuto* *ComAuto* *ComAuto* *ComAuto* *ComAuto*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

6b. Application of ingredients and raw materials – Feed for Salmon

Transformation questions, into production	***Answer, fill in***		**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*No only by feed type, not by ID.*		No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?			Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Feed bags could be mixed in containers for feeding by canons*		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material?			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

How are they recorded; on paper, punched into computer system, automated data gathering?			

6c. Application of ingredients and raw materials, de-lice chemical

Transformation questions, into production	***Answer, fill in***		**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*Yes, directly*		No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?	*Electronic*		Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Split up, one chemical was used on many fish groups / tanks*		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?	*Date/time of treatment* *Cage number* *Fish group number* *Dosage* *Total amount of chemical used* *Batch number of chemical*	*ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch* *ComPunch*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

6d. Application of ingredients and raw materials – Water

Not investigated further in this study.

7a. Raw material / ingredient unpacking, pre production storage, mixing – Salmon Juveniles

Questions pre-production	***Answer, fill in***		**Description or example**
Storage type for this raw material / ingredient as it enters production?	*Salmon smolt was taken from well boat tank into fish cages, whole shipment distributed.*		Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*Shipment was split, never mixed.*		1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*As before for fish group number; whole shipment had unique fish group number and each production tank had unique fish group number.*		As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?	*Size distributions* *Mortality*	*ComPunch* *ComPunch*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	*None*		None / iced / iced and refrigerated / refrigerated / etc.

Is the storage / display temperature shown or recorded?	*Recorded electronically*	No / Shown only / Recorded manually / Recorded electronically

7b. Raw material / ingredient unpacking, pre production storage, mixing – Feed

Questions pre-production	***Answer, fill in***		**Description or example**
Storage type for this raw material / ingredient as it enters production?	*First storehouse in 400 kg bags, as received. Then bags were "fed" by feeding* canons into one ore several cages.		Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*Storehouse 1:1 with received bags* *Bags were joined and split between cages.*		1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*Feed type was recorded when feed was used.*		As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?	*Breakage*		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	*None*		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*No*		No / Shown only / Recorded manually / Recorded electronically

7c. Raw material / ingredient unpacking, pre production storage, mixing – de-lice chemical

Questions pre-production	***Answer, fill in***		**Description or example**
Storage type for this raw material / ingredient as it enters production?	*As received*		Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*1:1*		1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*By chemical batch number*		As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?			List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	*Not relevant*		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display	*Not relevant*		No / Shown only / Recorded

temperature shown or recorded?		manually / Recorded electronically

7d. Raw material / ingredient unpacking, pre production storage, mixing – Water

Not investigated further in this study

8a. Reception of ingredients and raw materials – Salmon Smolt

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	*Confidential information*			Name and address / GLN
Where are shipments of this type received?	*Confidential information*			Name and address / GLN
Description of total amount received?	*One part of generation of salmon smolt in a well boat tank.*			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	*50-100000 individuals* *50000-10000 kg*			From-to in kg, ton / etc
How often does reception take place?	*Intensive and frequent reception (up to twice per day)*			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Unique code with Year + Output Number* *Indirect reference*			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Supplier name* *Permit number* *Unit number* *Fish group number* *Shipment date and time* *Transporter name* *Number of individuals* *Average weight* *Biomass* *Species* *Broodstock type* *Age* *Hatching info* *Startfeeding info* *Genetic origin* *Salinity 0/00* *Treatment* *Vaccine type* *Length of starving period* *Last day of sorting* *Feed types*	*P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P* *P*	*Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept* *Kept*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate “Discarded”, “Kept” or “Repunched”.
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*No further splitting*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from				No / Yes indirectly / Yes

the identification of the total amount to LU?				directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*No further splitting*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?				No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	*Day degrees were specified*			No / Yes
Is the temperature of the shipment measured on reception?	*Yes*			No / Yes

8b. Reception of ingredients and raw materials – Feed for Salmon

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	*Confidential information*			Name and address / GLN
Where are shipments of this type received?	*Confidential information*			Name and address / GLN
Description of total amount received?	*A number of 400-500 kg feed big bags*			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	*10000-40000 kg*			From-to in kg, ton / etc
How often does reception take place?	*0-3 times per month*			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Delivery number, feed type number and feed batch number was on delivery note.* *Feed batch number was recorded as a 'Note' attached to the feed delivery registration*			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked	*Date and time received*	*O*	*Rep.*	List of parameters.

to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Total quantity delivered* *Name of feed producer* *Feed name* *Feed type number* *Feed batch number* *Order number*	*P* *P* *P* *P* *P* *P*	*Rep.* *Rep.* *Rep.* *Rep.* *Rep.* *Rep.*	For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*No further splitting*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	*No*			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*No further splitting*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?				No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	*No, not relevant*			No / Yes
Is the temperature of the shipment measured on reception?	*No, not relevant*			No / Yes

8c. Reception of ingredients and raw materials – Chemicals

Transformation questions, reception	***Answer, fill in***	**Description or example**
From whom are shipments of this type received?	*Confidential information*	Name and address / GLN
Where are shipments of this type received?	*Confidential information*	Name and address / GLN

Description of total amount received?	*Bottles*			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?				From-to in kg, ton / etc
How often does reception take place?	*A few times per year*			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Unique delivery number and order number on freight note / invoice.*			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Date/time*	*P*	*Kept*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*The LU was the set of bottles of one type of chemical, although not necessarily originating from the same production batch.* *Chemical type number was the unique ID, on the freight note and also physically on each bottle.*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	*Yes, directly. The link was recorded on the freight note.*			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	*Manual*			Electronic / manual
What parameters are linked to each LU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*The TU was each individual bottle.* *Chemical batch production number was the non-unique ID, on the freight note and also physically on each bottle.*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	*Yes, directly. The link was recorded on the freight note.*			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	*Manual*			Electronic / manual
What parameters are linked to each TU? How are they transmitted; on label, paper, fax, electronically, other? Are they recorded on reception?	*Vaccine batch number*	O	Rep.	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
Does a temperature log accompany the shipment?	*No, not relevant*			No / Yes

Is the temperature of the shipment measured on reception?	*No, not relevant*	No / Yes

8d. Reception of ingredients and raw materials – Water

Not investigated further in this study.

9a. Transport of Salmon smolt from distribution terminal / supplier

A well boat delivered salmon smolt. Not investigated further in this study.

First processor

A modified version of Olsen's method was used to analyse this link, since the questions in the analysis schemes in the method was not finished.

Transport

A modified version of Olsen's method was used to analyse this link, since the questions in the analysis schemes in the method was not finished.

Second processor

1. Transport of finished goods to distribution terminal or directly to customer

Question to transporter of finished goods	***Answer, fill in***	**Description or example**
What type of transport is used?	*Truck*	Truck / vessel/ air plane / post / courier / etc.
What type of delivery is it?	*Both to distribution terminal and directly to costumer*	Distribution terminal or directly to supplier, either
How is the vehicle identified?	*Name and address of transporters company on box label. No ID on vehicle.*	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	*No ID of the particular trip. Could be one of many trips pr order.*	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	*Not known. Transporter was not part of this survey*	No / Yes, indirectly / Yes, directly
What parameters are linked to this transport? How are they recorded; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the buyer or given back to the supplier?	*Not known.* *Transporting company was not part of this survey*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Buyer" or "Suppl".
Which temperature control method was used?		None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	*No*	No / Yes manually / Yes electronically

2. Collection of finished product

Transformation questions, shipping	***Answer, fill in***	**Description or example**
To whom are shipments of this type delivered?	*Confidential information*	Name and address / GLN
From where are shipments of this type shipped?	*Confidential information*	Name and address / GLN
Description of the total amount collected?	*Typically part trucks*	Full/part containers, full/part trucks, full/part holds / etc
Range of total amount collected every time?	*From 10 kg to several tons*	From-to in kg / ton / other number relating to TU/LU
How often does collection take place?	*Daily*	Daily / weekly / etc
How is the total collected amount identified? What type of code and media?	*Order number* *Non unique* *Direct reference on label* *Also in order system IS400*	Trip number / SSCC[4] / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect

[4] Each logistic unit is often marked with a ***Serial Shipping Container Code*** **(SSCC)** which uniquely identifies the company and the particular logistic unit.

	Production lot number was stamped on boxes. This number was non unique.(day number/sequential number, 300/16) *Bar code on label was the non unique EAN 13.*			reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	*Order number* *Client name* *Dispatch date* *Article ID (internal)* *Article name* *Production lot number*	*P* *P* *P* *P* *P* *P*	*Sent* *Sent* *Sent* *Sent* *Sent* *Sent*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If collected amount is divided into LUs; how is each LU identified? What type of code and media?	*LU was a pallet but no unique ID on pallets*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to each LU?	*Indirectly by order number on label*			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	*Manual*			Electronic / manual
What parameters are linked to each LU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".
If LU is divided into TUs; how is each TU identified? What type of code and media?	*Non unique* *Box 1 of 10….001/010* *Direct reference Label*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	*No*			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to each TU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the transporter, sent directly to the buyer, or sent to the buyer via the transporter?	*Transporter name* *Transporter ID (internal)* *Costumer name and address* *Product name* *Scientific name* *Order number* *Storage temperature* *Producer name and address* *Product number (internal)* *Dispatch date*	*L* *L* *L* *L* *L* *L* *L* *L* *L* *L*	*Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via* *Via*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Tran", "Sent" or "Via".

	Specie *Net Weight* *C.E.E number of plant* *Number of collie* *EAN 13 number* *Origin/Farmed in*	*L* *L* *L* *L* *L* *L*	*Via* *Via* *Via* *Via* *Via* *Via*	
Does a temperature log accompany the shipment?	*No*			No / Yes
Is the temperature of the shipment measured on collection?				No / Yes

.3. Post production storage, quality control, packaging, labelling

Questions post-production	***Answer, fill in***		**Description or example**
What is the name/type of the product?	*Multiple products of salmon filets*		Identifying description or name of the product
What is the product condition?	*Chilled, vacuumed*		Ambient / chilled / frozen / etc
Which storage method is used post-production?	*Boxed* *Cold storage*		Boxed / bulked / seawater tanks / brine tanks / cold storage / etc.
What type of transport from process to packaging is used?	*By hand*		Not needed / Flow line / Fork-lift / By hand / etc.
Is a label used, if so, what type?	*Clear text* *(bar code EAN 13 not used)*		Clear text, barcode / Radio Frequency Identification-number (RFID) / none / etc.
If a label is used, what information is on it?	*Transporter* *Costumer* *Product name* *Product number* *Species* *Origin* *Lot number* *Storage temperature* *Producer name and address* *Net weight* *Expedition date* *C.E. - number*		Name of the company / date and time of production / date of durability etc
What quality control checks are linked to the finished product? How are they recorded; on paper, punched into computer system, automated data gathering?	*Bacterial analysis 6 types* *1 pr week linked to final prod number*		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control method was used?	Refrigerated		None / iced / iced and refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*Recorded electronically*		No / Shown only / Recorded manually / Recorded electronically

4. Production ends

Transformation questions, from production	***Answer, fill in***		**Description or example**
What type of lot / batch is used for finished product?	*Daily, lot - number by product,*		Daily / weekly / etc
What is the lot / batch amount?	*From 10 kg to several tons*		From-to in kg / ton / etc
How is the lot / batch identified?	*Internal* *Visible numbers* *Day number /production order* *ddd/nn*		Unique / Non-unique. Code structure. Internal / Visible number
Can the producer link from identification of lot / batch to shipment of finished product?	*Yes indirectly to transporter* *Yes directly to costumer*		No / Yes indirectly / Yes directly (Lot / batch-ID recorded after production and linked to TU-ID)
If the answer above is yes, how is it linked?	*Manual via labels to transporter and costumer* *Also electronic to costumer*		Electronic / manual
What parameters are linked to the finished production batch? How are they recorded; on paper, punched into computer system, automated data gathering?	*Temperature*	*ComAuto*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Is the finished lot / batch split up, joined together or kept as one?	*Split up* *Try to keep lot=1 customer*		Split up / joined together / kept as one

5. During production

Questions production	***Answer, fill in***	**Description or example**
How are the batches separated during production?	*Physically separation. Only one production line pr product.*	Physically, staged mixing, continuous mixing, etc
1 batch only or many in parallel?	*1 batch only*	One / Many
If many, are they ever mixed?		No / Yes
How are batches identified during production?	*Internal, unique number* *Visible numbers on whiteboard, boxes, and in paper records and electronic records.* *Day number /production order* *ddd/nn*	Unique / Non-unique. Code structure. Internal / Visible number
Is this identifier retained or referred to after production?	*Yes*	No / Yes

6 a. Application of ingredients and raw materials - Salmon

Transformation questions, into production	***Answer, fill in***	**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*Yes directly* *Raw material ID recorded during production.*	No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)

If the answer above is yes, how is it linked?	*Both manual on whiteboards and in paper and electronic (Excel)*		Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Split up*		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?	*Fish farmer ID*	*ComPunch*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

6 b. Application of ingredients and packaging - plastic

Transformation questions, into production	***Answer, fill in***		**Description or example**
Can the producer link from identification of ingredients and raw materials to identification of lot / batch?	*No* *Only link to Supplier*		No / Yes indirectly / Yes directly (ingredients and raw materials ID recorded under production)
If the answer above is yes, how is it linked?			Electronic / manual
Is the ingredient / raw material split up, joined together or kept as one?	*Split*		Split up / joined together / kept as one
What parameters are recorded to document the application of this ingredient / raw material? How are they recorded; on paper, punched into computer system, automated data gathering?	*None*		List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".

7. Raw material / ingredient unpacking, pre production storage, mixing – Salmon

Questions pre-production	***Answer, fill in***		**Description or example**
Storage type for this raw material / ingredient as it enters production?	*LU (pallets) stored in chilled storage*		Whole shipment as received / each LU as received / each TU as received, in local tank, etc.
Relationship from the above to received shipments?	*1:n*		1:1 with shipment / LU / TU, split, joined, mixed, added in queue, etc.
Identification of this raw material / ingredient as it enters production?	*Internal reception number*		As before, by date/time, by tank number, by other reference
What quality control checks are linked to the raw materials / ingredients pre-production? How are they recorded; on paper, punched into computer system, automated data gathering?	*Temperature log*	*Comauto*	List of parameters. For each parameter, indicate "Paper", "ComPunch" or "ComAuto".
Which temperature control	*Iced and refrigerated*		None / iced / iced and

method was used?		refrigerated / refrigerated / etc.
Is the storage / display temperature shown or recorded?	*Recorded electronically*	No / Shown only / Recorded manually / Recorded electronically

8. Reception of ingredients and raw materials – Salmon

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	*Confidential information*			Name and address / GLN
Where are shipments of this type received?	*Confidential information*			Name and address / GLN
Description of total amount received?	*Full trucks*			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	*17-20 tons*			From-to in kg, ton / etc
How often does reception take place?	*Weekly*			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Internal reception number.* *Indirect reference on whiteboard and written on LU.* *Also recorded in excel*			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?	*Invoice number* *Producer name and org. number* *Receiver name and address* *Bank* *Account number* *SWIFT code* *foreign currency* *Date of invoice* *Date of payment* *VAT number receiver* *Payment terms* *Delivery terms* *Transport method* *Transport company* *Transport agent* *Loading date* *Loading place* *Product name* *Number of items* *Net weight* *Price/kg* *Sum price* *Total net weight* *Total number of items* *Total sum* *Harvesting plant ID (EFTA)* *Order number*	*L* *L* *l* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L*	*Re* *Re* *Re* *Re* *Re*	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate “Discarded”, “Kept” or “Repunched”.
If received amount is divided into LUs; how is each LU identified? What	*Pallet number*			Trip number / SSCC / none / etc Unique / Non-unique.

type of code and media? Is this identifier discarded or recorded and kept?				Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?	*Yes indirectly by pallet number*			No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?	*Manual by receiving pallet report for the actual order*			Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?	*Fish Type* *Condition* *Quality* *Size* *No in unit* *Preservation* *Pallet number* *Net Weight* *Use by* *Farmer ID* *Farmer name* *EAN number* *EFTA number* *Exporter* *SSCC* *Order number* *Origin* *Production method* *Specie* *Treatment* *Package date* *Box numbers on pallets (ID's)*	*L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L*	 *Re* *Re* *Re* *Re* *Re* *Re* *Re* *Re* *Re* *Re* *Re* *Re* 	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Box number*			GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?	*Yes*			No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?	*Manually by LU label*			Electronic / manual
What parameters are linked to the each TU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?	*Specie* *Treatment* *Quality* *Size* *Pieces* *Box number* *Pallet number* *Net weight* *Gross weight* *Order number* *EAN number* *EFTA number* *Farmer ID* *Farmer name* *Use by* *Preservation*	*L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L* *L*	*Re* *Re* *Re* *Re* *Re* *Re* 	List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".

	Storage temperature *Exporter* *Box no/pallet* *Origin* *Production method*	*L* *L* *L* *L* *L*	 *Re* *Re* *Re*	
Does a temperature log accompany the shipment?	*No*			No / Yes
Is the temperature of the shipment measured on reception?	*No*			No / Yes

8. Reception of ingredients– packaging, plastics

Transformation questions, reception	***Answer, fill in***			**Description or example**
From whom are shipments of this type received?	*Confidential information*			Name and address / GLN
Where are shipments of this type received?	*Confidential information*			Name and address / GLN
Description of total amount received?	*Part trucks*			Full/part containers, full/part trucks, full/part holds, etc
Range of total amount received every time?	*Several pallets*			From-to in kg, ton / etc
How often does reception take place?	*2-3 times a year*			Daily, weekly, etc
How is the total received amount identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Invoice number*			Trip number / SSCC / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
What parameters are linked to the whole shipment? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".
If received amount is divided into LUs; how is each LU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*No ID*			Trip number / SSCC / none / etc Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from the identification of the total amount to LU?				No / Yes indirectly / Yes directly (LU-ID recorded upon collection)
If the answer above is yes, how is it linked?				Electronic / manual
What parameters are linked to the each LU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?				List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".

If LU is divided into TUs; how is each TU identified? What type of code and media? Is this identifier discarded or recorded and kept?	*Lot number on label*	GTIN+ / other Unique / Non-unique. Sequential / Structured Bar-code / RF-ID / Direct reference (label) / Indirect reference, etc.
Can the producer link from TU-ID to LU-ID?		No / Yes indirectly / Yes directly (TU-ID recorded upon LU-ID)
If the answer above is yes, how is it linked?		Electronic / manual
What parameters are linked to the each TU? How are they transmitted; on Label, Paper, Fax, Electronically, Other? Are they recorded on reception?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Discarded", "Kept" or "Repunched".

9 a. Transport of ingredients and raw materials - Salmon

Question to transporter of ingredients and raw materials	***Answer, fill in***	**Description or example**
What type of transport is used?	*Truck*	Truck / vessel / air plane / post / courier / etc.
What type of delivery is it?	*Distribution terminal*	Distribution terminal or directly from supplier, either
How is the vehicle identified?	*Vehicle registration number*	Registration number of vehicle or name and address (or GLN)
How is the trip identified?	*Trip number linked to transport order number* *Freight manifest* *Order number* *Custom number*	SSCC, transporter code, delivery code, freight code, etc.
Is there a link from vehicle / trip to delivery?	*No*	No / Yes, indirectly / Yes, directly
What parameters are linked to this transport? How are they recorded; on Label, Paper, Fax, Electronically, Other? Are they kept for own use only, given to the buyer or given back to the supplier?		List of parameters. For each parameter, indicate L/P/F/E/O for type of transmission. For each parameter, indicate "Own", "Buyer" or "Suppl".
Which temperature control method was used?	*Checked if no ice*	None / iced / iced and refrigerated / refrigerated / etc.
Is temperature logged during transportation?	*Yes, electronically*	No / Yes manually / Yes electronically

9 a. Transport of ingredients – Packaging/plastics

Not investigated further in this study.

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