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## Report

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## Results industry questionnaire SEAFOODsense

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## Summary

The aim of this research was to define sensory quality, and determine how this can be measured, at each point where quality decision-making is carried out in the chain of seafood handling from catch or slaughter to consumer. This was carried out by taking interviews with the industry to obtain knowledge about their sensory quality evaluation procedures and the descriptive terms they used. In four different countries, Ireland, Iceland, Denmark and The Netherlands, 8-17 companies throughout the fish production chain were selected. Information on sensory quality was rarely described or measured in a systematic way in each of the individual companies throughout the European fishery production chain. Though not in a systematic way, almost all companies assessed the products by its appearance and described general quality criteria, often related to freshness or other product specifications. If specific methods (EU scheme, QIM and Torry) were in place, it was relatively easy to describe norms and tolerances. Between companies in the chain, this information was not often recorded or described. Although to the opinion of the companies they delivered what their customers demand, this was hardly ever described in terms of sensory quality and little was known about the demands of the end-user. No sensory quality description of the final product was present and there was no translation of this description backwards in the fishery production chain.

Through its definition every position in the fishery production chain was pointed out as “quality decision-making”. But only these companies who have a structured “sensory method” in place were selected for the following tasks of the project to evaluate the sensory quality in the chain and to evaluate the sensory quality on attributes resulting from the preference mapping.

# 1. Introduction

Within the SEAFOODplus project, pillar two 'consumer research' project 2.2 Seafoodsense and WP 2 task 1 the following objective was formulated:

Define sensory quality, and determine how this can be measured, at each point where *quality decision-making* is carried out in the chain of seafood handling from catch or slaughter to consumer. Research questions were defined as:

- which points in the fishery production chain are in place for quality decision making
- are there sensory methods used (for quality determination) in the fishery production chain
- which methods are used
- what is measured in the opinion of the industry
- why do they measure this

*Quality decision-making* was defined as: the possibility to differentiate different quality grades and being able to sell or buy fish according these quality grades.

Within this project the meaning of "Sensory methods" was defined in the loosest possible way; looking at the fish to check for blemishes was regarded as a form of sensory evaluation. This might have been carried out by a person who was sorting bad from good close to time of catch (and might never have heard the term "sensory evaluation").

Within pillar 2 the scope of the research was defined as cod and salmon in various products. Products were described as 'all kind of processed or unprocessed fish products'. E.g. fresh fillets, cold smoked vacuum packed salmon, farmed salmon.

Previous research (1997, Olafsdóttir et al) had shown that industry used sensory analyses amongst other quality assessment methods, but not to what extent and which attributes. The attitude of the European fish production sector towards quality and labelling (2003, Jorgensen et al) has shown the interest of the industry towards quality monitoring but did not identify the methods/attributes to be used and did not show the communication between the links in the fishery production chain. Coomans (2002) identified the traceability and information transfer in the Dutch fishery production chain and identified the QIM method as being very suitable for traceability of sensory quality in the beginning of the fishery production chain.

## 2. Method

The sensory quality definition and the used methods in the fishery production chain was analysed through interviews. This knowledge was used to reveal how sensory properties that determine eating quality are communicated between stages or decision-makers in this chain. The interviews were done with key persons in the fishery production chain to obtain knowledge about their sensory quality evaluation procedures and the descriptive terms they used. The target groups were so called key persons in companies throughout the fishery production chain. Key persons were those in a company who had practical knowledge on quality assurance and assessment methods. They needed to know about the actual process in the company. Examples of those include the quality manager, the quality staff, the production manager or shift leader (not the general manager who is only in the office). The fishery production chain generally consists of consumer, retailer, storer/distributor, fish processor, wholesaler, auctioneer and fishing vessel/fish farmer. Depending on the selected products and country, a selection of ten companies per country was made. The selection of the companies was aimed to give useful information, not necessarily be fully representative of the whole fishery production sector. The companies needed to produce at least the species cod or salmon. The interview was structured into guidelines and consisted of three parts: an introduction, questions on general information and questions on sensory specific information. In the end some control questions were formulated to be sure that all areas were covered. The interview was made and reported in the native language and the results were summarized in a developed format/table. The results were treated confidentially and reported anonymously.

### **Introduction to the company about the project.**

This interview is part of a European project on Seafood in a wide context (SEAFOODplus). The final aim of this project is to increase consumers' health and well being by increasing the seafood consumption.. The aim of this project (seafoodsense) is to develop consumer oriented sensory quality models for seafood, to be used in seafood chain. This model makes it possible to define consumer product quality demands into 'production' language and control measures. Or in other words: we will investigate if and how with aid of sensory methods we can follow product quality throughout the complete production chain. The tools within this project are consumer preference and (expert) panels in the industry like your company. *For example: consumers tell us which product they like. Since it is hard for the consumer to specify why they like this product, and if they can it is very subjective, the sensory experts analyse and describe the product in detail. The sensory expert can tell for example how tough or firm a product is. By statistical techniques (preference mapping) it is possible to combine both results and researchers can tell that consumers like products, which have exactly this toughness. Researchers know that toughness is influenced by freshness, so if we can measure freshness through during the production chain, it is possible to predict toughness and to control the final product on that item what is most liked by consumers.*

Within this project several European partners cooperate. This means that the developed model will be of value throughout Europe. Initially the focus is on Salmon and Cod.

The purpose of this interview is to identify sensory quality measurements in the production chain; at what moment in the chain quality decision making takes place and how this is done. We expect results containing valuable information also for your company, like consumer quality demands, and how every part in the chain can use this to meet the demands. International communication about ways to fulfil and measure/control product quality in this respect.

The results will be reported anonymously. We will provide you the results of this research. For more information about the project: [www.SEAFOODplus.org](http://www.SEAFOODplus.org)

**Interview Questions:**

To be able to get answers on above main questions the following list has been made:

*General information:*

- Who are we talking with: function and position in the company?
- What is the main business of the company? (trader, producer, exporter)
- When was the date of foundation of your company?
- What is the position of your company in the fisheries chain? (which part of the chain)
- Could you give me some general company information, such as number of persons working at the company, annual turnover, annual production capacity (kg fish), % of cod/salmon produced
- Which kind of products do you sell? Primary processing (filleting), secondary processing (freezing, marinating, smoking), ready to eat products, combined products (with a sauce)
- How many customers do you have? Who are your main customers? Is it possible to get names and that we contact them for this project?
- How many suppliers do you have? Who are your main suppliers? Is it possible to get names and that we contact them for this project?
- How are you buying the fish? Do you work with preferred suppliers? Or are you buying the fish at the auction?

*Sensory specific information:*

- Do you control incoming goods/fish? If yes, what items are controlled? (weight, size, nr. Batches, other product specifications) In your opinion, do you pay attention to sensory aspects like appearance, odour?
- Do you control products during processing? If yes, what items are controlled? (weight, size, nr. Batches, other product specifications) In your opinion, do you pay attention to sensory aspects like appearance, odour?
- Do you control goods/fish at exit? If yes, what items are controlled? (weight, size, nr. Batches, other product specifications) In your opinion, do you pay attention to sensory aspects like appearance, odour?
- Are there sensory quality criteria defined in your company? Are these criteria described or do people 'just know them'?
- Who is defining sensory quality criteria, you or your customer? Or official body like food and drug act?
- In which way you judge the sensory quality in your company? Is this in a structured way? (using a method?) How is the sampling performed (frequency)?
- How do you know this method? Do you get/give training for these methods? Are people selected or targeted for these methods? (by function or by experience)
- What are you doing with that information? Do you register this information? Are there norms and tolerances, even if you're not aware of this?
- What happens if someone notices something 'not good' (like torn apart fillets)? Describe the actual situation what actions are taken.
- How do you know the shelf life of a fish (product)?
- How do you know that the fish is fresh?
- How are your customers judging you on delivered (sensory) quality?
- Do you have a panel to judge the quality of the fish? (taste panel, QIM panel, EU panel)

***Other questions:***

- Are you (ISO) certificated?
- Are you looking at the microbiology or other (not sensory) quality controls? (such as pH or colour, temperature/time registration)
- Is this done by yourself or do you source this out?
- What happens if the results are outside tolerances?

**Final check:**

Is it possible to answer the following questions:

- which points in the chain are in place for decision making?
- Are there sensory methods used in the fishery chain?
- Which methods are used?
- What do they measure in their opinion?
- Why do they measure this?

### 3. Results

In total 43 companies were interviewed; Ireland 17, in Denmark 8, in Iceland 9 and in The Netherlands 9 in the period November 2004-January 2005. In table 1 and 2 the results are summarized.

**Table 1: Summarized results of general company information of 43 companies throughout the European fishery production chain.**

		vessel	farmer	auction	wholesaler	processor	storage	retail	export
number of cases		5	3	5	12	18	4	9	10
country	Iceland	1	1	1	2	4		1	2
	Denmark	1		1	2	4	1	2	
	Ireland	2	2	2	7	8	1	5	6
	The Netherlands	1		1	1	2	2	1	2
quality manager		1	2	2	4	10		3	3
production manager			3		3	3	1	2	3
other		5	2	4	7	11	3	6	8
how many employees	1-10	5	2	3	3	4	1	3	4
	10-50		1	1	4	6	3	3	5
	50-150			1	3	5		1	1
	150>				2	3		2	
annual turnover	0-5 mln	5	2		5	7	1	4	3
	5-10 mln		1		3	5	1		2
	10-50 ml			5	1	4	1	2	2
	50> mln				2	2			2
	unknown				1		1	3	1
annual production/sales	0-100ton	2			2	3		2	1
	100-200t	1			2	1		2	
	200-500t	1	3			2	1	1	3
	500-1000				1	2			1
	1000>ton	1		5	5	8	2	3	4
	unknown				2	2	1	1	1
number of customers	0-5	3	3		1	2			1
	5-10				1	2		1	1
	10-20	1			2	2			1
	20>	1		5	8	11	4	8	7
	unknown					1			
number of suppliers	0	2							
	0-5	2	2		4	5		4	3
	5-10					5		2	1
	10-20				3	5	1	1	1
	20>	1		5	5	3	3	2	5
	unknown		1						

The whole fishery production chain was covered from primary production (fishing and farming) to retailer. Some companies combined two or more links in the production chain meaning the results were reported for 66 so called 'cases'.



Most of the companies were small to medium sized for number of employees. The processors had generally more employees. The annual turnover was more or less balanced between the various companies. The annual production was for some companies very high, over 25.000 tons. The number of customers was relatively high for the majority of the companies interviewed; this implied that each company needed to fulfil many different demands in for example quality performance. This directly pointed out the difficult task of the aim of the SEAFODsense project to harmonize the control of these demands. Many companies had multiple suppliers, but less in numbers than customers.

**Table 2: Summarized results of sensory specific information of 43 companies throughout the European fishery production chain.**

		vessel	farmer	auction	wholesaler	processor	storage	retail	export
number of cases		5	3	5	12	18	4	9	10
country	Iceland	1	1	1	2	4		1	2
	Denmark	1		1	2	4	1	2	
	Ireland	2	2	2	7	8	1	5	6
	The Netherlands	1		1	1	2	2	1	2
target product cod%	0%	1	2		3	5		2	2
	0-5%	1		2	5	5	2	4	4
	5-20%	1		2	2	2	2	2	1
	20-50%	2		1	1	2		1	1
	50-100%		1		1	4			2
target product salmon%	0%	5	1	4	5	6		2	4
	0-5%			1	1	1	2	1	3
	5-20%				2	5	1		
	20-50%		1		2	3	1	3	1
	50-100%		1		2	3		3	2
primary processed products (icing, filleting)		3	3	5	9	12	4	6	9
secondary processed products (freezing, marinating, smoking)				1	9	12	3	7	7
multiple products (combined products, ready to eat)					5	6	1	5	1
sensory incoming goods	yes sensory control incoming goods	3	2	5	12	17	4	8	10
	appearance	2		5	9	13	2	7	7
	smell			5	5	8		5	3
	freshness			5	5	7	2	4	5
	other		2	1	4	5	1	3	2
sensory processing goods	yes sensory control during production	3	2	2	11	17	2	4	9
	appearance	2	3	1	9	15	1	4	7
	smell	1	2	1	5	8		3	4
	freshness	1	2	1	3	5	1	3	5
	taste				1	2		1	
	other	1		1	2	1		1	1
sensory final goods	yes sensory control final goods	3	2	2	11	18	2	5	8
	appearance	1	3	1	10	17	1	5	8

	smell		2	1	8	13		5	5
	freshness	1	2	1	6	8	1	5	6
	taste				5	9		4	3
	other	1			1	1			
sensory quality criteria (not described)	no						1		1
	yes, described	2	3	4	9	13	3	5	8
	yes, not described	3		1	3	5		4	1
sensory quality criteria described by customer		3	2	3	3	2	1	1	2
sensory quality criteria described by own quality department		1	1	3	8	12	3	6	9
sensory quality criteria described by official body		1	1	3	3	1	1	3	2
sensory quality criteria described by other				2	4	6		4	3
sensory method used		1	1	5	10	15	3	7	8
sampling method used		1	2	4	10	15	2	7	7
assessors are trained			1	4	8	11	1	5	5
assessors are targeted		2			3	4		3	2
assessors are experienced		5	2	5	11	18	4	7	10
sensory norms and tolerances are present	no	2	1		1	3		1	
	yes, no registration	3		2	4	4	2	4	2
	yes, registered		2	3	7	11	2	4	8
customers judge sensory quality	no					1	1	1	1
	yes, in a unstructured way	2	1		4	4	2	6	4
	yes, in a structured way	3	2	4	8	12	1	2	5
certified	yes they are certified		1	1	7	12	1	5	6
	certified HACCP		1	2	8	8	1	5	7
	certified for BRC				1	3			
	certified ISO								
	no they do not have certification	5	2	4	5	6	3	4	4
willing to participate	yes	2	1	4	8	12	3	7	6
Is this company in place for decision-making	yes	3	3	4	11	17	3	7	8

The % produced cod and salmon varied from a minor product to the main product produced in the company. Many companies processed various kinds of products: primary products (filleting, freezing, and packaging) as well as secondary processed (salting, marinating and smoking). The multiple processed products (ready to eat, combined products) are more special and limited to the processors in the chain.

As mentioned before, the "Sensory methods" were defined in the loosest possible way. Almost all companies said they performed sensory controls on the incoming goods (61 cases). This was mainly done by assessing the appearance (45 cases) and sometimes done by assessing the freshness and smell (26 and 28 cases respectively). Other sensory aspects assessed for (in 18 cases) were for example amount of ice, quality of the eggs for farmers, quality in general, quality of gutting, quality of washing, temperature, and catch information accompanied with the batch of fish. Most of these answers were not a 'sensory attribute' but more a general control method.

Also intermediate products and the final goods were assessed for sensory quality (50 and 51 cases respectively), this was done by appearance (42 – 46 cases respectively), and less often by freshness (21 and 30 cases respectively).

For two cases sensory criteria were not present at all. For 47 cases (24 companies) sensory criteria were said to be present and described. Descriptions of sensory criteria are summarized in table 3.

**Table 3: Descriptions of sensory quality criteria as defined by 24 companies**

Company number	Description of sensory quality criteria
3	QIM
4	stivavi (national training school for fish industry)
8	EU scheme
9	HACCP and home made method
10	comparison test
11	general sensory quality
13	EU scheme
16	grading 5 points raw, Torry for cooked
22	Torry for cooked and raw
24	grading raw fillets
25	appearance, gutting
26	HACCP, quality cooking
27	internal and HACCP
28	HACCP tasting, visual
29	HACCP requirements + organic
30	visual, temperature
31	visual, during filleting
32	visual, during filleting
33	smell, taste and check vacuum
34	overall check, experience
35	defined in HACCP, temp, cooking
38	several
41	ranking 0-5 on 7 areas E,A+,A-,B
43	HACCP

The companies described these sensory quality criteria as being a sensory method. Scientifically this was not the case. The descriptions do not always refer to a scientific method like Torry, QIM or EU scheme. The companies had difficulties in describing what was actually assessed with these methods. Secondly it can be noticed that in many cases the HACCP system was mentioned when asked about sensory norms and tolerances or sensory methods in place. The HACCP system is not a sensory method though and rarely describes a sensory method for controlling (incoming) goods. This gives doubts about the sensory criteria in these cases being described at all. The same for sensory norms and tolerances; 21 cases said these were present but not registered. This implied that in these companies the information about sensory assessments, if it was performed at all, cannot be used for control or management procedures. The majority of the persons in the companies assessing the sensory quality were not trained but performed these assessments by experience. Examples of statements are: “we know by experience what product quality this client wants to have”, “someone new in our company is accompanied by an experienced person who teaches him the common practices”. Who was demanding the sensory quality criteria? Only 18 cases answered that their customers specified the sensory quality criteria for them. This means that for the remaining 48 cases the traceability of this information was not guaranteed. The own quality department was mentioned 43 times as describing/demanding the sensory quality criteria, often this would be an indirect way of customers demand. Only half of the cases said they had a HACCP certificate. This was strange since the EU legislation has made a HACCP system compulsory for all food processing companies since 2000. None of the companies has an ISO certificate.

The important question about if the company was in place for quality decision-making was answered positive for 56 cases. *Quality decision-making* was defined as: the possibility to differentiate different quality grades and being able to sell or buy fish according these quality grades. The companies were able to make the quality related decisions independently. Either for buying the demanded quality, for selling the demanded quality, or both.

Since some of the background information is lost when summarizing the results in a table only, a short summary is given for each individual country.

**Iceland:**

In Iceland there was not a proper salmon chain, well at least on a very small scale. In the cod chain they were relying on time and temperature and good manufacturing practices (handling) a lot. They relied on their suppliers. The big filleting companies were using sensory methods on a regular basis. All were using grading schemes for raw fillets and some were also using Torry-schemes on cooked samples. They trained their own people but many of them have been at short courses (IFL). Many people in the industry still have a big experience in fish and fish handling. They were selling their products to companies that they presume are cooking samples from the production (on a regular basis)

The skipper was sure he got higher price at the fish auction because the customers knew his reputation on good handling. The boats were relying on buyers who were aiming at exporting the fish fresh by planes to Europe.

The auction has a good quality system every people had been at a QIM course, however not using it on a daily basis but they thought they had learned a lot on the course.

The marketing or exporting companies had clear description of how the products should be, to be able to sell under brand name and there were quality manuals with descriptions on sensory aspects (grading schemes for raw fillets Torry-schemes on cooked samples)."

**The Netherlands:**

In all companies the experience with fish and its quality was the most important quality control procedure they have. Only the bigger processing companies had described procedures but hardly on sensory quality. Much is related with freshness: 'I know when it has been caught', "it is always fresh, I know that", "we always buy good quality fish", "It only stays here for one day, nothing will happen". But not specified in more detail than 'it looks good'. The producer who produces frozen fish products and uses frozen raw material was assessing for freezer burn, but no norms and tolerances were present. The wholesalers and exporters were more concerned with delivering what the customers demand in a 'technical' way (right size and amount) than in a sensory quality way. The sensory quality specifications were met at the moment they bought the fish, relying on their own judgment or the judgment of the commissionaires ("they know what we want"). The skipper knew a lot about good (sensory) quality and how to get good quality but he felt there was no extra market price for delivering this quality. His buyers are more or less the same every week and his 'name' was his quality certificate. The auction makes practical use of the QIM method and according to the buyers this was reliable information. If for this project companies are to be used who said they have sensory methods in place; it would be no surprise if this will be less than needed.

Information on sensory quality descriptions was not traceable along the whole chain. Only the steps from auction to their buyers and from processors to their buyers (retail) have written information on sensory quality.

**Denmark:**

In the Danish fish producing companies some perform sensory quality control in a very structured way. They have a panel for sensory analysis and register the results. But mainly they use 'good manufacturing practice' and experience to control the sensory quality, with untrained laboratory technicians. All companies said they are in place for quality decision-making, but it is not clear if they all do it.

**Ireland:**

Ireland does not have a very industrial fish processing industry; Spanish and German processors in Ireland are dealing with Spain and Germany (respectively) only. Most companies were following the EC Standards (HACCP), but very rarely ISO standards, since these costs too much to maintain. Quality controls were all done on the spot mainly at the Fishermen's Cooperative by experienced people (by sight and touch etc) or, in the case of salmon, there is one Irish Salmon Farming Organisation which deals with all the National Standards. When either white fish from boats via the Fishermen's Co-ops or salmon from farms via the 'Organisation' are sold to fish-mongers, the latter do not care about quality since it all falls between Irish, hence European Standards, with strong HACCP all over the chain.

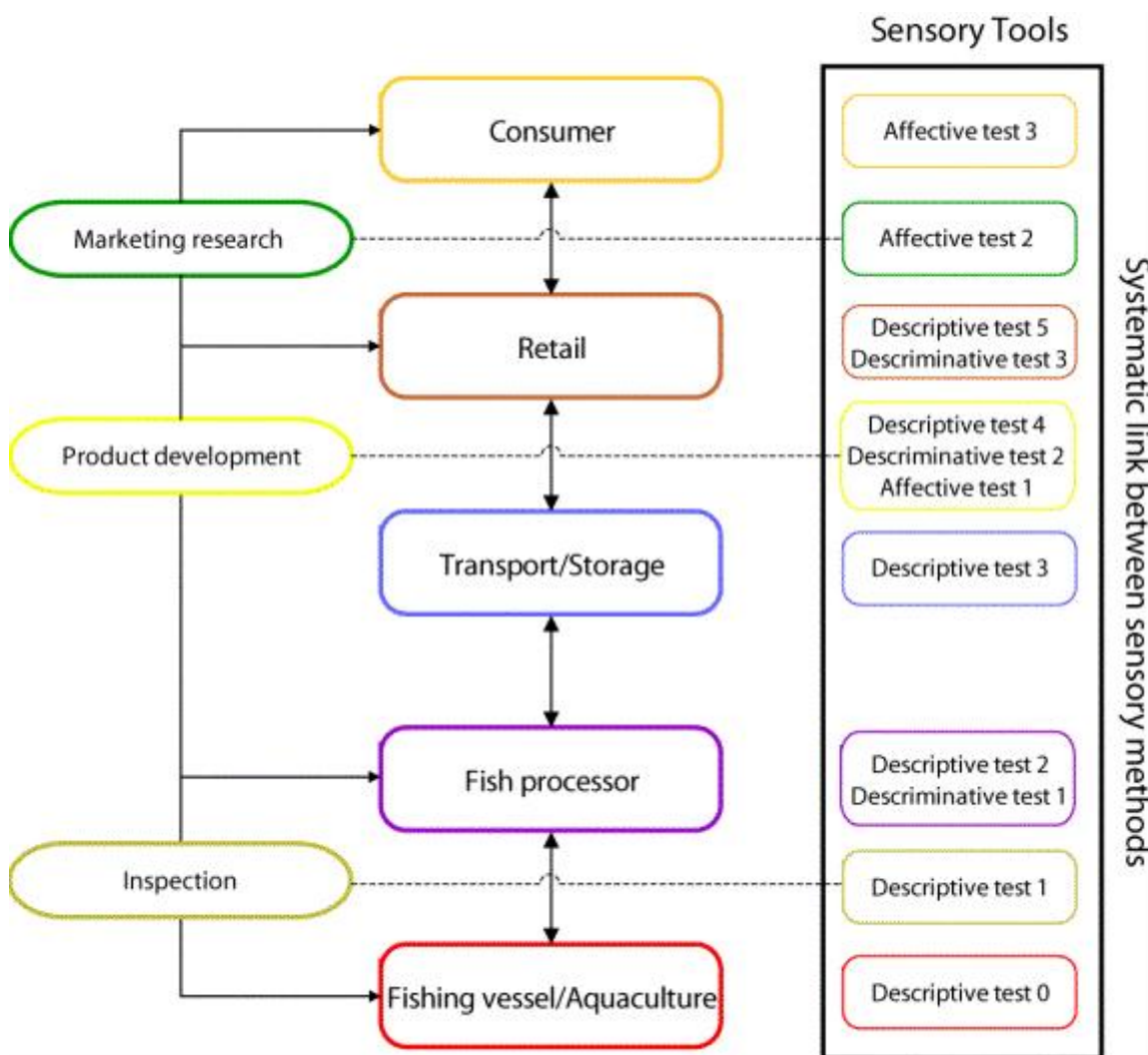
Many artisanal smoke houses follow HACCP and believe this is sufficient to sell efficiently throughout Europe.

In Ireland HACCP was said to be a method to control sensory quality.

## 4. Conclusion

The results from the questionnaire showed that there was large variation in how structured and how well documented the information on sensory quality were in each of the individual companies throughout the European fishery production chain. Though not in a systematic way, almost all companies assessed the products by its appearance and described general quality criteria, often related to freshness or other product specifications.

Below is the schematic figure of the sensory quality model. When the results given in table 2 are compared with the model it can be seen that 60-100% of the vessels, farms and auctions used sensory test of the incoming products (Descriptive test 0). The wholesalers, processors and exporters used sensory tests (Descriptive test 2) in 95 – 100% of the companies and they have sensory tests at the entrance and during the processing as well as for the final products. 100% of the storage companies used sensory tests (Descriptive test 3) at the entrance, but only 50% during processing and 75% for the final goods. 90% of the retailers used sensory test (Descriptive test 5) for the incoming and ~70% for the final goods. 90% of the retailers used sensory test (Descriptive test 5) for the incoming and ~70% for the final goods.



If specific methods (EU scheme, QIM and Torry) were in place, it was relatively easy to describe norms and tolerances for the products. But these interviews showed that the used sensory tests were not always well documented. In the descriptive test used for incoming goods it was mostly appearance and smell that were measured. In descriptive tests used for the final goods the taste was included. Between companies in the chain, this information was not often recorded or described.

65% of the companies assessed the sensory quality because their own quality department required it. Only 25% assessed the sensory quality because their customers required it. Although to the opinion of the companies they delivered what their customers demand, this was hardly ever described in terms of sensory quality and little was known about the demands of the end-user. No sensory quality description of the final product was present and there was no translation of this description backwards in the fishery production chain.

Through its definition every position in the fishery production chain was pointed out as “quality decision-making”. But only these companies who have a structured “sensory method” in place were selected for the following tasks of the project to evaluate the sensory quality in the chain and to evaluate the sensory quality on attributes resulting from the preference mapping.

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