Deliverable Report

Deliverable No:	D29.4		**Delivery Month:**	34
Deliverable Title	Report on the actual products' sensory profiling in the five countries investigated			
WP No:	29		**WP Lead beneficiary:**	P11. AU
WP Title:	Socioeconomics - Consumer value perceptions and behavioural change.			
Task No:	29.2		**Task Lead beneficiary:**	P3. IRTA
Task Title:	Consumer sensory perceptions			
Other beneficiaries:	P1. HCMR	P18. CTAQUA	P38. HRH	
Status:	Delivered		**Expected month:**	29

Lead Scientist preparing the Deliverable: Guerrero, L. (IRTA)

Other Scientists participating: Lazo, O. (IRTA), Claret, A. (IRTA), Robles, R. (CTAQUA), Saltavarea, H. (HRH)

Objective: The objective of this Deliverable is to assess the actual new products' sensory profiling in the five countries investigated (*i.e.*, Germany, France, United Kingdom, Italy and Spain). Consumer sensory evaluation of the new products developed in WP 28 was conducted by means of a central location test under controlled conditions. This deliverable contains the overall acceptability for each product, a quantitative assessment of relevant and simple sensory attributes made by participants and supplementary qualitative descriptive information obtained by means of CATA (Check-All-That-Apply) questions. In addition, sensory motives driving consumers' acceptance are identified by integrating sensory descriptive data provided by trained panellists with consumers' acceptability. Results are described and presented taking into account socio-demographic data (country, gender, etc.) and the previous segmentation information obtained in Task 29.1.

Description: This deliverable describes consumer sensory perceptions of the different prototypes developed and tested in Task 28.2 New Product Development according to the procedure described in *D29.3 Consumer assessment of the selected new products*. Consumer sensory perceptions of the new products (from WP 28) were evaluated in 5 countries (n=100 per country). The different segments identified in Task 29.1, based on the different potential the new products were expected to have in different national and international segments, were taken into account. The products used were provided by Sub-task 28.2.2 and transferred to actual product samples from the selected species for the sensory testing with consumers (D29.3). This deliverable contains all the results obtained in the different consumer tests (expectations, acceptability scores, identifications of the main sensory drivers of preference and perception/image of the tested products and concepts) as well as methodological details about how the test was performed. The document is divided in two main sections, one describing the experimental protocol and a second describing and discussing the main findings obtained and their practical implications.

1. Introduction

Consumers are the last step in the production chain and those who ultimately decide on the success or failure of a new product launched into the market. It is therefore essential to understand the factors affecting consumer behaviour and the key aspects driving decision-making and product purchasing.

Sensory properties have been identified as one of the main determinants of food selection and consumption. However, sensory perception *per se* might be strongly affected by other aspects such as individual characteristics (e.g. attitudes or expectations) and environmental factors (context, origin, brand name, price, etc.) (Font i Furnols and Guerrero, 2014). In the same vein, expected quality seems to be one of the most important factors in consumers' intention to purchase food. It is evident that quality cues are used to infer expected fish quality attributes at the point of sale. These cues can be grouped into intrinsic (colour, odour, eyes shape, brightness) and extrinsic (price, origin, quality labels), and their role in developing expectations depends on the type of fish or fish products and on the context (circumstances in which the product and individuals will interact) in which the product will be used or consumed.

In addition, it is worth making a clear distinction between experiential quality attributes such as convenience, freshness or sensory characteristics that will be experienced and ascertained at the time of consumption, and credence quality attributes, such as healthiness or naturalness, that cannot be experienced directly even after frequent consumption. Both quality attribute types can generate individual expectations, but only quality attributes experienced directly can be assessed, confirmed or disconfirmed. To enhance consumer perception (both expected and experienced) of fish and fish products, additional information provided at the point of purchase (Grunert et al., 2004) through communication (i.e. on the product label/package), may play an important role in reducing uncertainty in the formation of quality expectations. In fact, as stated by Van Wezemael et al. (2012), detailed information seems to be an effective way to facilitate more appropriate expectations and to improve enjoyment.

In the framework of the DIVERSIFY project, twelve products from new aquaculture fish species have been developed and tested from a technological, physical/chemical, microbiological and sensory perspective (see *D28.3 Report on product and process solutions for each species based on technological, physical and sensory characteristics* and *D28.4 Physical prototypes of new products from the selected species meagre, greater amberjack, wreckfish, pikeperch and grey mullet* from Task 28.2). These products were selected from a pool of 41 concepts (see *D28.2 List of ideas for new product development*) based on their different degree of technological complexity and processing and taking into account the appropriateness for each of the species under study.

In this Δeliverable, intrinsic and some extrinsic characteristics (information provided about them) of the selected products/concepts have been assessed by consumers in five particular countries (France, Germany, Italy, Spain and UK), thus focussing in both experiential and credence quality attributes. Purchase probability has also been assessed in order to estimate those aspects having a major impact on the individuals' buying intention.

2. Methodology

2.1. Selection of the new products to test

Twelve different new products were developed according to deliverables D28.2 (*D28.2 List of ideas for new product development*), D28.3 (*D28.3 Report on product and process solutions for each species based on technological, physical and sensory characteristics*) and D28.4 (*D28.4 Physical prototypes of new products from the selected species meagre, greater amberjack, wreckfish, pikeperch and grey mullet*). **Table 1** shows the new products developed for each species.

In order to reduce the number of products to test into a more practical and realistic amount, thus reducing loss of interest, concentration and sensory fatigue (Amerine et al., 1965), a product selection was made by the researchers involved in deliverable D28.4. This selection was based on the technological complexity, shelf-life, easiness to handle/prepare, consumption context and shipment convenience of each of them. Finally, six products were selected (**Table 1**) in order to have sufficient statistical degrees of freedom in drawing a Preference Mapping (Schlich and McEwan, 1992) and adequate sensory variation in building a broad sensory space that can include different segments of consumers with differentiated preference patterns. The selected products were also approved by other partners involved in work packages WP27 to WP30, including researchers and industrial participants.

Table 1. New products developed for each species (in bold products selected for tasting with consumer).

MEAGRE	Idea 1*: Frozen fish fillets with different recipes **Idea 6: Fish burgers shaped as fish (H)** **Idea 4: Ready to eat meal: salad with fish (L)**
PIKEPERCH	Idea 21: Fresh fish fillet with different "healthy" seasoning and marinades Idea 30: Ready-made fish tartar with additional soy sauce **Idea 9: Fish spreads/pate (H)**
GREY MULLET	**Idea 2: Thin smoked fillets (M)** **Idea 33: Ready-made fish fillets in olive oil (M)** Idea 21: Fresh fish fillet with different "healthy" seasoning and marinades
GREATER AMBERJACK	Idea 13: Frozen fish fillet that is seasoned or marinated Idea 30: Ready-made fish tartar with additional soy sauce **Idea 34: Fresh fish steak for grilling in the pan (L)**

L: low processing; M: mid processing; H: high processing.
*: See deliverables D28.2 and D28.4 for a detailed description of each idea/product.

2.2. Elaboration of the new products to test

Only those products having more complex technological processes (marked as M or H in **Table 1**) are briefly described in this section. For a more detailed description see *D28.4 Physical prototypes of new products from the selected species meagre, greater amberjack, wreckfish, pikeperch and grey mullet*.

2.2.1. Fish burgers (meagre)

In order to elaborate the fish burgers, 85% of minced meagre (10 mm-plate) and 15% (w/w) of shredded Emmental cheese were placed in an industrial mixer for 20 seconds. Then 0.1% of transglutaminase (Activa GS, Ajinomoto, Tokyo, Japan) dissolved in water (5%) at a temperature between 10-15 °C was added to the fish mixture together with 1% of table salt. The mixture was evenly mixed for 20 additional seconds. Thereafter, within the next 20 minutes, 100 g of the product were placed into the fish-shaped mould and a vacuum cycle was conducted to compact the sample and allow a homogenous crosslinking. Fish burgers

were then stored at 0-2°C overnight (8-10 h) before freezing them in a conventional freezer. After that, the fish burger was placed on a tray and a black olive slice was placed on the fish "head" to simulate a fish eye. Then, the product was packed with its final skin pack.

2.2.2. Pikeperch fish pate

Ten pikeperch fillets *(for each 30 cans of 200 g)* were scalded in boiling water for 5 minutes. Afterwards, bones were carefully removed. In a separate container, an emulsion was prepared by mixing 120 g of sodium caseinate with 940 g of hot water. Then 940 g of sunflower seed oil were incorporated and finally 6 g of garlic in powder, 4 g of smoked paprika in powder and 50 g of table salt. The emulsion was mixed in a meat cutter with the scalded Pikeperch until making a uniform paste but keeping some of the fibrous texture. Once the paste was ready it was placed in aluminium cans (200 g/can) for pasteurization. Pasteurization was performed in a convection oven at 100ºC with steam for 30 minutes. Cans were placed separately inside the oven so the steam could reach them homogenously. In addition, temperature sensors were placed inside some of the cans to assess that the product reached the necessary core temperature. After pasteurization, cans were store at 4ºC in a fridge chamber.

2.2.3. Thin smoked fillets (grey mullet)

Smoking was done following the procedure determined during the prototype preparation phase (Task 28.2). Smoked grey mullet fillets with the skin on were used. Hot smoking with dry salting and addition of sugar was the procedure followed for the preparation of the product. An electrical oven was used, with oak chips as raw material for smoke production.

Instead of a brining, a drying salting mixture was used. The drying salting mixture was prepared with pure sea salt and sugar in a proportion of 3:1. The fish fillets were placed in a kitchen tray (salting tray) with a 2 cm salt mixture covering the bottom. This first layer was covered with another layer of 2-3 cm of the salting mixture. Fish fillet remained in the salting tray for 2.5 h. After this time, the fillets were rinsed thoroughly under tap water to remove any trace of the salting mixture. Once the excess water was removed, the fish fillets were ready for smoking.

The smoking was done at 60ºC for 40 minutes. Smoked fillets were left to cool down at room temperature. Once the smoked fillet portions were cooled down, they were packaged under vacuum and refrigerated at 4ºC until transport.

2.2.4. Fish fillets in olive oil (grey mullet)

Bottled grey mullet in olive oil was prepared by P18. CTAQUA staff at the facilities of a collaborating catering company (Alta Cazuela, Jerez, Spain) in an autoclave oven especially designed for this type of preparation. The fillet, without skin, was further processed to obtain a clean and homogenous piece of fish to be introduced in the glass bottles used for the cooking process. This procedure further eliminated trimmings. Fillets were then placed sealed in airtight glass containers and heated for sterilization of the product. Each bottle had a capacity of 250 ml; an average of 140 g of fillets and 35-40 ml extra virgin olive oil were placed per bottle. Some examples of the production process for the smoked fillets and for the fish fillets in olive oil are shown below (Fig. 1).

Figure 1. Example of the production of some of the products. a) Grey mullet fillets in salting mixture before smoking; b) Grey mullet fillets on smoking trays; c) Glass pots with clean and homogenous pieces of mullet fillets; d) Filling the glass containers with olive oil; e) Bottles with grey mullet fillet and olive oil ready to go under cooking process.

2.3. Recruitment of participants

One hundred participants were recruited in each of the five selected countries (France, Germany, Italy, Spain and UK). The selection criteria were:

- 50% of the individuals per country belonging to each of the two main relevant segments of consumers identified in Task 29.1 (see deliverable D29.2) namely "Involved innovators" and "Involved traditional". The third segment described in deliverable D29.2 (Ambiguous/indifferent) was not included in this study in order to focus on those segments having a more polarised psychographic profile and due to the relative low number of respondents (n=100). This third segment represents about one third of the market in the 5 study countries, so this fact will be taken into account for further discussion when commenting on the main results obtained in case that important differences between the two selected segments are observed.

- Balanced fish consumption (farmed and wild), age, gender, income and marital status, trying to fit the average frequencies in their respective segments per country (see profile tables in deliverable D29.2). It is important to remark that all recruited individuals were regular fish consumers. Obviously, this fact might have an effect on the results obtained and will be consequently discussed later on in this Deliverable.

- Participants having any type of food allergy or food intolerance were screened out.

All the data obtained from the selected participants during the recruitment (category involvement, domain-specific innovativeness, subjective knowledge, fish consumption, age, gender, income and marital status) were also included in the final data file in order to characterize the new segments identified based on their sensory preference.

Annex 1 shows the questionnaire developed and used during the recruitment step.

2.4. Facilities, materials and personnel

All the tests were performed under controlled conditions in a central location. Each laboratory involved in this study provided a testing room equipped with sensory booths, designed according to ISO regulations (ISO, 2007), with capacity for a minimum of 10 participants. In addition, they had a preparation room equipped with a kitchen where to cook the different fish samples (grill and pan), a fridge for storing fresh samples (4-6ºC), a freezer to keep some of the samples frozen (-18ºC) and generic kitchen cookware. Each testing booth had individual computers and Internet connection to capture the answer of the participants. Mineral water and standard apple pieces (Golden delicious or Granny Smith) were provided to each consumer to clean their mouths between samples.

Regarding personnel needs, in each location three persons were involved in order to properly execute the test. One person was responsible to welcome participants and explain the different tasks to perform. The other two persons were responsible for sample preparation and distribution. An additional person from P3. IRTA was present all the time in all locations in order to control and verify the right execution of the test (order of the samples, cooking procedures and temperatures, etc.) and to assist the local staff when needed.

2.5. Handling, storage and preparation of the samples

All the samples were shipped in advance to each location in the right conditions and guaranteeing the cold chain. Samples were sent with detailed instructions about the right procedure to store them until analysis. Some of the samples were stored at 4-6ºC in a fridge (fish spreads, fish fillets in olive oil and smoked fillets) and some of them at -18ºC in a freezer (fish burgers, fish for the salad and fish steak for grilling).

Fish burgers, fish steaks for grilling and fish fillets to be cut and added to the salad were placed in a fridge at 4-6ºC 24 hours before their sensory assessment in order to thaw them. Fish spread, fish filets and smoked fillets were removed from the fridge 2 hours before tasting them to reach room temperature (20-22ºC). The total amount of fish sample used per tasting session was about 25 g per product and person.

Fish burgers and fish steaks (plus 1% of table salt added to the raw steak) were grilled in a pan until reaching an internal temperature of 63ºC (USDA, 2016). Then, each burger/steak was cut in pieces of 25 g approximately, placed in a small black tray and served to each participant as fast as possible to prevent them from cooling down. Fish fillets to be added to the salad were cut in dices of 1.5 x 1.5 cm approximately. Salt (1 g/100 g fish weight) and diluted apple cider vinegar (70:30, v/v) were then added until completely covering the product (fish to vinegar ratio should be approximately 1:1, w/v) and stored for 3 hours at 3-4 °C to achieve a pH below 4.5. After this period, the liquid was removed and the fish dices were allowed to drain. Lettuce was washed and strips were cut and rolled to use for brochettes. Brochettes were prepared with a toothpick placing three pieces of fish and two pieces of lettuce as interleaves. One small spoon of dressing was placed on each toothpick and 2 brochettes were placed in a small black tray for each consumer. The dressing sauce was a mustard vinaigrette (1 g lemon zest (1.6%), 7.5 g lemon juice (11.9%), 7.5 g extra virgin olive oil (11.9%), 20 g of Dijon mustard (31.8%), 1.5 g of oregano (2.4%), 25 g of honey (39.7%), 0.3 g of salt (0.5%) and 0.15 g pepper (0.2%) mixed in a conventional blender). The product was served at room temperature. Fish spread was dished up alone to avoid any interference from other products such as bread. The product was placed in small transparent glasses with a black spoon to contrast the colour. Smoked fillets and fish fillets in olive oil were also served alone in small black trays. All the ingredients and special cookware were also provided by IRTA. The researcher from IRTA assisted local people during the preparation and cooking of the samples to ensure the same methodology within and across countries. **Figure 2** shows some examples of how the product was presented to the participants.

All the samples were presented following a balanced design (see below, and **Tables 2** and **3**).

Figure 2. Examples of sample presentation to the participants in the test.

2.6. Test design and execution

A total of ten tasting sessions were held in each location in two consecutive days. Each tasting session lasted for 1-1.5 h. Groups of 10-12 participants were convened every 1.5-2 h in order to have enough time to prepare the sensory booths between sessions. Each tasting session was divided in four main parts:

1. Participants were informed about the aim of the test and how to use the computers for inserting their answers.

2. Overall expectation: consumers assessed the expected acceptability for each of the 10 different ideas of products shown in **Table 1** (note that ideas 21 and 30 were repeated twice), one by one (see the design for the different presentation orders in **Table 2**), without any additional information (no images were provided since they might bias their answer). Then, they had to indicate their personal opinion (image) about each product concept by scoring 18 different attributes on a 7-point Likert scale (see Instructions and Questionnaire in **Annex 2**).

3. Blind tasting: participants evaluated the overall acceptability for each product after having tasted it. In addition, they assessed the acceptability of odour, flavour and texture. Finally, respondents received a multiple-choice questionnaire with a list of 28 sensory descriptors where they had to tick the options that they consider applicable to each product (Check-all-that-apply or CATA) (Adams et al. 2007). All these tasks were done product-by-product according to the order described in **Table 3** (see Instructions and Questionnaires in **Annex 2**).

4. Overall expectation in informed condition: participants received the full written description of each product according to the product information described in Deliverable D28.2. They had to assess their overall acceptability in a structured 9-points liking scale. Then, for each product participants had to indicate their purchase intention by means of Juster's 11-point probability scale (Juster, 1966). Finally, respondents evaluated their personal perception of each product by means of a semantic differential scale (made up of 11 adjectives) (Osgood et al., 1957). Again, products were shown one by one in a pre-established order (**Table 3**) (see Instructions and Questionnaires in **Annex 2**).

All the products in the different parts were presented in the same order within a tasting session. This presentation order was different in each session according to the design shown in **Tables 2** and **3** (MacFie et al., 1989), but the same in all the different locations in order to facilitate the comparison between countries.

Table 2. Order of presentation for the 10 ideas of product (expectations) in each session for all the countries.

Session	Order of presentation									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Session 1	246	854	782	917	549	652	131	330	493	086
Session 2	782	246	549	854	131	917	493	652	086	330
Session 3	549	782	131	246	493	854	086	917	330	652
Session 4	131	549	493	782	086	246	330	854	652	917
Session 5	493	131	086	549	330	782	652	246	917	854
Session 6	086	493	330	131	652	549	917	782	854	246
Session 7	330	086	652	493	917	131	854	549	246	782
Session 8	917	652	854	330	246	086	782	493	549	131
Session 9	652	330	917	086	854	493	246	131	782	549
Session 10	854	917	246	652	782	330	549	086	131	493

Product 086: Fish spreads/pate; *Product 131:* Fresh fish fillet with different healthy seasoning and marinades; *Product 246:* Frozen fish fillets with different recipes; *Product 330:* Thin smoked fish fillets; *Product 493:* Ready-made fish tartar with additional soy sauce; *Product 549:* Ready to eat meal: salad with fish; *Product 652:* Ready-made fish fillets in olive oil; *Product 782:* Fish burgers shaped as fish; *Product 854:* Fresh fish steak for grilling in the pan; *Product 917:* Frozen fish fillet that is seasoned or marinated.

2.7. Sensory characterization of the products with trained assessors

Nine trained assessors with more than four years of experience in descriptive sensory profiling of different food products, including fish, performed a CATA test over the six selected new products in duplicate (in two different tasting sessions). Then, they evaluated the samples using a sensory descriptive analysis in triplicate (in three different tasting sessions). All the sensory tests were performed in sensory booths and in the same conditions with those carried out by consumers in the different locations, thus assessing exactly the same sensory descriptors in all cases. Sample preparation and the order of presentation of the samples were also similar to this described for consumers.

Sensory characterization with the trained assessors was performed before the consumer tests in order to select the sensory attributes to be included in the CATA test for the consumers.

Table 3. Order of presentation for the 6 selected products for the blind tasting and the full information condition in each session for all the countries.

Session	Order of presentation					
	1st	2nd	3rd	4th	5th	6th
Session 1	A	F	B	E	C	D
Session 2	B	A	C	F	D	E
Session 3	C	B	D	A	E	F
Session 4	D	C	E	B	F	A
Session 5	E	D	F	C	A	B
Session 6	F	E	A	D	B	C
Session 7	B	A	C	F	D	E
Session 8	A	F	B	E	C	D
Session 9	D	C	E	B	F	A
Session 10	F	E	A	D	B	C

Product A: Fish spreads/pate; *Product B:* Thin smoked fish fillets; *Product C:* Ready to eat meal: salad with fish; *Product D:* Ready-made fish fillets in olive oil; *Product E:* Fish burgers shaped as fish; *Product F:* Fresh fish steak for grilling in the pan.

2.8. Data analyses

All the statistical analyses were performed with the software XLSTAT, version 2015 (Addinsoft, Paris).

Overall, quantitative data were analysed by means of Analysis of Variance (ANOVA) including the product, the segment ("Traditional" or "Innovators") and the country as fixed factors. The analyses per country were submitted to a two-way ANOVA (product and segment as fixed factors). In all cases, multiple mean comparisons were performed by means of Tukey's post-hoc test. In some cases, a Principal Component Analysis was also carried out to examine the structure of the data set.

CATA data were analysed by means of Simple Correspondence Analysis. Pairwise comparison of multiple proportions values between products was done with the Cochran's Q test and the Marascuilo test. A Multiple Factor Analysis was also performed in order to test the similarity between the sensory spaces obtained in the different countries (RV coefficient).

In order to identify segments of consumers with similar preference patterns, a Hierarchical Cluster Analysis was conducted (Ward method). The validity of the identified segments was checked by means of a Discriminant Analysis and their corresponding confusion matrix.

In order to identify the main sensory drivers of consumers' preferences, three different Preference Mappings were obtained combining the blind liking scores with the different descriptive data available: Quantitative Analysis and CATA with trained assessors and CATA with consumers. In all cases, liking data was fit to linear, circular, elliptic and quadratic models.

Finally, and in order to identify those quality aspects with a higher impact in the overall acceptability of the different tested products and on the purchase probability, different multiple regression analyses were performed.

3. Results and discussion

In this section, results are presented and discussed according to the main objective of the test performed: expectations, image/perception of the different concepts/ideas of product, liking of the selected products, sensory characterization made by consumers (CATA test), overall liking, purchase likelihood, personal perception of each product (semantic differential scale), sensory description made by trained assessors (quantitative profile and CATA) and identification of the main drivers of consumers' preference (Preference Mapping).

3.1 Consumers' expectations

Expectations can be defined as subjective notions of things to come or in a simpler way as a type of hypothesis formulated by the consumer. Consumer product expectations may be regarded as pre-trial beliefs about the product, thus playing an important role by improving or degrading the perception of a product, even before it is tasted (Deliza and MacFie, 1996).

Table 4 shows the expected degree of liking of the ten product ideas described in **Table 1**. Products with a lower degree of processing were those who generated higher expected acceptance. Similar results were obtained for the two segments of consumers that participated in this study ("Involved traditional" and "Involved innovators"). Accordingly, it seems that the higher preference for the low processed fish products is not directly related to aspects such as willingness to try new products or variety seeking behaviours.

Table 4. Average expected degree of liking of selected product ideas.

Idea	Mean value	Standard deviation
Grilled fillet (Idea 34)	7.5^{a}	1.672
Fresh fillet (Idea 21)	7.1^{b}	1.843
Smoked fillet (Idea 2)	6.8^{bc}	1.862
Frozen fillet (Idea 1)	6.7^{c}	1.716
Salad (Idea 4)	6.7^{c}	1.867
Fish olive oil (Idea 33)	6.6^{c}	1.879
Frozen marinated fillet (Idea 13)	6.6^{c}	1.858
Hamburger (Idea 6)	6.2^{d}	1.929
Tartar (Idea 30)	5.8^{e}	2.273
Pate (Idea 9)	5.8^{e}	2.184

a-e: Mean values with different superscripts differ significantly ($p<0.05$).

Significant differences ($p<0.05$) between countries were observed in the pooled mean values for all the products. French participants score all products higher than Italians (7.2 vs. 5.7), with the rest of the countries being in between. Even though the interaction country x product was significant, similar patterns were observed in all the different locations (see **Figure 3**).

It is worth mentioning that all consumers involved in the present study were selected based on their regular consumption of fish (wild or farmed) (see the recruitment questionnaire in **Annex 1**). This recruitment procedure could explain the higher preference for those products having the genuine sensory properties of fish, without any interference. Probably, products having a higher degree of processing would be more appropriate for consumers who do not like fish because of its taste, presence of bones, odour, etc. In these cases, the existence of different processed alternatives could be a good solution for those individuals looking for a more convenient and less "fishy" product.

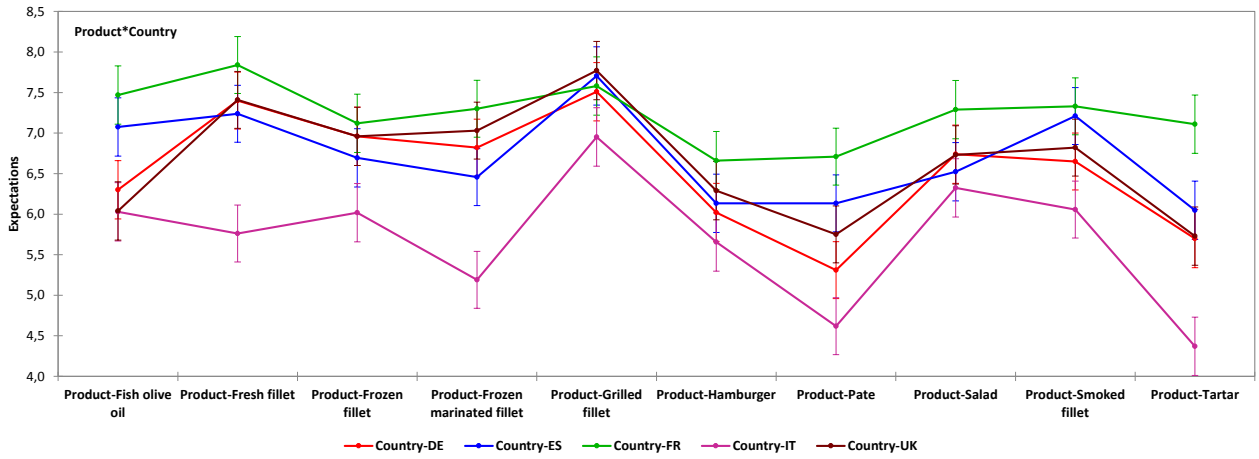

Figure 3. Consumer expectations for each product and country

3.2. Image/perception of the different products or ideas

The image that a product/idea has or produces in the consumers' mind is closely related to how it is perceived and conceptualised, thus implying a cognitive process that may build individual expectations and drive personal preferences (Guerrero et al, 2012). In general, and despite of the lower expected liking for the processed products reported previously, all the products were perceived quite positively (**Figure 4**). The mean values for the negative characteristics were in most cases under the neutral value of the scale (value 4), thus indicating different levels of disagreement, meanwhile the positive properties were almost always scored above 4 (agreement).

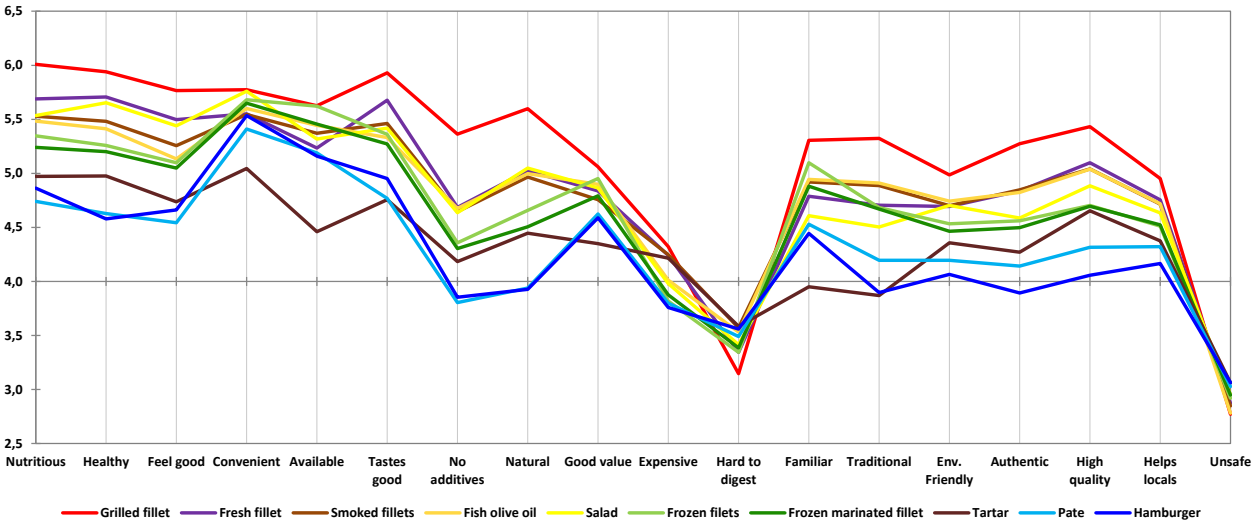

Figure 4. Image/perception of each concept/product assessed.

Hamburger and pate were the two products that were worst perceived regarding the presence of additives and naturalness. Grilled fillet was in all cases the best-perceived product in agreement with its higher expected acceptance discussed above. Differences between the two segments (Traditional vs. Innovators), although statistically significant in some cases, were very small and irrelevant.

Regarding the country of origin of the respondents, some statistical differences were observed for the different attributes assessed, but in an overall sense and according to the results of the multiple factor analysis these differences were irrelevant as well (**Figure 5**). The RV coefficients (Robert and Escoufier, 1976; Schlich, 1996) among countries also confirm their relative similarity (**Table 5**).

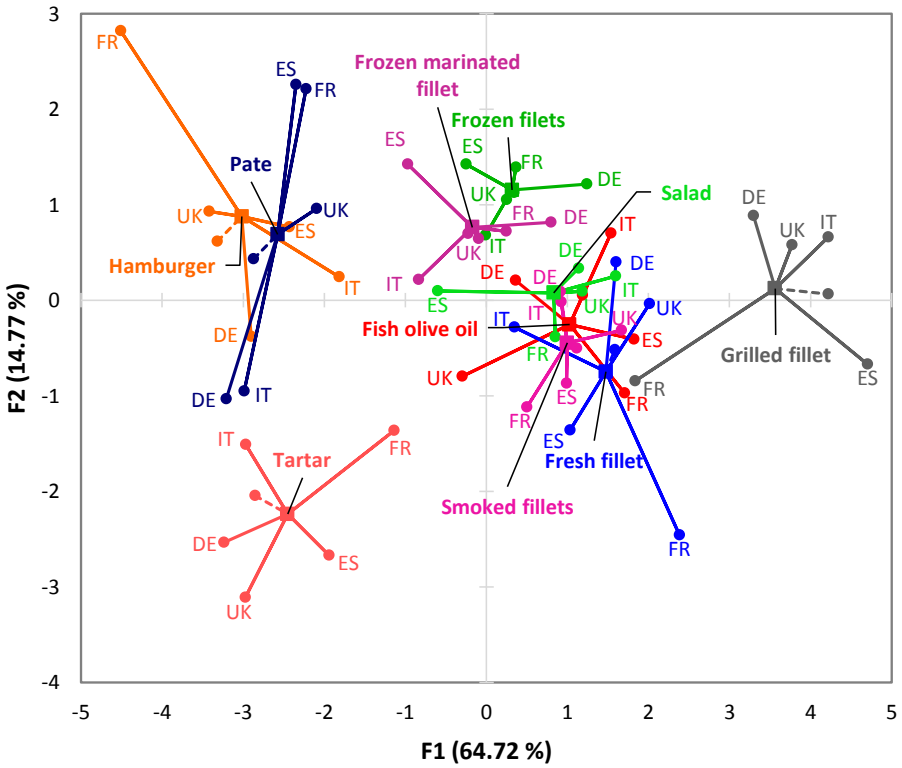

Figure 5. Sample location per country in the first two dimensions of the multiple factor analysis.

Table 5. Similarity between countries according to the RV coefficient.

Country	DE	ES	FR	IT	UK	Overall
DE	1.000	0.683	0.711	0.804	0.889	0.921
ES	0.683	1.000	0.622	0.812	0.742	0.879
FR	0.711	0.622	1.000	0.535	0.723	0.772
IT	0.804	0.812	0.535	1.000	0.761	0.895
UK	0.889	0.742	0.723	0.761	1.000	0.920
Overall	0.921	0.879	0.772	0.895	0.920	1.000

According to the results of the multiple regression analysis (**Table 6**), the most important parameter affecting liking expectations was the expected taste of the product. Health, nutritional and well being related issues were relevant as well in order to increase individuals' expectations, but to a lower extent. These findings seem to confirm those obtained by Verbeke (2006) who affirmed that in general consumers are unwilling to sacrifice taste by an improvement in health or functional properties.

Table 6. Effect of the different studied parameters on the expectations by country.

	Effect on expectations					
Parameter	Overall	DE	ES	FR	IT	UK
Nutritious	+			+	+	
Healthy	+				+	
Feels good	+	+		+		
Convenient			+			-
Available	-					
Tastes good	+	+	+	+	+	+
No additives						
Natural						
Good value	-					-
Expensive	-			+		-
Hard to digest	-				-	
Familiar	+	+	+			
Traditional						
Env. friendly	-			-		
Authentic						
High quality				+		
Helps locals		+				
Unsafe	-			-		-
*R^2	0.418	0.585	0.350	0.465	0.342	0.391

+: significant positive effect on expectations ($p<0.05$); -: significant negative effect on expectations ($p<0.05$); *: All the R^2 values are significant ($p<0.0001$). Signs marked in green are those with the highest standardised regression coefficient, in orange the second highest and in red the third highest ones (in absolute value).

3.3. Blind tasting (sensory acceptability)

According to what was described in the methodological section only six products were blind tasted. As expected, according to Guerrero (1999) and Font i Furnols (2009) and when dealing with consumers, significant and important linear correlation coefficients were observed between the overall acceptability and odour, flavour and texture acceptability values ($r>0.7$) (**Table 7**). For this reason and in order to make this deliverable simpler only the overall acceptability will be presented and discussed.

Table 7. Linear Pearson correlation coefficients between the four measured acceptability variables.

Variable	Overall	Odour	Flavour	Texture
Overall	1	0.830	0.908	0.838
Odour	0.830	1	0.819	0.742
Flavour	0.908	0.819	1	0.849
Texture	0.838	0.742	0.849	1

All the tasted products had scores higher than 5, thus indicating that none of them were clearly rejected in an overall sense (**Table 8**).

Table 8. Mean acceptability values for the different products per country.

Product	Overall	DE	ES	FR	IT	UK
Fish olive oil	6.3^{b}	6.0^{b}	6.7^{ab}	7.2^{abc}	6.0^{bc}	5.7^{bc}
Grilled fillet	7.1^{a}	6.9^{a}	7.0^{a}	7.5^{a}	6.8^{a}	7.3^{a}
Hamburger	6.5^{b}	6.2^{ab}	6.9^{ab}	7.1^{abc}	6.4^{ab}	6.0^{bc}
Pate	5.8^{c}	5.2^{c}	6.4^{ab}	6.6^{c}	5.3^{c}	5.3^{c}
Salad	6.3^{b}	6.0^{b}	6.2^{b}	7.4^{ab}	5.5^{c}	6.4^{b}
Smoked fillet	6.2^{b}	6.3^{ab}	6.7^{ab}	$6.7b^{c}$	5.6^{c}	5.9^{bc}
Std. Error	0.088	0.200	0.192	0.166	0.186	0.228

a-c: Mean values with different superscripts differ significantly ($p<0.05$).

Regarding the pooled data (Overall) the most preferred product was the grilled fillet and the least appreciated the fish pate in agreement with the previously reported expected liking (see **Table 4**). The same pattern was observed in all the studied countries with the sole exception of Spain, where the least preferred product was the fish salad. Small differences between countries were obtained for the remaining products. It is worth mentioning the difference in the acceptability scores given by the French participants compared to the Italian ones. **Figure 6** shows these results in a graphical form.

Figure 6. Mean acceptability values per product and country.

In general, consumers belonging to the "Innovators" segment tended to score the samples higher than the "Traditional" segment. This difference was only significant for the pooled data and for Spanish consumers. Anyhow, the interaction segment x product was always not significant ($p>0.05$) indicating a similar preference pattern in both segments.

The acceptability results obtained confirm those previously reported regarding consumers' expectations, and also seem to indicate a tendency to prefer the low processed fish products; although, fish hamburgers were the product that most improved their valuation compared to their expected liking.

Based on the overall acceptability scores and regardless of the country of origin of the respondents, four main clusters of participants were obtained with different preference patterns (**Table 9**). This four clusters solution was able to correctly classify 88.4% of the respondents according to the discriminant analysis performed, which proves the validity of number of clusters retained.

Table 9. Mean acceptability values for each segment of consumers and product.

	Segment			
Product	1	2	3	4
Fish olive oil	7.3^{aA}	5.0^{cC}	6.5^{bBC}	7.2^{aA}
Grilled fillet	6.6^{bAB}	7.3^{aA}	7.2^{aA}	7.1^{abA}
Hamburger	7.1^{aA}	6.9^{aAB}	4.5^{bD}	7.4^{aA}
Pate	6.0^{B}	5.5^{C}	6.1^{C}	5.5^{B}
Salad	4.5^{cC}	6.3^{bB}	7.1^{aAB}	6.8^{abA}
Smoked fillet	7.2^{aA}	6.8^{aAB}	6.0^{bC}	4.9^{cB}
N	97	173	115	125

a-c: Mean values in the same row with different lowercase letters differ significantly ($p<0.05$).
A-C: Mean values in the same column with different uppercase letters differ significantly ($p<0.05$).

The grilled fillet was well appreciated in the four clusters in agreement to what was observed in the expectations results (**Table 4**) and in the overall liking (**Table 8**). The fish in olive oil was well accepted in clusters 1, 3 and 4, but in the centre of the scale ("I do not like nor dislike it") in cluster 2. The hamburger was also appreciated in 3 clusters (1, 2 and 4) and was only rejected in cluster 3. The fish pate obtained low acceptability scores compared to the previous products in all the clusters, but always above the central value of the scale. Finally the fish salad and the smoked fillet were both well accepted in 3 of the clusters and rejected in clusters 1 and 4 respectively. Regarding the socio-demographic (gender, age, country, fish consumption, marital status, children at home, education, occupation, financial situation) and psychographic (consumer involvement, domain specific innovativeness, subjective knowledge and innovator or traditional segment) profile of the respondents in each cluster, only the country of origin had a significant effect ($p<0.05$). Cluster 1 had a significant higher amount of Spanish consumer and a significant lower percentage of British participants, which could explain the lower acceptability of the fish salad. Cluster 2 had a significant higher number of German consumers and a significant lower amount of French ones. The opposite was observed in cluster 4.

These results show clearly different preference patterns among EU consumers in agreement with Askegaard and Madsen (1998), who affirmed that Europe cannot be regarded homogeneously as a unique food culture, since noticeable differences exist not only at a national level but also from a more regional/local point of view in food preferences, habits, food-related behaviour and attitudes. All the selected fish product assessed in the present study seem to have a specific niche within the European market.

3.4. Sensory properties of the different fish products

This section of the deliverable contains the three different sensory characterizations of the six selected fish products assessed: CATA performed by trained assessors and consumers and quantitative analyses carried out by trained panellists. In all cases, and in order to be able to compare the three different profiles produced, the same sensory descriptors were evaluated.

Check-All-That-Apply method (CATA) has been widely used in order to capture the sensory perception that consumers have about a specific product (Adams et al. 2007, Varela and Ares 2012). Traditionally, this task was only reserved to trained assessors; however, nowadays the role that consumers play in describing and characterizing the products that they normally consume is widely recognised (Dooley et al. 2010, Ares et al. 2015).

All the selected descriptors (28 in total) differed significantly among products (**Table 10**). **Figure 7** shows the main differences between samples in the first two dimensions of the correspondence analysis.

Table 10. Proportion of sensory attributes assigned to the different samples by consumers.

Attribute	Fish olive oil	Grilled fillet	Hamburger	Pate	Salad	Smoked fillets
Acid	0.088 (b)	0.031 (ab)	0.025 (a)	0.045 (ab)	0.451 (c)	0.059 (ab)
Earthy	0.137 (c)	0.155 (cd)	0.067 (ab)	0.210 (d)	0.049 (a)	0.122 (bc)
Lemon	0.125 (a)	0.106 (a)	0.080 (a)	0.088 (a)	**0.747 (b)**	0.076 (a)
Pungent	0.106 (b)	0.024 (a)	0.084 (b)	0.110 (b)	0.257 (c)	0.108 (b)
Smoked	0.227 (b)	0.176 (b)	0.200 (b)	0.169 (b)	0.061 (a)	**0.853 (c)**
Adhesive	0.047 (a)	0.047 (a)	0.145 (b)	0.147 (b)	0.029 (a)	0.053 (a)
Hard	0.035 (a)	0.094 (b)	0.241 (c)	0.035 (a)	0.024 (a)	0.139 (b)
Aromatic herbs	0.108 (a)	0.080 (a)	0.120 (a)	0.135 (a)	**0.518 (b)**	0.076 (a)
Fish	**0.712 (b)**	**0.839 (c)**	**0.682 (b)**	**0.673 (b)**	**0.539 (a)**	**0.731 (b)**
Metallic	0.045 (ab)	0.031 (ab)	0.033 (ab)	0.022 (a)	0.043 (ab)	0.063 (b)
Salty	0.355 (c)	0.133 (a)	0.263 (b)	0.184 (a)	0.157 (a)	**0.559 (d)**
Sweet	0.063 (ab)	0.110 (bc)	0.129 (c)	0.090 (bc)	0.235 (d)	0.029 (a)
Crumbly	0.290 (b)	0.282 (b)	0.059 (a)	0.278 (b)	0.110 (a)	0.096 (a)
Juicy	0.390 (c)	0.388 (c)	**0.463 (cd)**	0.098 (a)	0.484 (d)	0.218 (b)
Bitter	0.096 (c)	0.053 (abc)	0.022 (a)	0.049 (ab)	0.143 (d)	0.069 (bc)
Garlic	0.047 (a)	0.035 (a)	0.069 (a)	**0.424 (c)**	0.161 (b)	0.024 (a)
Milky	0.024 (a)	0.033 (a)	0.122 (b)	0.122 (b)	0.024 (a)	0.006 (a)
Sardine	0.316 (c)	0.069 (ab)	0.043 (a)	0.090 (ab)	0.039 (a)	0.118 (b)
Vegetables	0.014 (a)	0.008 (a)	0.020 (a)	0.024 (a)	0.288 (b)	0.012 (a)
Fibrous	0.190 (b)	0.190 (b)	0.259 (c)	0.261 (c)	0.071 (a)	0.220 (bc)
Oily	**0.565 (d)**	0.131 (ab)	0.290 (c)	0.071 (a)	0.137 (ab)	0.167 (b)
Butter	0.051 (ab)	0.094 (bc)	0.196 (d)	0.108 (c)	0.033 (a)	0.022 (a)
Intense	0.251 (a)	0.210 (a)	0.247 (a)	0.239 (a)	0.365 (b)	0.439 (b)
Oil	**0.588 (d)**	0.173 (ab)	0.290 (c)	0.104 (a)	0.208 (b)	0.129 (a)
Shellfish	0.035 (a)	0.027 (a)	0.065 (a)	0.176 (b)	0.061 (a)	0.051 (a)
Vinegar	0.045 (a)	0.018 (a)	0.020 (a)	0.037 (a)	0.600 (b)	0.045 (a)
Gummy	0.088 (a)	0.084 (a)	**0.422 (c)**	0.075 (a)	0.049 (a)	0.188 (b)
Pasty	0.096 (b)	0.082 (ab)	0.137 (b)	**0.447 (c)**	0.027 (a)	0.094 (b)

a-d: Mean values for each sensory descriptor with different letters in brackets differ significantly ($p<0.05$).

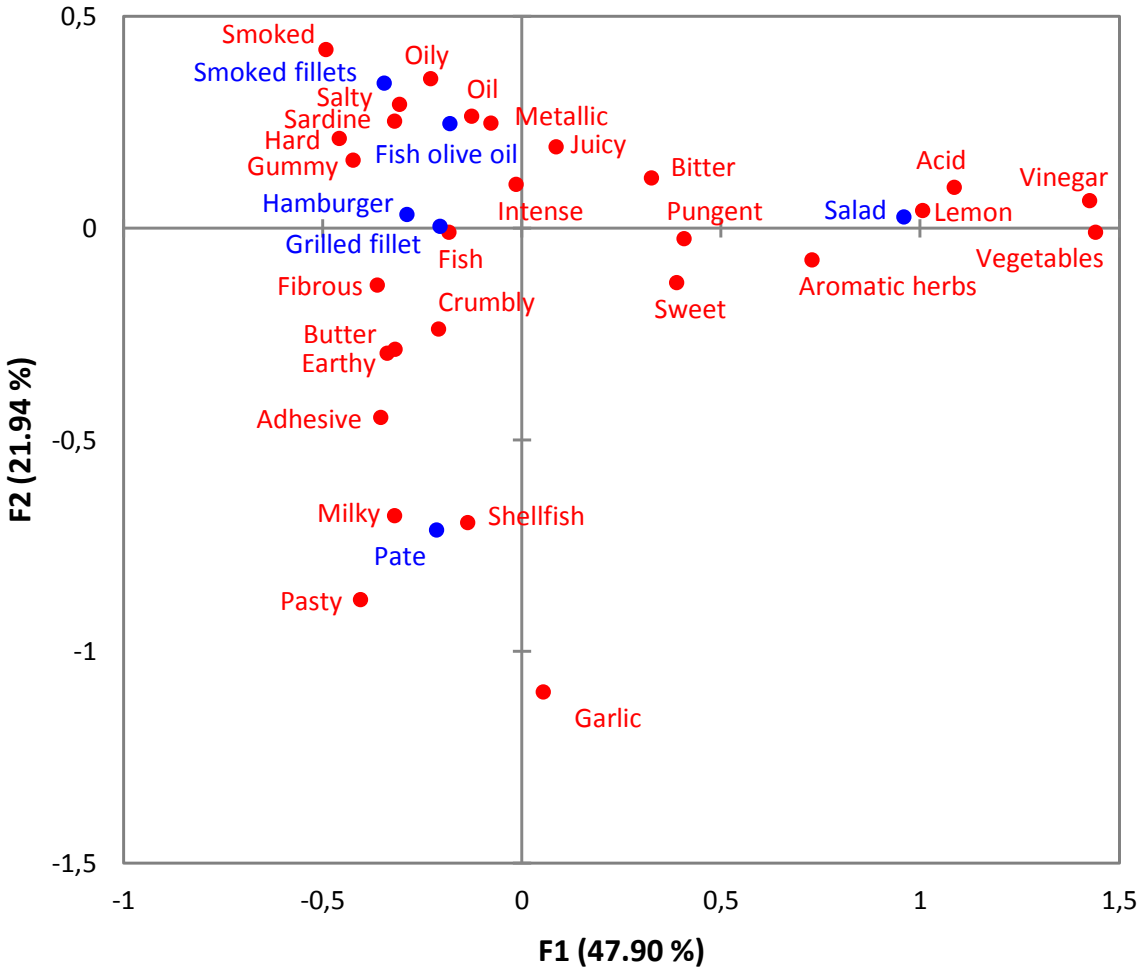

Figure 7. First two dimensions of the correspondence analysis performed over the consumers CATA data.

Consumers were able, in general, to properly describe in sensory terms the different products, especially the fish pate and salad, which were located alone in different places in **Figure 7**. The fish pate was characterised by its higher garlic and milky odour/flavour and by its pastiness. The fish salad was mainly described as acid/vinegar lemon as a result of the dressing sauce. The grilled fillet had the highest fish flavour while the hamburger was the hardest and gummy product. Obviously, the smoked fillet presented the highest values for the smoked flavour/odour and for the salty taste as a result of the elaboration process. Finally, as expected, the fish in olive oil were described as having oil flavour and oily texture and the highest sardine flavour/odour.

In general, consumers showed high discriminant ability since they were able to clearly differentiate the six tested samples. This result is not surprising taking into account the important actual sensory differences between products. Anyhow, it is important to highlight that using this technique (CATA test) consumers are supposed to be able to differentiate closer products.

Similar results were obtained in the different countries involved in the present study as shown in **Table 11** by the RV coefficients (Robert and Escoufier, 1976; Schlich, 1996). In all cases, these coefficients of similarity between matrices were higher than 0.99. Regarding trained assessors, **Table 12** shows the CATA results obtained over the mean values of the two replicates.

Table 11. Similarity between countries according to the RV coefficient.

Country	DE	ES	FR	IT	UK
DE	1.0000	0.9899	0.9884	0.9931	0.9918
ES	0.9899	1.0000	0.9933	0.9921	0.9951
FR	0.9884	0.9933	1.0000	0.9951	0.9971
IT	0.9931	0.9921	0.9951	1.0000	0.9956
UK	0.9918	0.9951	0.9971	0.9956	1.0000

Table 12. Proportion of sensory attributes assigned to the different samples by the trained assessors.

Attribute	Salad	Pate	Fillets in oil	Hamburger	Smoked fillet	Grilled fillet
Acid	**0.889 (b)**	0.111 (a)	0.056 (a)	0 (a)	0.167 (a)	0.722 (b)
Aromatic herbs	0.778 (b)	0 (a)	0 (a)	0 (a)	0 (a)	0 (a)
Bitter	0.167 (a)	0.333 (a)	0.389 (a)	0.111 (a)	0.333 (a)	0.333 (a)
Butter	0 (a)	0.056 (a)	0 (a)	0.278 (ab)	0 (a)	0.500 (b)
Earthy	0 (a)	0.611 (b)	0 (a)	0 (a)	0.056 (a)	0.056 (a)
Fish	0.111 (a)	0.500 (ab)	**0.889 (b)**	**0.833 (b)**	0.611 (b)	**0.889 (b)**
Garlic	0 (a)	**0.833 (b)**	0 (a)	0 (a)	0 (a)	0 (a)
Intense	0.778 (c)	0.556 (abc)	0.667 (bc)	0.278 (ab)	**0.833 (c)**	0.167 (a)
Lemon	0.778 (b)	0 (a)	0 (a)	0 (a)	0 (a)	0.667 (b)
Metallic	0 (a)	0.222 (a)	0.111 (a)	0 (a)	0.056 (a)	0 (a)
Milky	0 (a)	0.389 (a)	0 (a)	**0.889 (b)**	0 (a)	0.056 (a)
Oil	0.056 (a)	0.111 (a)	**0.889 (b)**	0 (a)	0.056 (a)	0 (a)
Pungent	0.722 (b)	0 (a)	0.111 (a)	0 (a)	0 (a)	0 (a)
Salty	0.222 (ab)	0.389 (abc)	0.667 (bc)	0.444 (abc)	**0.833 (c)**	0 (a)
Sardine	0 (a)	0 (a)	0.667 (b)	0.278 (a)	0.111 (a)	0.056 (a)
Shellfish	0 (a)	0.111 (a)	0 (a)	0 (a)	0 (a)	0 (a)
Smoked	0 (a)	0.556 (bc)	0.167 (ab)	0 (a)	**0.889 (c)**	0 (a)
Sweet	0.611 (b)	0.389 (ab)	0.111 (a)	0.444 (ab)	0.111 (a)	0.278 (ab)
Vegetables	0.278 (b)	0.056 (ab)	0 (a)	0.111 (ab)	0 (a)	0 (a)
Vinegar	0.778 (b)	0 (a)	0 (a)	0 (a)	0 (a)	0 (a)
Adhesive	0.056 (a)	0.389 (abc)	0.500 (bc)	0.167 (ab)	0.222 (ab)	0.778 (c)
Crumbly	0.167 (ab)	0.167 (ab)	0.444 (b)	0 (a)	0.167 (ab)	0.556 (b)
Fibrous	0 (a)	0.611 (b)	0.667 (b)	0.056 (a)	0.556 (b)	0.333 (ab)
Gummy	0.167 (ab)	0 (a)	0.167 (ab)	0.778 (c)	0.444 (bc)	0 (a)
Hard	0 (a)	0 (a)	0.167 (a)	0.556 (b)	0.278 (ab)	0.167 (a)
Juicy	0.722 (b)	0 (a)	0.222 (a)	0.778 (b)	0.167 (a)	0.778 (b)
Oily	0 (a)	0 (a)	**0.889 (b)**	0.167 (a)	0.111 (a)	0.056 (a)
Pasty	0 (a)	0.611 (b)	0.056 (a)	0 (a)	0.222 (a)	0.167 (a)

a-c: Mean values for each sensory descriptor with different letters in brackets differ significantly ($p<0.05$).

Figure 8 shows the main differences between samples for the trained assessors in the first two dimensions of the correspondence analysis. The sensory description of the samples provided in this case was almost the

same with this obtained with the consumers. Only some attributes such as Earthy or Sardine were associated to certain products clearer.

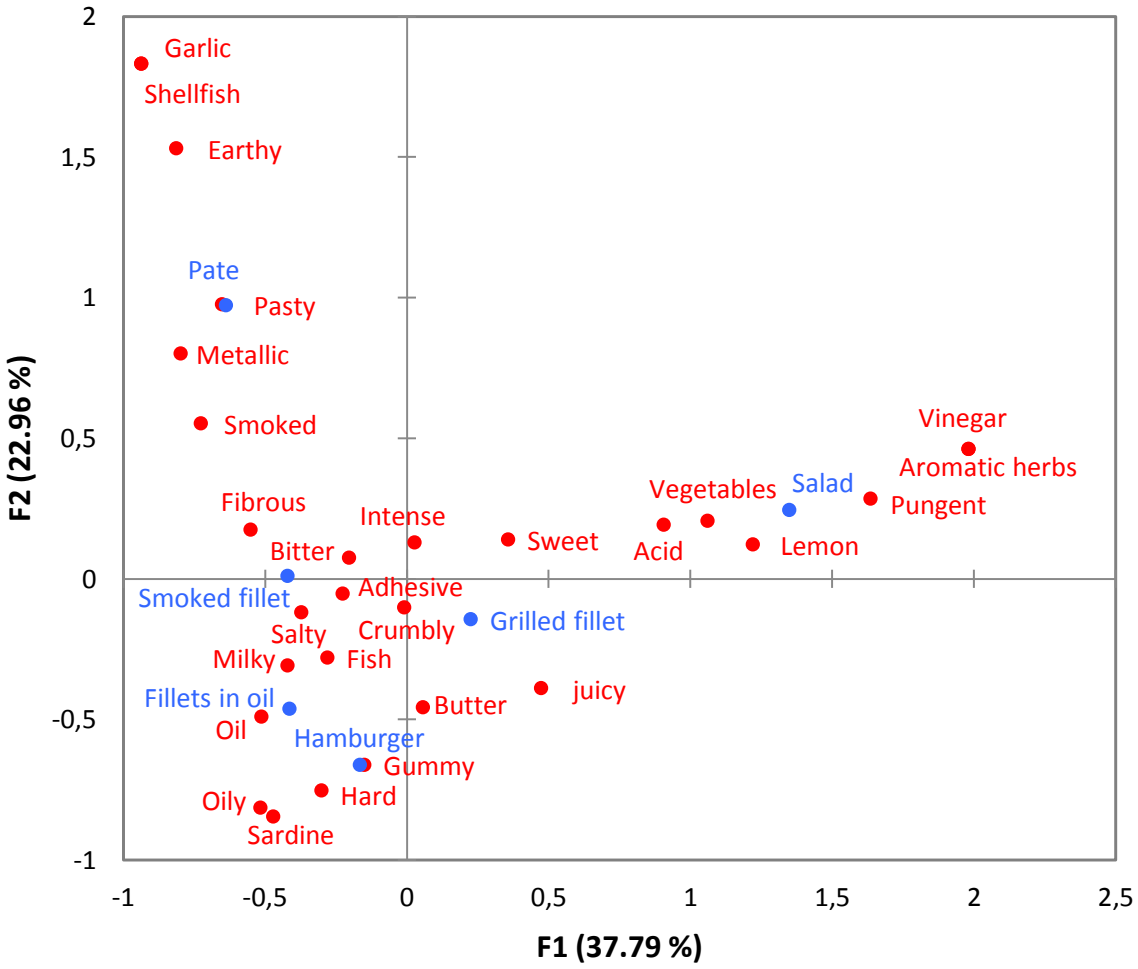

Figure 8. First two dimensions of the correspondence analysis performed over the CATA data from the trained assessors.

In general, trained assessors were somewhat more discriminant among samples than consumers. These differences can be appreciated when comparing the two Cochran matrices (**Tables 10** and **12**) in detail (see for instance descriptors such as Acid or Hard). The descriptive analyses performed by the trained assessors (**Table 13** and **Figure 9**) provided a similar picture about the sensory properties of the selected products to the picture given by the CATA test. However, as shown in **Figure 10**, a clearer distinction between the different products was obtained compared to **Figures 7** and **8**. These differences can be explained by the higher discriminant ability of quantitative procedures when compared with qualitative ones (e.g. CATA). In general, Qualitative methods (CATA) tend to provide less information and discriminant abilities than quantitative data. CATA produces counts (frequencies) instead of scoring or intensities (Dooley et al. 2010) and as stated by Valentin et al. (2012), nonparametric data has a tendency to have less power than parametric data.

Table 13. Mean values for each sensory descriptor and product obtained in the quantitative profile. The descriptive analysis was performed by the trained assessors.

Attribute	Fish olive oil	Smoked fillets	Pate	Salad	Hamburger	Grilled fillet
Acid	1.5^{bc}	1.1^{cd}	0.6^{de}	5.2^{a}	0.3^{e}	2.2^{b}
Aromatic herbs	0.0^{b}	0.0^{b}	0.1^{b}	3.2^{a}	0.0^{b}	0.0^{b}
Bitter	1.7^{a}	1.7^{a}	1.3^{ab}	1.3^{ab}	0.6^{b}	2.0^{a}
Butter	0.1^{cd}	0.0^{d}	0.9^{b}	0.0^{d}	2.2^{a}	0.8^{bc}
Earthy	0.0^{b}	0.1^{b}	2.7^{a}	0.0^{b}	0.0^{b}	0.2^{b}
Fish	4.4^{ab}	2.9^{cd}	2.1^{de}	1.2^{e}	3.7^{bc}	5.0^{a}
Garlic	0.2^{b}	0.0^{b}	5.3^{a}	0.6^{b}	0.0^{b}	0.0^{b}
Intensity	5.5^{c}	7.1^{a}	5.6^{bc}	**6.7^{ab}**	4.9^{cd}	4.2^{d}
Lemon	0.0^{c}	0.1^{c}	0.0^{c}	4.0^{a}	0.0^{c}	1.5^{b}
Metallic	0.4^{abc}	0.5^{ab}	0.6^{a}	0.2^{bc}	0.1^{c}	0.2^{abc}
Milky	0.1^{c}	0.0^{c}	1.3^{b}	0.0^{c}	5.1^{a}	0.2^{c}
Oil	**6.2^{a}**	0.2^{c}	0.4^{bc}	0.5^{bc}	1.1^{b}	0.5^{bc}
Pungent	0.3^{b}	0.3^{b}	0.2^{b}	2.9^{a}	0.0^{b}	0.0^{b}
Salty	3.6^{a}	4.3^{a}	1.3^{b}	1.2^{b}	1.8^{b}	0.9^{b}
Sardine	2.5^{a}	1.4^{b}	0.2^{c}	0.1^{c}	1.7^{ab}	0.7^{bc}
Shellfish	0.0^{b}	0.0^{b}	0.8^{a}	0.0^{b}	0.0^{b}	0.0^{b}
Smoked	0.3^{bc}	**7.4^{a}**	0.8^{b}	0.0^{c}	0.0^{c}	0.0^{c}
Sweet	1.2^{ab}	1.3^{ab}	1.5^{ab}	1.9^{ab}	2.0^{a}	1.0^{b}
Vegetables	0.0^{b}	0.1^{b}	0.1^{b}	2.5^{a}	0.0^{b}	0.1^{b}
Vinegar	0.1^{b}	0.3^{b}	0.0^{b}	4.3^{a}	0.0^{b}	0.0^{b}
Adhesive	1.9^{b}	1.6^{b}	2.2^{b}	0.3^{c}	1.4^{bc}	4.1^{a}
Crumbly	**6.0^{b}**	2.6^{c}	**7.5^{a}**	4.8^{b}	2.4^{c}	**5.3^{b}**
Fibrous	5.2^{a}	4.4^{ab}	3.7^{b}	1.8^{c}	2.1^{c}	3.6^{b}
Gummy	1.6^{b}	5.0^{a}	0.3^{c}	1.5^{b}	**5.8^{a}**	1.2^{bc}
Hard	2.5^{b}	4.9^{a}	0.7^{c}	2.6^{b}	5.1^{a}	3.5^{b}
Juicy	4.6^{ab}	1.9^{c}	1.8^{c}	5.0^{ab}	5.6^{a}	4.0^{b}
Oily	**6.3^{a}**	0.6^{cd}	0.5^{d}	1.5^{bc}	2.3^{b}	0.7^{cd}
Pasty	2.4^{b}	1.8^{bc}	5.1^{a}	0.8^{c}	1.2^{bc}	1.5^{bc}

a-e: Mean values in the same row with different superscripts differ significantly ($p<0.05$).

As stated previously, the main differences between the different products are closely linked to their production process. In this sense, the addition of transglutaminase in the fish burgers produced a gummier and harder product; the addition of the olive oil in grey mullet increased the oily texture and the oil flavour and odour; the salting and the smoking processes produced salty and smoked characteristics in the smoked fillets; the garlic added in the fish pate in order to mask the earthy flavour of Pikeperch was accordingly one its more salient sensory characteristics; the addition of the dressing sauce in the fish salad was the responsible of the acid, vinegar or pungent descriptors associated with this product; and finally the low-processed product (grilled fillet) was the one with the highest fish flavour and adhesive texture.

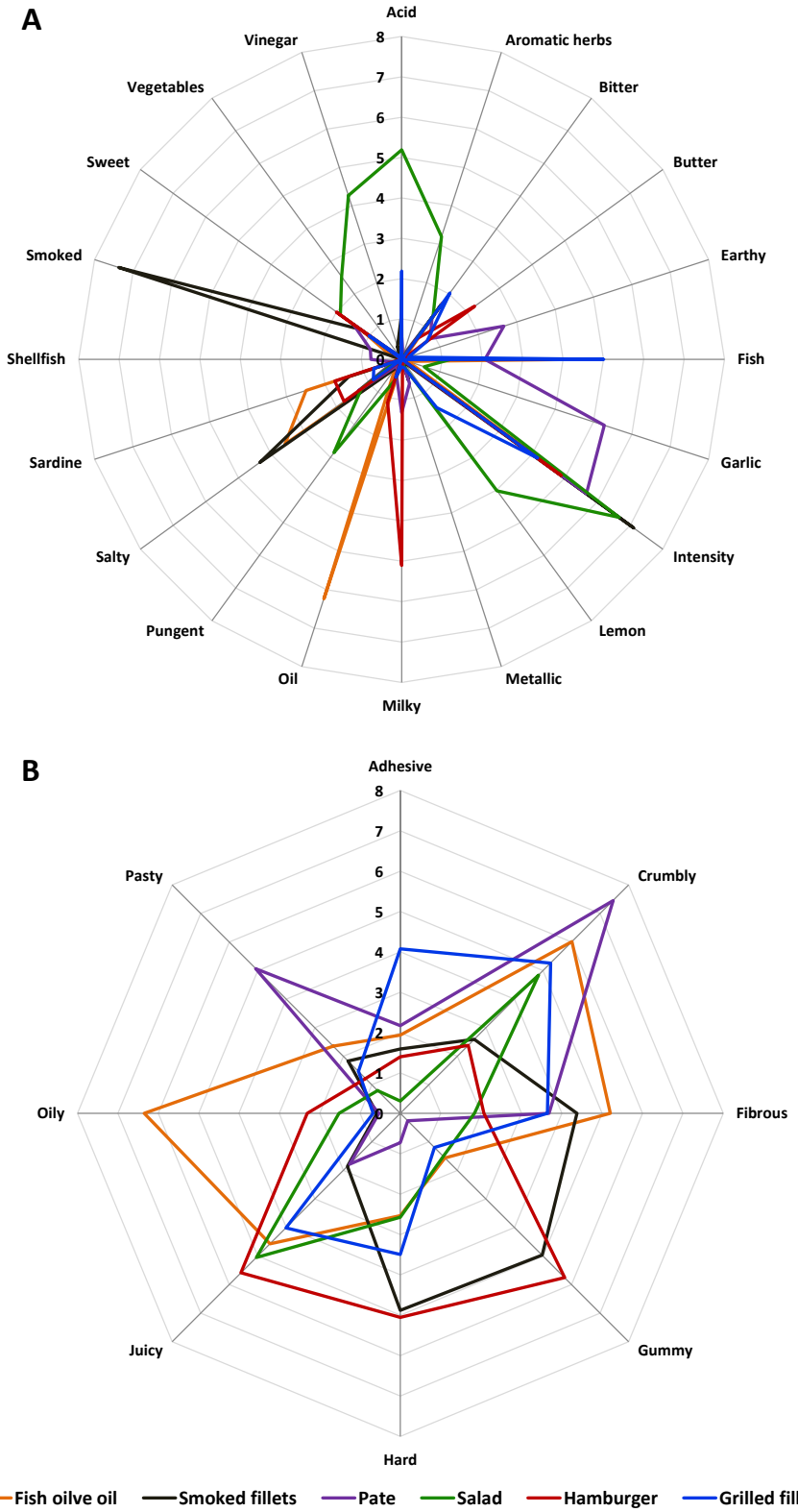

Figure 9. Sensory profile of the different fish products obtained with trained assessors (A: Odour and Flavor; B: Texture).

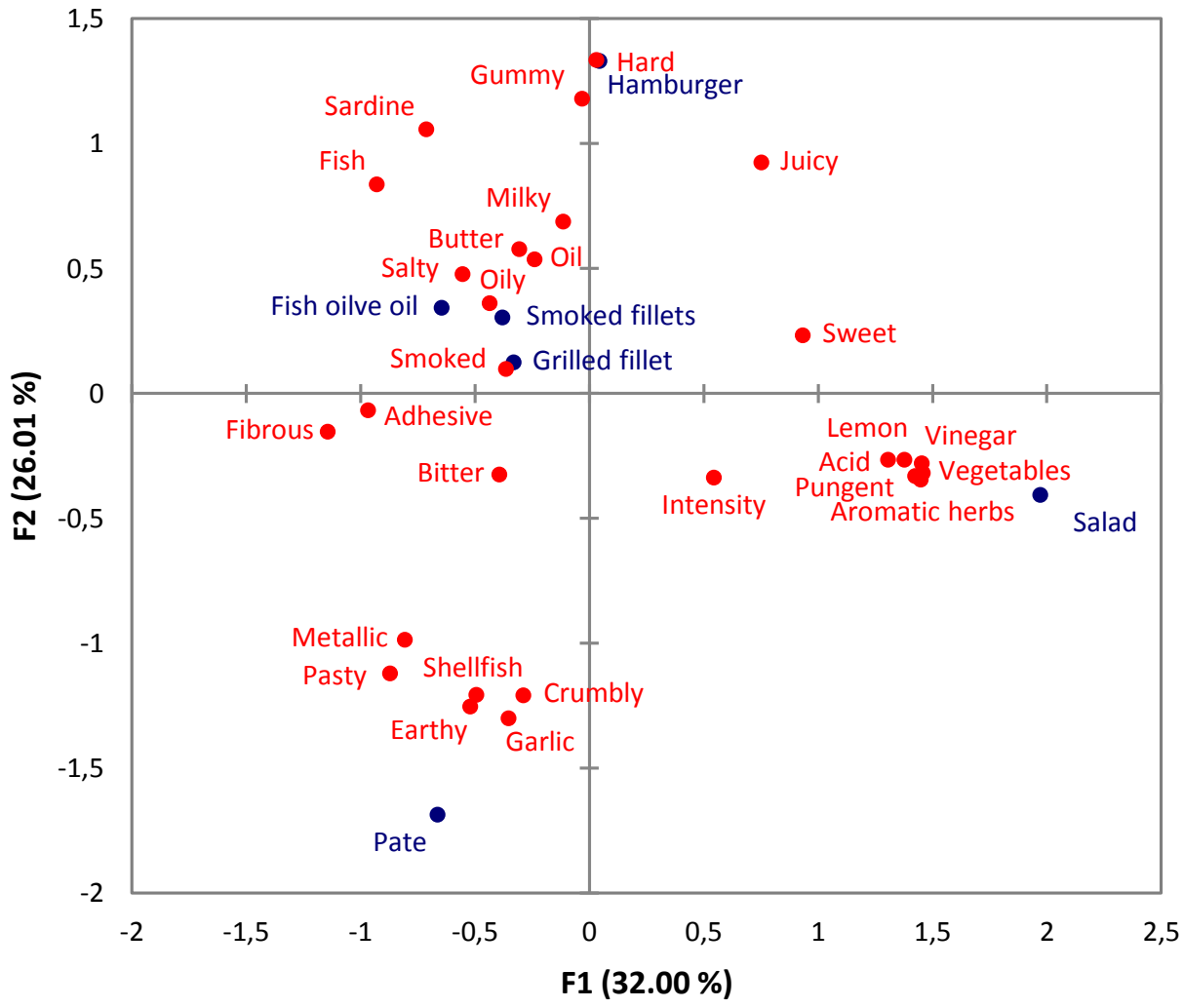

Figure 10. First two dimensions of the principal component analysis over the mean values from the quantitative analysis performed by the trained assessors.

3.5. Overall liking in the full informed condition

The overall liking was assessed after having tasted each sample and after having read the full written description of each product. The acceptability scores obtained in this case were similar to those obtained for the expectations and for the blind tasting. Again, the grilled fillet was the preferred product and the fish pate the less accepted (**Table 14**).

Table 14. Mean acceptability values for the different products per country.

Product	Overall	DE	ES	FR	IT	UK
Fish olive oil	6.4^{bc}	6.0^{bc}	7.0^{ab}	6.9^{ab}	6.0^{b}	5.8^{b}
Grilled fillet	7.1^{a}	7.0^{a}	7.3^{a}	7.5^{a}	6.8^{a}	7.1^{a}
Hamburger	6.2^{c}	5.7^{bc}	6.5^{b}	6.8^{ab}	6.0^{b}	5.7^{bc}
Pate	5.6^{d}	5.2^{c}	6.5^{b}	6.5^{b}	4.9^{c}	4.8^{c}
Salad	6.3^{bc}	5.9^{bc}	6.4^{b}	7.5^{a}	5.5^{bc}	6.2^{ab}
Smoked fillet	6.5^{b}	6.5^{ab}	7.1^{ab}	6.9^{ab}	6.2^{ab}	6.1^{b}

a-d: Mean values in the same column with different superscripts differ significantly ($p<0.05$).

Similarly to what was observed in the blind tasting, some differences were detected depending on the country of origin of the participants. Anyhow, only one product, the fish pate, had negative acceptability scores (below 5 in the scale) in Italy and in UK.

In general, and in agreement to what was observed in the blind tasting, consumers belonging to the "Innovators" segment tended to score the samples higher than the "Traditional" segment. This difference was significant for the pooled data and for Spanish, German and Italian consumers. Anyhow, the interaction segment x product was always not significant ($p>0.05$) indicating a similar preference pattern in both segments.

3.5.1. Confirmation/disconfirmation of expectations

According to the four routes to psychologically describe how disconfirmation created by expectations may influence product quality perception (assimilation, contrast, generalized negativity and assimilation-contrast) (Anderson 1973) and based on the results obtained, the participants in the present study behaved according to two routes: assimilation and contrast (**Figure 11**).

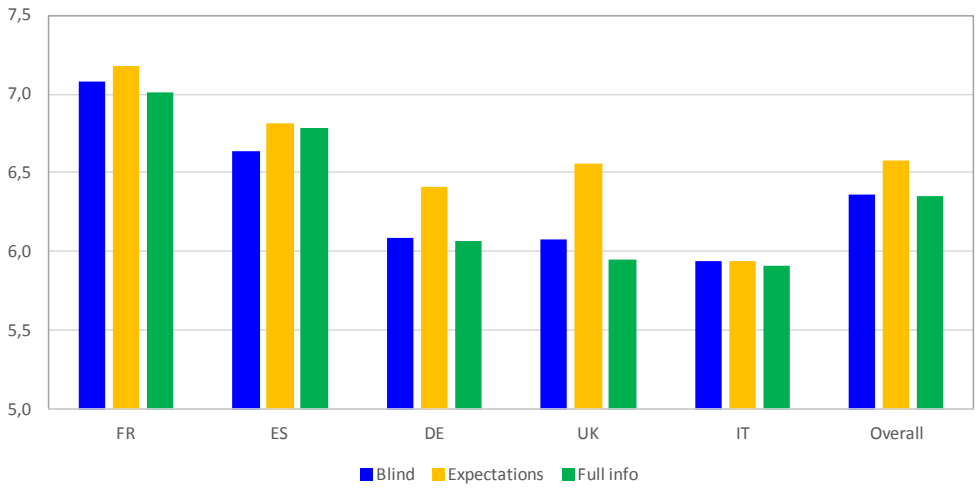

Figure 11. Mean acceptability for each country and all the samples in blind, expected and full informed conditions**.**

The only country where an assimilation effect was observed was in Spain, where the discrepancy between expectations and the product performance (i.e. blind tasting) was minimized (i.e. assimilated) by the consumer by shifting his/her perception closer to his/her expectation (i.e. full information). In the remaining countries and in the pooled data, a contrast effect was observed, especially in the UK. Contrast theory assumes that the consumer will magnify the disparity between the product received and the product expected. Nevertheless, in most cases the difference between the blind and the fully informed tasting was not significant ($p>0.05$). It is worth highlighting the lower values observed in Italy when compared to the other countries, especially for expectations (see **Figures 3** and **11**). This difference might be due to an idiosyncratic use of the scoring scale, even though further information would be needed in order to confirm this hypothesis.

3.6. Purchase probability

Market researchers commonly use a mathematical technique called intent scale translations to convert a respondent's stated purchase intentions into actual purchase probabilities. To avoid this translation, in the present study we opted for the Juster's 11-Point Probability Scale. The Juster scale in its many applications has been found to be superior as a predictive measure of future purchase behaviour compared to other intentions scales. **Table 15** shows the mean values of this probability scales obtained for each product, both for the pooled data and for each county.

Table 15. Purchase probability for each product and country.

Product	Overall	DE	ES	FR	IT	UK
Fish olive oil	5.4^{b}	5.3^{bc}	5.8^{ab}	6.2^{abc}	4.9^{ab}	4.6^{bc}
Grilled fillet	6.6^{a}	6.7^{a}	6.4^{a}	7.4^{a}	5.9^{a}	6.7^{a}
Hamburger	5.1^{b}	4.8^{bc}	5.3^{ab}	6.2^{abc}	4.8^{b}	4.7^{bc}
Pate	4.3^{c}	4.1^{c}	4.8^{b}	5.6^{c}	3.4^{c}	3.4^{c}
Salad	5.3^{b}	5.2^{bc}	4.9^{b}	7.2^{ab}	4.0^{bc}	5.3^{b}
Smoked fillet	5.6^{b}	5.9^{ab}	5.7^{ab}	6.1^{bc}	4.9^{ab}	5.2^{b}

a-c: Mean values with different superscripts differ significantly ($p<0.05$).

Taking into account that Juster scale is a 11-points scale (from 0 to 10), the probability values obtained ranged from 34% of purchase probability for the fish pate (in Italy and UK) to 74% for the grilled fillet (in France). The values reported in **Table 15** show a similar pattern with those obtained for the acceptability in the full informed condition. In fact, the Pearson correlation coefficient between both measurements (acceptability and purchase probability) was $r=0.81$ ($p<0.0001$).

3.7. Product image with full information (semantic differential scales)

Semantic Differential measures people's reactions to stimulus (words and concepts) in terms of ratings on bipolar scales defined with contrasting adjectives at each end. These scales are easy to set up, administer and code, thus are simple means for obtaining data on emotional reactions that could be used in many different situations or cultural contexts (Dalton et al., 2008). Thus, besides its demonstrated reliability and validity, the procedure is also cost-effective.

In this study, 11 different adjectives were selected in order to assess how the different products tasted and described, were perceived by the participants. **Figures 12** to **17** show respectively the semantic profiles obtained for the pooled data set and for the different countries involved in this deliverable (Germany, Spain, France, Italy and UK).

Interestingly, the results provided by the differential semantic scales were those that showed higher discrepancies between countries. This finding seems to indicate that even though the different products were perceived similarly in the different locations regarding the acceptability ratings (expected, blind and full informed), they were described in a clearly different way when dealing with the main intangible dimensions that might define them. These results deserve further and deeper analyses.

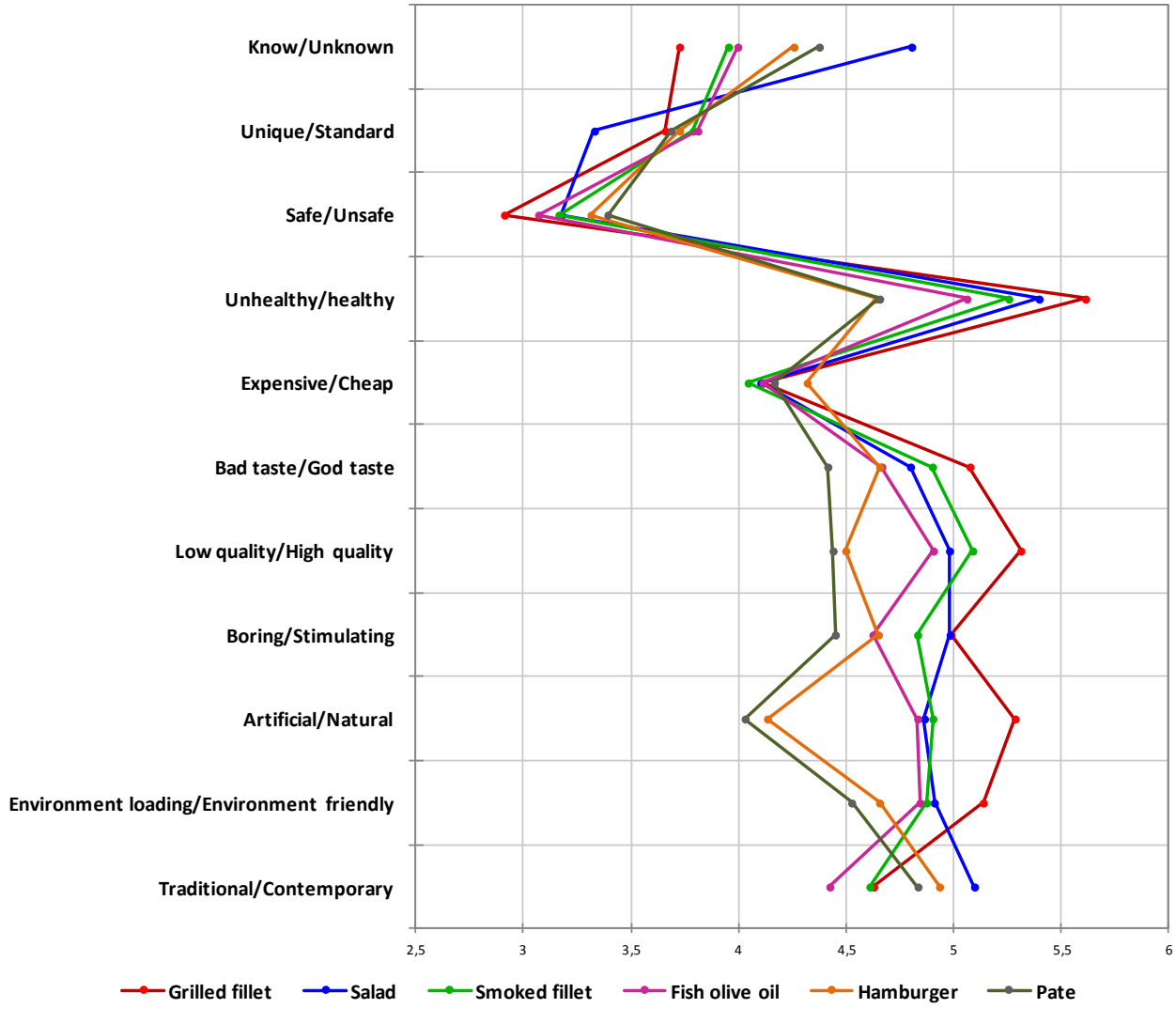

Figure 12. Differential semantic profile for the pooled data.

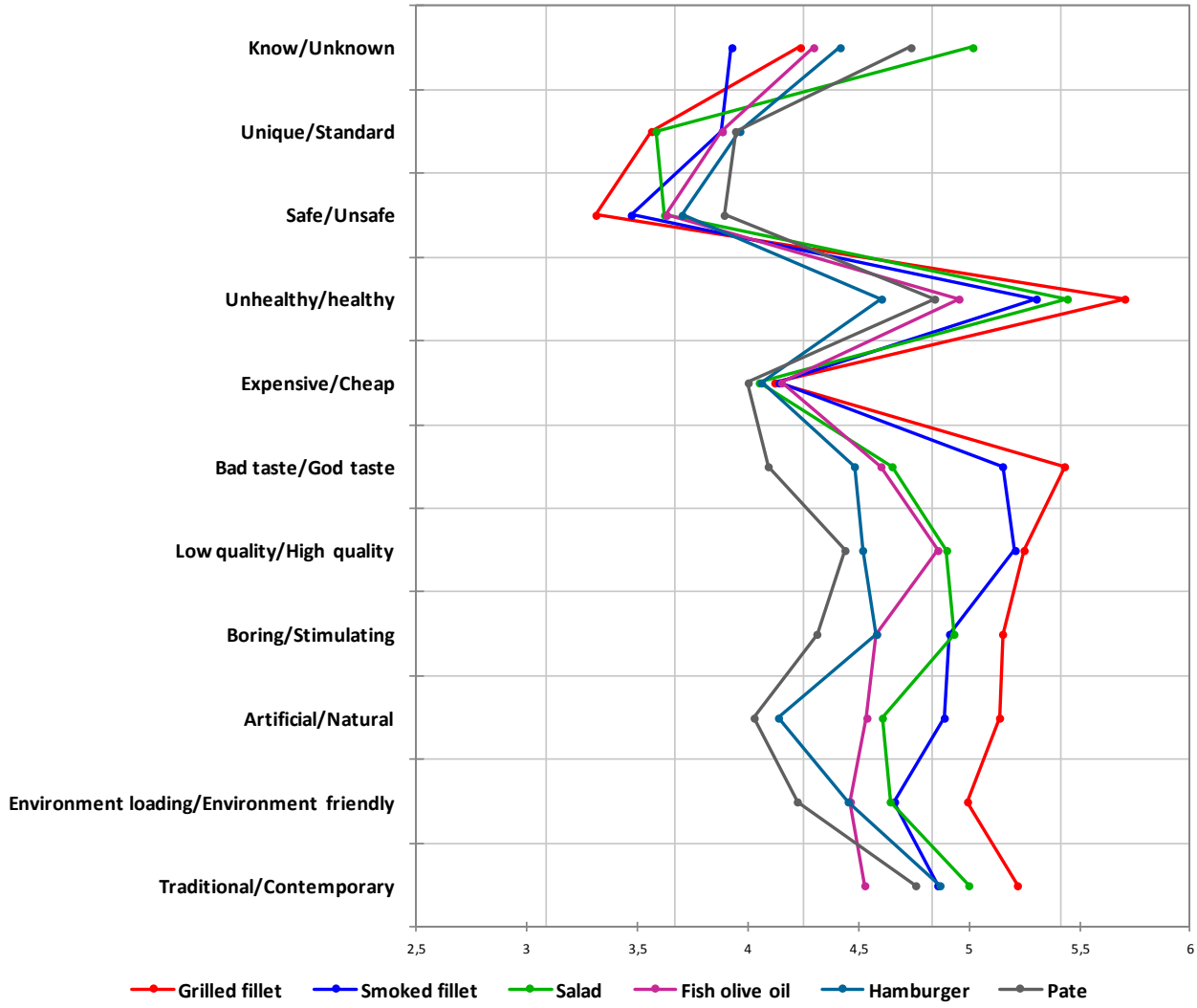

Figure 13. Differential semantic profile for German participants.

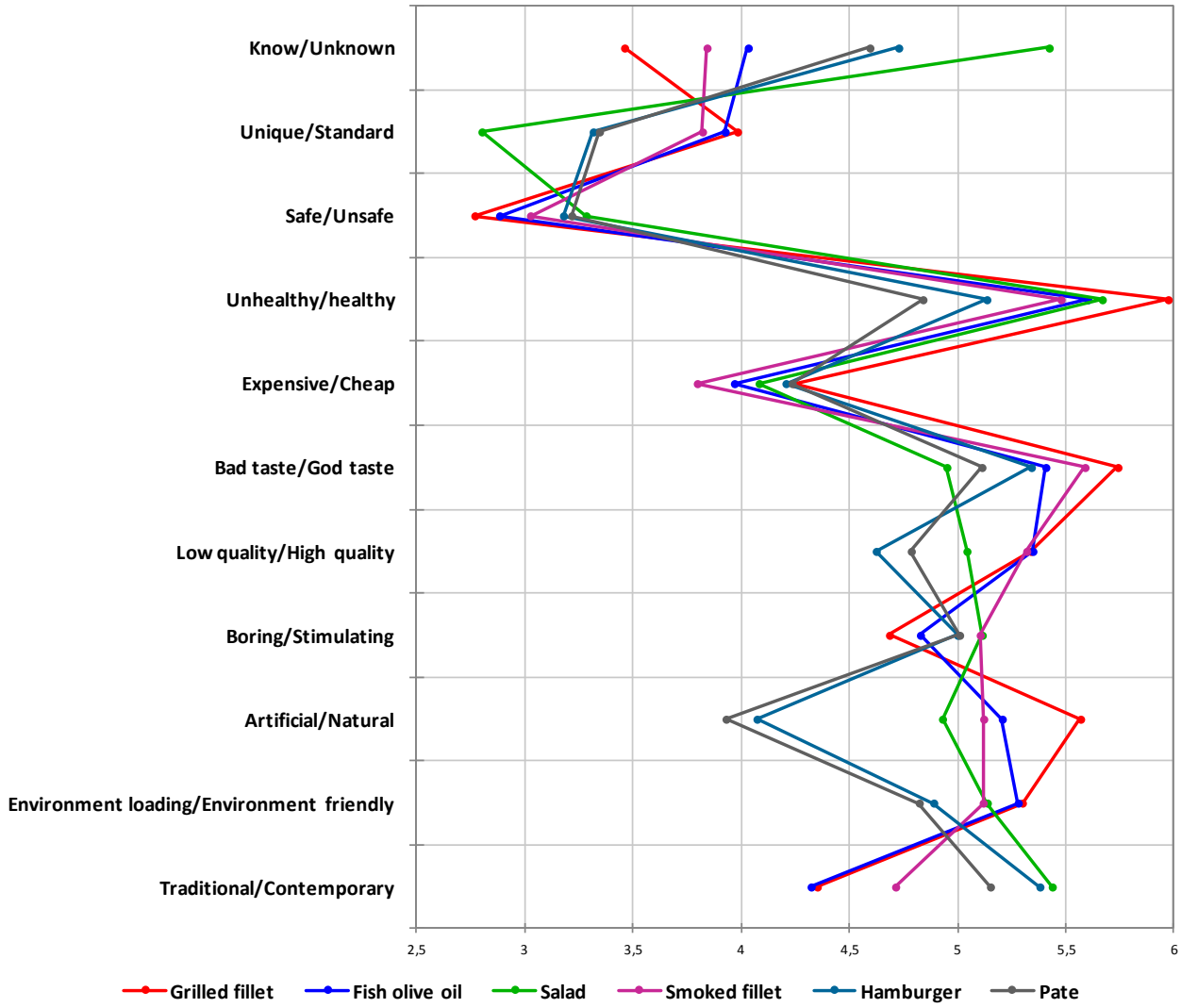

Figure 14. Differential semantic profile for Spanish participants.

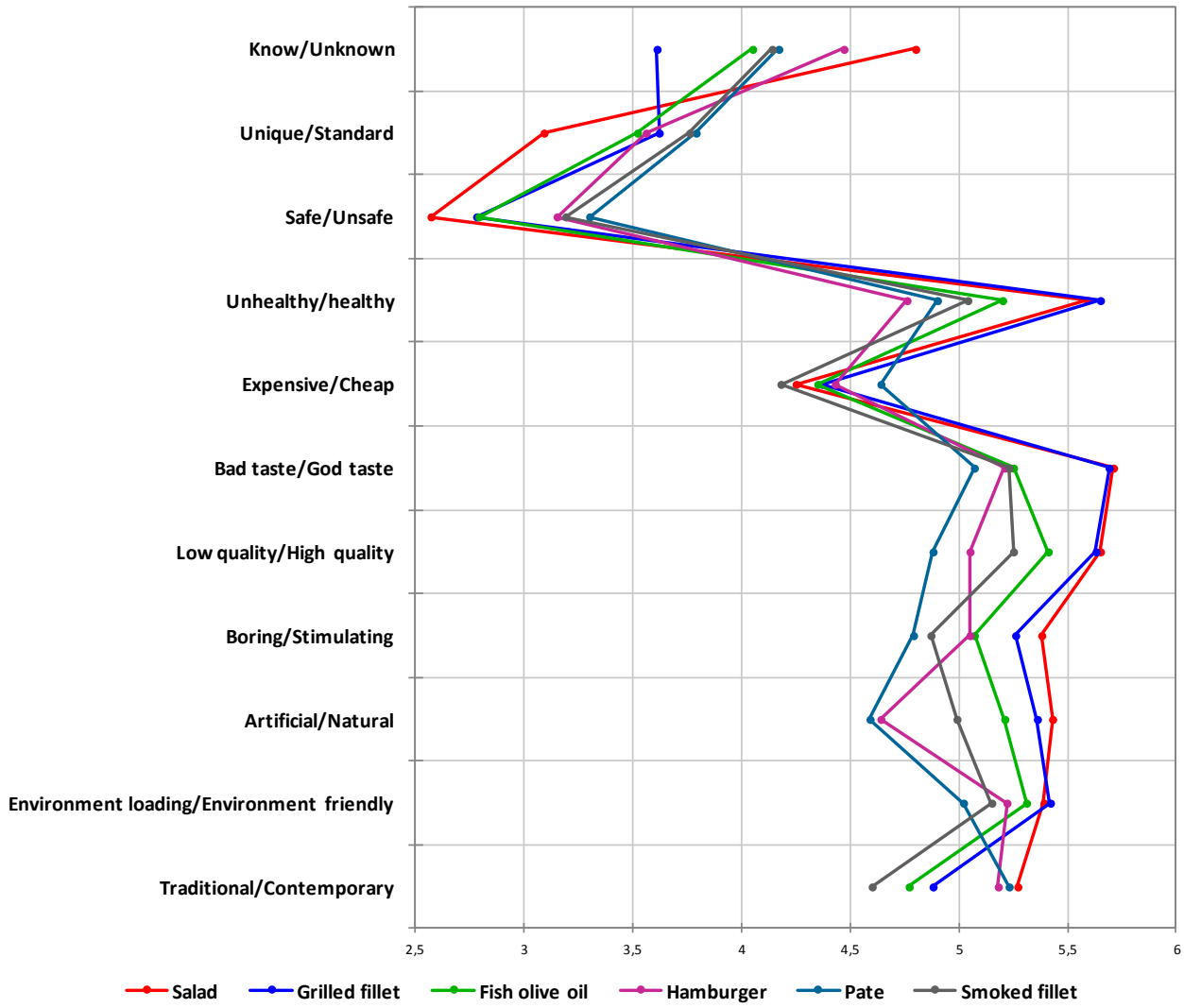

Figure 15. Differential semantic profile for French participants.

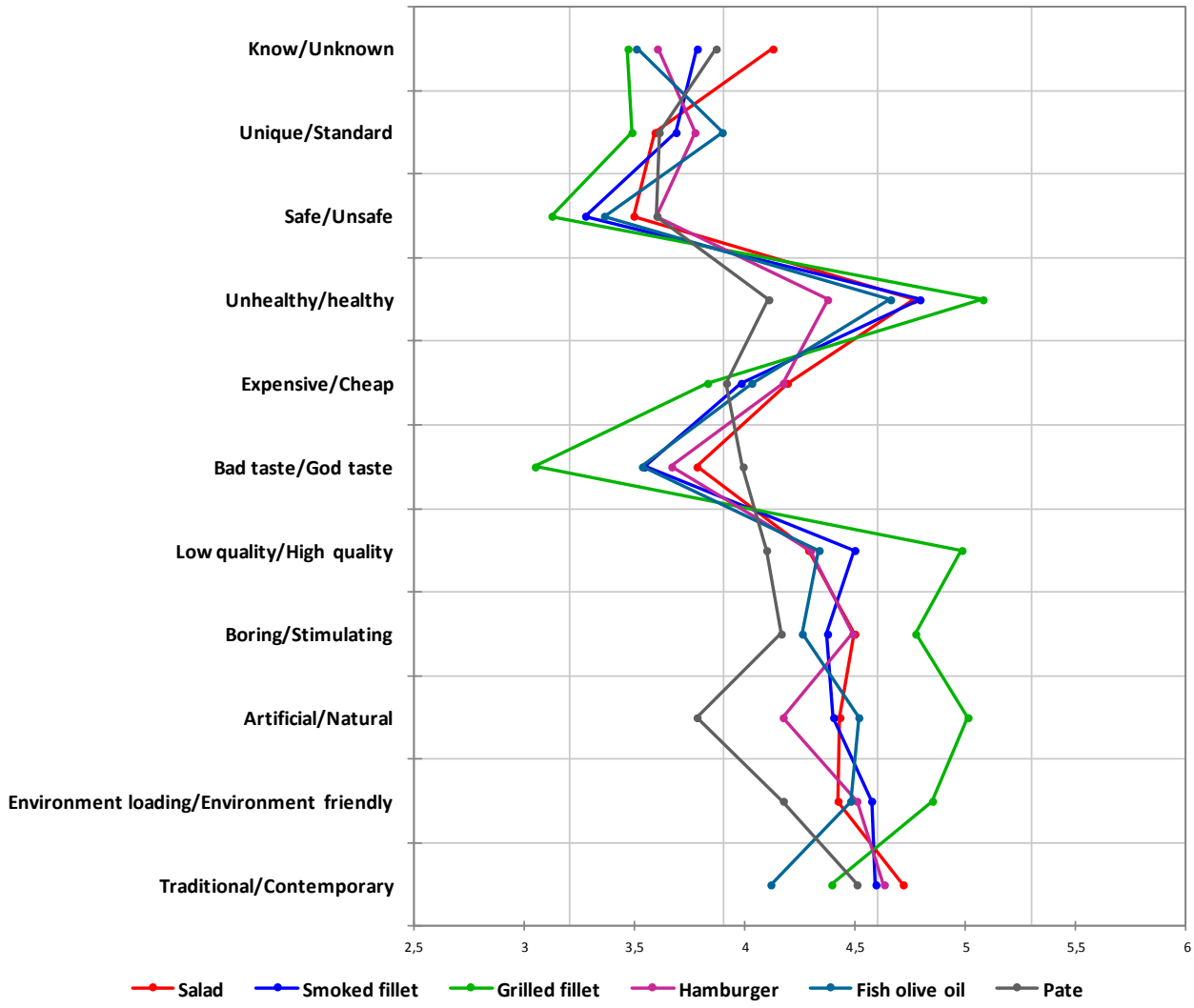

Figure 16. Differential semantic profile for Italian participants.

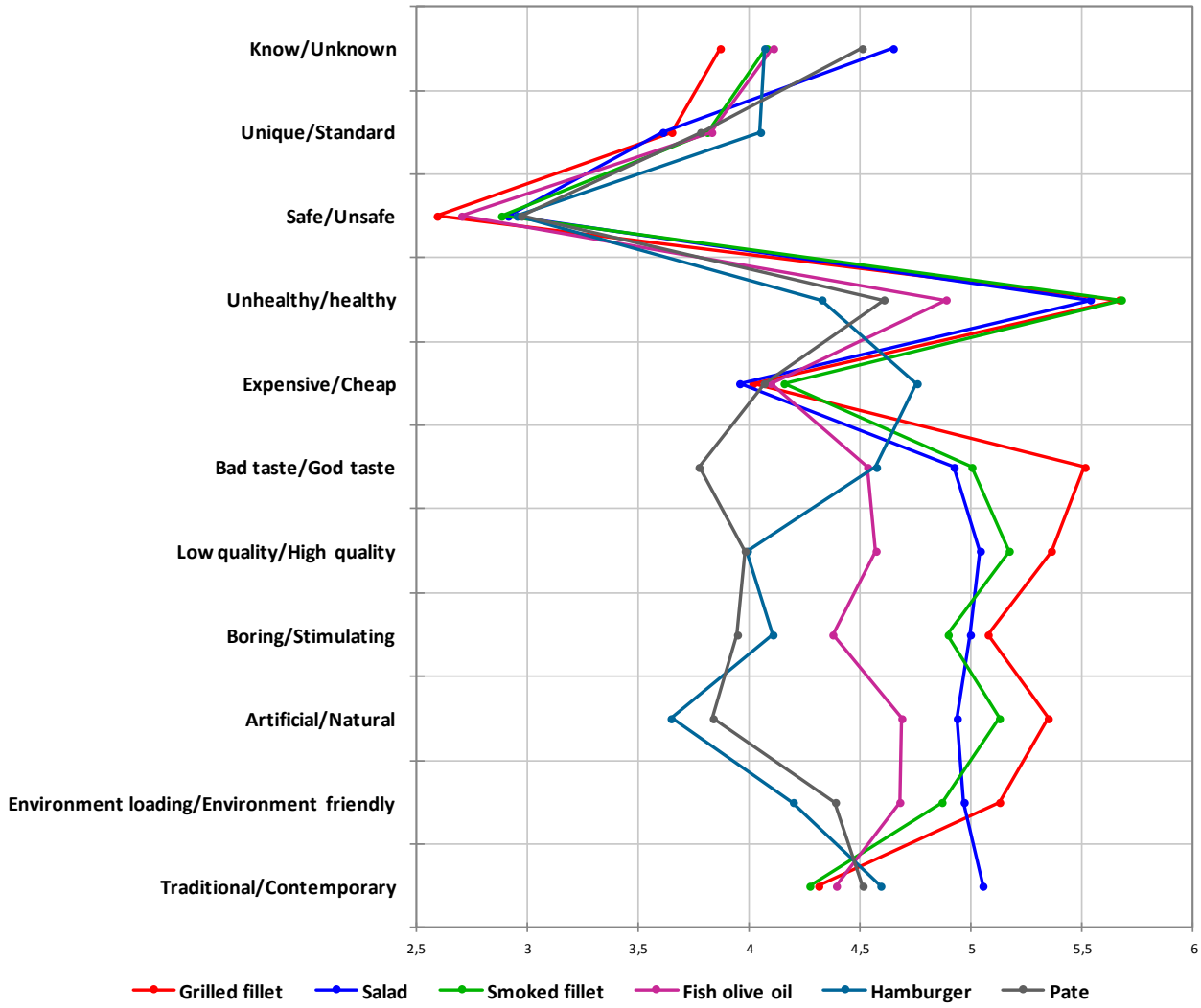

Figure 17. Differential semantic profile for British participants.

Based on the relevance of the differences detected in the semantic differential scales, **Tables 16** and **17** show, respectively, the impact of each dimension of the scale on the full informed acceptability and the purchase probability after performing different multiple regression analyses.

Table 16. Effect of the different studied parameters on the full informed acceptability by country.

Parameter	Overall	DE	ES	FR	IT	UK
Known/Unknown	-		-	-	-	
Unique/Standard	-	-				
Safe/Unsafe	-	-				-
Unhealthy/healthy	+				+	
Expensive/Cheap	-					-
Bad taste/Good taste	+	+	+	+	+	+
Low quality/High quality	+			+	+	
Boring/Stimulating	+		+		+	+
Artificial/Natural	+			+		
Environment loading/Environment friendly						
Traditional/Contemporary						
*R^2	0.49	0.67	0.51	0.62	0.34	0.60

+: significant positive effect on expectations ($p<0.05$); -: significant negative effect on expectations ($p<0.05$); *: All the R^2 values are significant ($p<0.0001$). Signs marked in green are those with the highest standardised regression coefficient, in orange the second one and in red the third one (in absolute value).

Table 17. Effect of the different studied parameters on purchase probability by country.

Parameter	Overall	DE	ES	FR	IT	UK
Known/Unknown	-	-	-	-	-	
Unique/Standard	-	-				
Safe/Unsafe	-	-				
Unhealthy/healthy	+		+			
Expensive/Cheap						
Bad taste/Good taste	+	+	+	+	+	+
Low quality/High quality	+				+	
Boring/Stimulating	+		+		+	+
Artificial/Natural	+	+		+		
Environment loading/Environment friendly						
Traditional/Contemporary		+				
*R^2	0.49	0.62	0.54	0.62	0.34	0.58

+: significant positive effect on expectations ($p<0.05$); -: significant negative effect on expectations ($p<0.05$); *: All the R^2 values are significant ($p<0.0001$). Signs marked in green are those with the highest standardised regression coefficient, in orange the second one and in red the third one (in absolute value).

Again and as stated previously, the sensory dimension seems to have an important contribution to the overall acceptance of the product and to its purchase probability. Importantly, the stimulating character of the product also seems to play an important role. On the contrary, it is worth mentioning the case of the

environmental friendly character of the products that was always not significant ($p>0.05$). The most plausible explanation for this finding is that most of the different products assessed included in their description "sustainably produced" or "produced in an environmentally sustainable way", which could have minimised the perceived differences between products. In any case, and when looking at the different differential semantic profiles (**Figures 12** to **17**), noticeable differences between products regarding environmental friendliness can be observed, especially in UK and Germany.

3.8. Preference mapping

Sensory properties of a product are among the most relevant drivers of its acceptance. In the results previously shown in this deliverable, sensory properties had a major role in determining the acceptance scores of the different products assessed. However, it is reasonable to guess that not all sensory attributes will have the same impact on the overall perception of a product. External Preference mapping permits to relate preferences shown by the consumers to the sensory characteristics of the products, thus allowing the identification of the most relevant sensory descriptors driving the individual preference (Carroll, 1972; Schlich and McEwan, 1992). This approach, although descriptive in nature, provides a reliable basis to the marketing and R&D teams for adapting or creating products that will correspond to the consumers' expectations.

Figures 18, 19 and **20** show respectively the preference maps obtained using the data obtained in the CATA test with consumers and in the CATA test and quantitative profile with the trained assessors as descriptors.

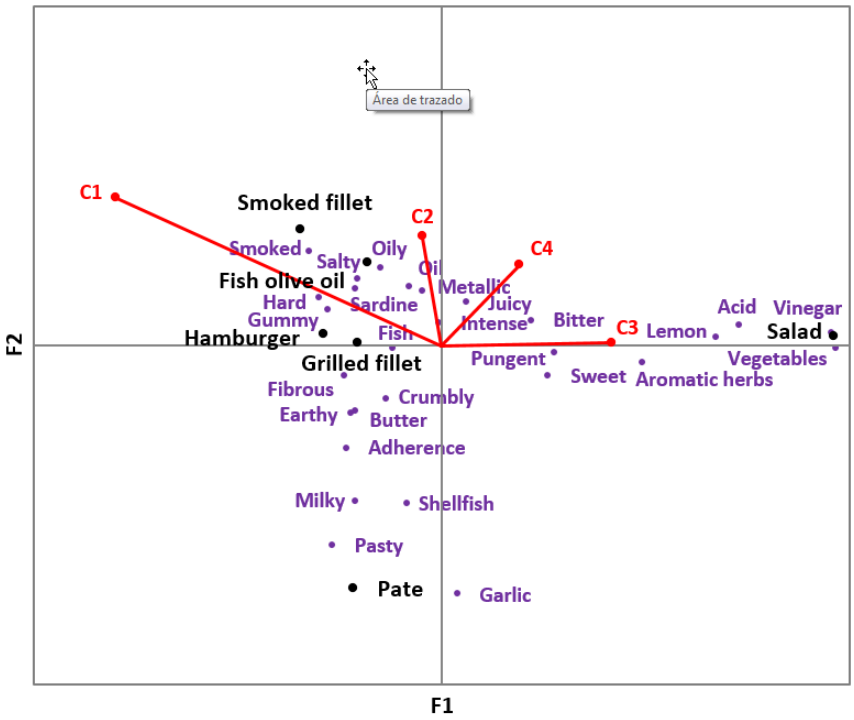

Figure 18. External preference mapping obtained with the consumers CATA data. C1-C4 are the different clusters of consumers obtained in the blind tasting.

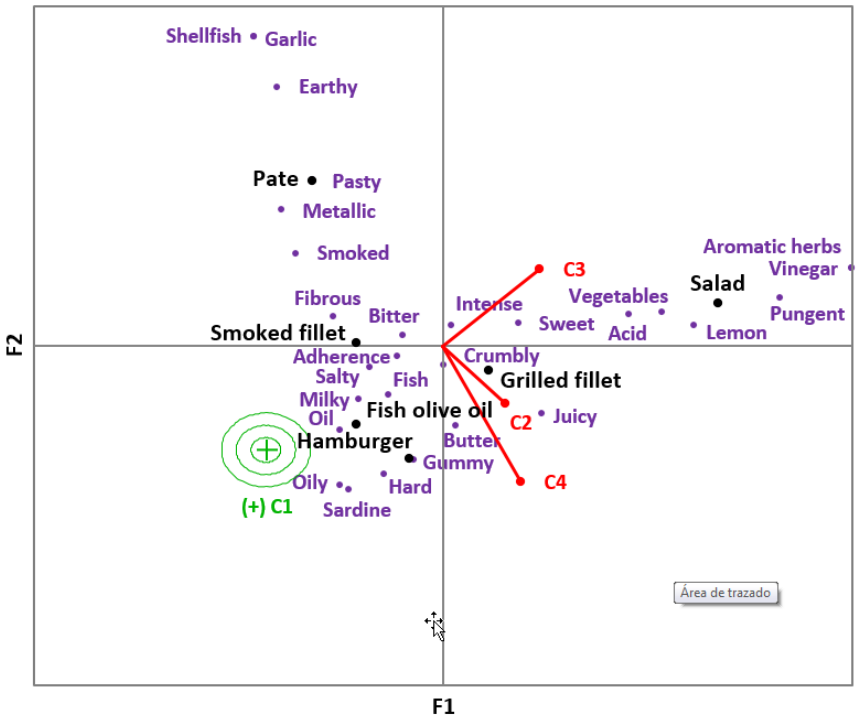

Figure 19. External preference mapping obtained with the CATA data from the trained assessors. C1-C4 are the different clusters of consumers obtained in the blind tasting.

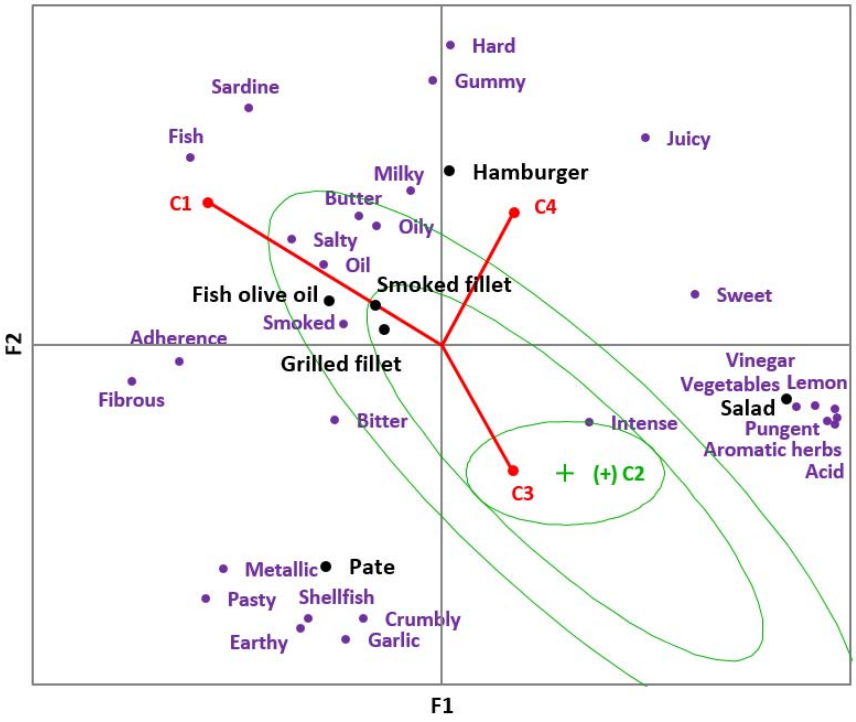

Figure 20. External preference mapping obtained with the quantitative profile from the trained assessors. C1-C4 are the different clusters of consumers obtained in the blind tasting.

In the case of the CATA data obtained from consumers, only Cluster 1 was significant ($p<0.05$) (**Figure 18**). This cluster was fitted to a linear model of preference ($R^2=0.97$). Consumers belonging to this cluster clearly reject the fish salad showing similar preferences for the grilled fillet, the hamburger, the fish in olive oil and the smoked fillet. The main reason of this preference is the rejection of acid/vinegar flavours and to a lower extent the presence of garlic. These results for cluster 1 were also confirmed by the map obtained with the quantitative profile (**Figure 20**). In this case the preference for this cluster was also adjusted to a linear model ($R^2=0.98$) and again the rejection of those characteristics linked to the fish salad and fish pate were the responsible for the observed preference pattern.

Regarding Cluster 2, only the map obtained from the quantitative profile was able to explain its preference ($R^2=0.99$) by means of an elliptical model with an ideal point (indicated by a + sign in **Figure 20**). The different ellipses drawn in this figure represent areas of similar preference (the bigger the ellipse the lower the preference). Consumers in this cluster preferred the grilled fillet and the smoked fillet and seem to look for intense flavours. In any case they reject the intense flavours of the fish pate (mainly garlic), of the fish in olive oil (oily flavour) or even of the fish salad (acid, vinegar, pungent, etc.).

Cluster 4 was explained to some extent in **Figure 19** by a linear model ($R^2=057$). In this case, the higher preference for the hamburgers seems to be due by their differential texture properties (hardness, gumminess and juiciness). The same conclusion can also be drawn by looking at **Figure 20**, although in this case cluster 4 had a lower R^2 value ($R^2=0.33$).

Finally cluster 3 was not significantly explained in any of the figures. The best goodness of fit was in **Figure 19** to a linear model ($R^2=0.35$). According to this map, consumers in this cluster seem to reject the hamburger and prefer the fish salad.

All the different maps have been obtained using the same clustering process performed for the blind tasting. Probably and by increasing the number of clusters, the percentage of well-fitted consumers to any of the figures and models would have increased considerably. In any case this would have required a higher number of participants in order to draw reliable conclusions (about 100 consumers per cluster).

4. Conclusions and final remarks

This study has demonstrated once more the relevance on the sensory properties as key drivers of consumer preferences. However, the products already developed were not able to reach the initial expectations that they produced in the participants. Anyhow, all the products were well accepted with the sole exception of the fish pate. The rejection of this product can be due to the less positive image that this product seems to have and also to its sensory properties. Even though the fish pate was tasted by untrained consumers, they were able, in most cases, to detect the earthy flavour associated to the pikeperch despite the addition of garlic to mask it.

Products with a lower degree of processing were those who generated higher expected scores and higher acceptability in the blind test. The recruitment procedure used in the present study (regular fish consumers) could explain the higher preference for those products having the genuine sensory properties of fish, without any interference. It seems reasonable to infer that products having a higher degree of processing would be more appropriate for consumers who do not like fish because of its taste, presence of bones, odour, etc. In these cases, the existence of different processed alternatives could be a good solution for those individuals looking for a more convenient and less "fishy" product.

The two segments of consumers previously identified and characterized in deliverable D29.2 ("Involved traditional" and "Involved innovators") had a low impact on the results obtained. In most cases the mean values calculated were higher for the most innovative segment, but the differences, although significant, were irrelevant. The low effect of these two segments can be due to the relatively low novelty of the selected products. In fact, all of them exist already in the market, although using different fish species.

The role of the country of origin of the participants was lower than expected, the variability being higher in some cases within countries than between countries. However, the image/perception of the different products other than the sensory properties, differed in an important way between countries, as well as their impact on the product acceptance and purchase probability. These results open a new framework of research aimed to understand the rationale behind the observed differences between countries and how they can be exploited to better design and commercialise the new products developed already.

The results provided here can have a relevant role in the next activities to be undertaken within the DIVERSIFY project. In this sense all the selected fish products assessed in the present study seem to have a specific niche within the European market, even for the least appreciated product (e.g. fish pate). The combination of the information provided in this deliverable together with the influence of the extrinsic properties that will be assessed in task 29.3 should provide a better understanding of how consumers perceive the different products and their characteristics. This information will be essential in order to build different business models aimed to develop launching strategies for the different tested new products in different markets (WP30).

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Co-funded by the Seventh Framework Programme of the European Union

Annex 1. Questionnaire developped for the recruitment of participants in the sensory test.

Recruitment Screener

Project	Diversify
Job Number:	0507
Research type	Sensory test

Key Criteria

All Recruits: (100 respondents)

- Exclusion of anyone working in sensitive industry (Q1a/b) or recent participant in research (Q2)
- Must be main or joint decision maker when grocery shopping (Q3)
- Must consume fish at least once a month (Q4-5)
- 50 belonging to the segment "traditional" and 50 belonging to the segment "innovators" according to their responses in Q6 and the segmentation criteria given in Q6.
- 50 males and 50 females (Q7)
- Ensure a spread of age (Q8) and exclude if younger than 30 years old or older than 60 years old
- Aim for good demographic mix (Q9-12)

Introduction:

Good morning / afternoon. My name is ……., I work for ..... who are currently conducting an important market research project about certain food production. They have asked us to contact people who consume certain food products. Would you be prepared to spare a few minutes?

Q1. What is your occupation? Probe for nature of job and industry

CLOSE IF ANY MENTION OF OCCUPATIONS IN THE BELOW TABLE

Food/ Drink	1	Close
Fishery	2	Close
Retail	3	Close
Market research	4	Close
Advertising	5	Close

Q2a. Have you attended any market research events in the past 6 months?

Yes	1	Go to Q2b
No	2	Skip to Q3

Q2b. What was the subject?

CLOSE IF RELATED TO FISHERY PRODUCTS

Q2c. Do you have any type of food allergy or intolerance?

Yes	1	Close
No	2	Skip to Q3

THOSE HAVING ANY TYPE OF FOOD ALLERGY OR INTOLERANCE WILL BE REJECTED

Q3. Thinking about grocery shopping, are you the main decision maker?

Yes, I'm the main decision maker	1	Continue
Yes, I am the joint decision maker alongside other family member	2	Continue
No, someone else in my family is main decision maker	3	Close

MUST BE MAIN OR JOINT DECISION MAKER WHEN GROCERY SHOPPING

Q4 which of the following items do you buy and consume?

Fish	1	Continue
Sea food	2	
Meat	3	
Fresh vegetables	4	
Frozen vegetables	5	
Fruit juice	6	

PARTICIPANTS MUST CONSUME FISH

Q5. How often would you say you consume each of the following?

	Once a week or more	2 -3 times a month	Once a month	Rarely than once per month	Never
Fish (wild or farmed)	1	2	3	4	5
Sea food	1	2	3	4	5

FISH (WILD OR FARMED) MUST BE CONSUMED REGULARLY (SCORE 1, 2 AND 3)

Q6.We are interested to understand your views regarding technology and progress.

Please listen to the following statements, and answer on a scale of 1 to 7, where 1 means strongly agree and 7 means strongly disagree …

	Strongly agree						Strongly disagree
	1	2	3	4	5	6	7
CONSUMER INVOLVEMENT							
a) I am very concerned about what fish products I purchase	1	2	3	4	5	6	7
b) I care a lot about what fish products I consume	1	2	3	4	5	6	7
c) Generally, choosing the right fish products is important to me	1	2	3	4	5	6	7
DOMAIN SPECIFIC INNOVATIVENESS							
d) In general, I am among the first in my circle to purchase new fish products.	1	2	3	4	5	6	7
e) In general, I would consider buying new fish products	1	2	3	4	5	6	7
f) In general, I am among the first in my circle to know the latest fish product trends	1	2	3	4	5	6	7
SUBJECTIVE KNOWLEDGE							
g) I consider that I know more about fish than the average person	1	2	3	4	5	6	7
h) I think that I know more about fish than most of my friends	1	2	3	4	5	6	7
i) I have a lot of knowledge about how to prepare fish	1	2	3	4	5	6	7
j) I I have a lot of knowledge about how to evaluate the quality of fish	1	2	3	4	5	6	7

CLASSIFICATION TO SEGMENTS / SEGMENTATION CRITERIA

Respondents are classified to segments according to their ranking sum in each of the above group of statements.

INTERVIEWER SUM UP THE SCORES GIVEN TO THE ABOVE STATEMENTS (Q6) AND WRITE THE RESULT HERE BELLOW:

	Sum of the scores given above			
CI = Consumer involvement (Q6,a+b+c)		CI<6	1	
		CI>5	2	CLOSE
DSI = Domain Specific Innovativeness (Q6,d+e+f)		SI<6	1	SEGMENT 2 (INNOVATORS)
		SI>5 & SI<16	2	CLOSE
		SI>15	3	SEGMENT 1 (TRADITIONALS)
SK = Subjective Knowledge (Q6 g+h+i+j)		SK<12	1	
		SK>11	2	CLOSE

Now, I would like you a few demographic questions just for classification purposes

Q7. Record gender

Female	1	Aim for male / female 50% /50%
Male	2	

Q8. Can you please tell me your age (record specific age): .....

Under 30	1	Close
30-39	3	GOOD SPREAD OF AGES
40-49	4	
50-59	5	
60 years & over		Close

Q9. What is your marital status?

Single, at parental home	1	Good mix
Single, living independently	2	
Married / Co-habiting	3	
Separated / Divorced	4	
Widowed	5	

Q10 Have you got any children living with you at home?

Yes, kids living at home	1	Record for info only
No, no kids living at home	2	

Q11. And what is your level of education?

Secondary school without qualifications	1	
Higher education (not university)	2	
University (first degree, BSc)	3	Record for info only
University (higher degree, postgraduate as MSc, PhD)	4	

Q12. Which of the following best describes your current occupation/ role?

Employer / freelancer	1	
Civil servant / private employee	2	
Housewife/husband	3	Good mix
Student	4	
Retired	5	
Unemployed	6	

Q13. How would you evaluate your financial situation on a scale from 1 to 7, where 1 means 'difficult' and 7 means 'well off'?

Difficult						Well off
1	2	3	4	5	6	7

Invitation:

We are inviting a few people to take part in this research. This is purely and simply a market research exercise, to help us understand about how people feel about certain food products. No one will attempt to sell you anything either during the interview or afterwards. We would very much appreciate your opinions.

The research will take place at ,,...and the session will last 1 – 1,5 hours. We will be giving a 'thank you' of XX to all who take part.

Would you be able to take part?

Yes 1 RECRUIT & RECORD APPOINTMENT DATE/TIME

No 2 CLOSE

INTERVIEWER: Classify the eligible respondent and let him know the exact day/time and place of the sensory test

Annex 2. Instructions and questionnaires used in the consumer tests.

Dear participant,

Thank you very much for you willingness to participate in the present study. This test belongs to a research project founded by the European Commission named DIVERSIFY.

Please, answer with honesty to all questions, taking into account that there are not correct or incorrect answers. The survey is anonymous and thus responses will not be linked to any particular people.

The whole survey will take approximately 60 minutes to be completed.

Thank you very much in advance for your participation.

NEXT

In this first part of the study 10 different fish products will be presented to you. Please, read the description provided for each of them and answer the different questions based on your personal opinion.

Remember that:
- should always provide an answer in order to move to the next question
- you cannot go back to see or change previous answers.

START

Please, try to imagine how much you think you would like the following fish product:

Product: 246

Frozen fish fillets with different recipes

Please answer by ticking in the relevant box on the left hand side.

- 9 ☐ I think I would like it extremely
- 8 ☐ I think I would like it very much
- 7 ☐ I think I would like it moderately
- 6 ☐ I think I would like it slightly
- 5 ☐ I do not think I would like it nor dislike it
- 4 ☐ I think I would dislike it slightly
- 3 ☐ I think I would dislike it moderately
- 2 ☐ I think I would dislike it very much
- 1 ☐ I think I would dislike it extremely

NEXT

Product: 246

Frozen fish fillets with different recipes

In your opinion, this product....	1 Strongly disagree	2 Disagree	3 Moderately disagree	4 Neither disagree nor agree	5 Moderately agree	6 Agree	7 Strongly agree
Is nutritious	☐	☐	☐	☐	☐	☐	☐
Is healthy	☐	☐	☐	☐	☐	☐	☐
Makes people feel good	☐	☐	☐	☐	☐	☐	☐
Is convenient	☐	☐	☐	☐	☐	☐	☐
Is easily available	☐	☐	☐	☐	☐	☐	☐
Tastes good	☐	☐	☐	☐	☐	☐	☐
Contains no additives	☐	☐	☐	☐	☐	☐	☐
Is natural	☐	☐	☐	☐	☐	☐	☐
Is a good value for money	☐	☐	☐	☐	☐	☐	☐
Is expensive	☐	☐	☐	☐	☐	☐	☐
Is hard to digest	☐	☐	☐	☐	☐	☐	☐
Is familiar/known	☐	☐	☐	☐	☐	☐	☐
Is a traditional product	☐	☐	☐	☐	☐	☐	☐
Is produced in an environmental friendly way	☐	☐	☐	☐	☐	☐	☐
Is authentic	☐	☐	☐	☐	☐	☐	☐
Has a high quality	☐	☐	☐	☐	☐	☐	☐
Helps local producers/economy	☐	☐	☐	☐	☐	☐	☐
Is unsafe	☐	☐	☐	☐	☐	☐	☐

NEXT

Now you are going to taste different fish products and then you will have to answer some questions about them. Please, follow the instructions provided in your computer screen.

As you can see, in each sensory booth you have an apple and mineral water to rinse your mouth between samples. Please, eat a small piece of apple after tasting each sample and then drink some water in order to have your mouth clean enough for the next fish product.

We did our best to remove all the bones from the products to taste, but please be careful since some remaining bones might still be present in some of the samples.

NEXT

Please, taste the product provided and answer the following questions by ticking in the appropriate box (please, keep some sample for the next questions):

- How much do you like this fish product (overall liking)?

I dislike it extremely	I dislike it very much	I dislike it moderately	I dislike it slightly	I do not like it nor dislike it	I like it slightly	I like it moderately	I like it very much	I like it extremely
☐	☐	☐	☐	☐	☐	☐	☐	☐

- How much do you like the ODOUR of this fish product?

I dislike it extremely	I dislike it very much	I dislike it moderately	I dislike it slightly	I do not like it nor dislike it	I like it slightly	I like it moderately	I like it very much	I like it extremely
☐	☐	☐	☐	☐	☐	☐	☐	☐

- How much do you like the FLAVOUR of this fish product?

I dislike it extremely	I dislike it very much	I dislike it moderately	I dislike it slightly	I do not like it nor dislike it	I like it slightly	I like it moderately	I like it very much	I like it extremely
☐	☐	☐	☐	☐	☐	☐	☐	☐

- How much do you like the TEXTURE of this fish product?

I dislike it extremely	I dislike it very much	I dislike it moderately	I dislike it slightly	I do not like it nor dislike it	I like it slightly	I like it moderately	I like it very much	I like it extremely
☐	☐	☐	☐	☐	☐	☐	☐	☐

NEXT

Please, taste the sample again and tick in the fallowing list all the sensory descriptors that you can perceive in this sample:

☐ Acid	☐ Aromatic herbs	☐ Bitter	☐ Butter
☐ Earthy	☐ Fish	☐ Garlic	☐ Intense
☐ Lemon	☐ Metallic	☐ Milky	☐ Oil
☐ Pungent	☐ Salty	☐ Sardine	☐ Shellfish
☐ Smoked	☐ Sweet	☐ Vegetables	☐ Vinegar
☐ Adhesive	☐ Crumbly	☐ Fibrous	☐ Gummy
☐ Hard	☐ Juicy	☐ Oily	☐ Pasty

NEXT

Please, eat a small piece of apple and drink some water in order to clean your mouth for the next fish product.

NEXT

In the next screens you will see the full description of the products that you have just tasted. Please, read it carefully and indicate how much you like these products, the purchase probability for each of them and how you perceived them.

NEXT

Product: **Fresh thin smoked fillets** from grey mullet, which can be used as a starter or incorporated within a sandwich/salad. The product is sustainably produced. It is labelled as a premium product and the country of origin is EU. The packaging is a plastic tray where the fillets are laid covered with a transparent plastic, which allows visibility of the fillets and vacuum or modified atmosphere packaging is used for shelf life prolongation. Ideas concerning the different uses of the fillets are included on the product's sleeve.

- How much do you like this fish product (overall liking)?

I dislike it extremely	I dislike it very much	I dislike it moderately	I dislike it slightly	I do not like it nor dislike it	I like it slightly	I like it moderately	I like it very much	I like it extremely
☐	☐	☐	☐	☐	☐	☐	☐	☐

- Would you buy this product?

- ☐ No chance, almost no chance (1 in 100)
- ☐ Very slight possibility (1 chance in 10)
- ☐ Slight possibility (2 chances in 10)
- ☐ Some possibility (3 chances in 10)
- ☐ Fair possibility (4 chances in 10)
- ☐ Fairly good possibility (5 chances in 10)
- ☐ Good possibility (6 chances in 10)
- ☐ Probable (7 chances in 10)
- ☐ Very probable (8 chances in 10)
- ☐ Almost sure (9 chances in 10)
- ☐ Certain, practically certain (99 chances in 100)

NEXT

Product: **Fresh thin smoked fillets** from grey mullet, which can be used as a starter or incorporated within a sandwich/salad. The product is sustainably produced. It is labelled as a premium product and the country of origin is EU. The packaging is a plastic tray where the fillets are laid covered with a transparent plastic, which allows visibility of the fillets and vacuum or modified atmosphere packaging is used for shelf life prolongation. Ideas concerning the different uses of the fillets are included on the product's sleeve.

In your opinion this product is or have:

	1	2	3	4	5	6	7	
Known	☐	☐	☐	☐	☐	☐	☐	Unknown
Unique	☐	☐	☐	☐	☐	☐	☐	Standard
Safe	☐	☐	☐	☐	☐	☐	☐	Unsafe
Unhealthy	☐	☐	☐	☐	☐	☐	☐	Healthy
Expensive	☐	☐	☐	☐	☐	☐	☐	Cheap
Bad taste	☐	☐	☐	☐	☐	☐	☐	Good taste
Low quality	☐	☐	☐	☐	☐	☐	☐	High quality
Boring	☐	☐	☐	☐	☐	☐	☐	Stimulating
Artificial	☐	☐	☐	☐	☐	☐	☐	Natural
Environment loading	☐	☐	☐	☐	☐	☐	☐	Environment friendly
Traditional	☐	☐	☐	☐	☐	☐	☐	Contemporary

NEXT

Thank you very much for your colaboration

FINISH