



Deliverable Report

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Deliverable Title	Development of the actual product samples from the selected species for the sensory testing with consumers in the five countries investigated.		
WP No:	29	WP Lead beneficiary:	P3. IRTA
WP Title:	Socioeconomics - Consumer value perceptions and behavioural change.		
Task No:	29.2	Task Lead beneficiary:	P3. IRTA
Task Title:	Consumer sensory perceptions.		
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Objective: The objective of this Deliverable is to develop the actual product samples from the selected species for the sensory testing with consumers in the five countries investigated: the different physical prototypes developed and tested in Tasks 28.2 (New Product Development) and 28.3 (Monitoring technical quality of the products) were manufactured according to the amount needed and following strict hygienic conditions. These samples will be the basis for the acceptability test to be done in task 29.2. This deliverable contains all the information needed to handle, store and prepare the different samples, the statistical design to follow in each location (order of presentation, sample distribution among participants, etc.) as well as some practical recommendations to carry out the test and recruit the participants properly.

Description: This deliverable is divided in six different sections aimed to provide detailed information about how to conduct the consumer assessment of the new products already developed and selected.



1. Selection of the new products to test.

Twelve different new products were developed, as described in *Deliverables D28.2 List of ideas for new product development*, *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*. Table 1 shows the new products developed for each species.

It is well known that untrained consumers should not assess a high number of samples in a single tasting session due to time constraints, loss of interest and concentration, and sensory fatigue (Amerine et al., 1965). In order to reduce the number of products to test into a more practical and realistic amount, 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, and 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 to perform a Preference Mapping (Schlich, McEwan, 1992) and adequate sensory variation to build 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 (WP) 27 to 30, thus including researchers and industrial participants.

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

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)
PICKEPERCH	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) Idea 2: Thin smoked fillets (M)
GREY MULLET	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 and to have a detailed description of each idea/product.

2. Recruitment of participants.

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

- 50% of the individuals per country belonging to the segment "Involved innovators" as defined in Task 29.1 (see *Deliverable D29.2 report on the segmentation analysis based on consumer value perception*), and 50% of the individuals per country belonging to the segment "Involved traditional".
- Fish consumption (farmed and wild), age, gender, income and marital status according to the average frequencies in their respective segments per country (see profile tables in Deliverable D29.2).
- Participants will be initially asked about allergies and intolerances. Those having any type of food allergy or intolerance will be rejected.

All the data obtained from the selected participants during the recruitment (category involvement, domain-specific innovativeness, subjective knowledge, optimistic bias, social representation of food, fish



consumption, age, gender, income and marital status) will also be included in the final data file, in order to characterize the different identified new segments based on their sensory preference.

3. Facilities, materials and personnel.

All the tests will be performed under controlled conditions in a central location per country. Each laboratory involved in this study must provide 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 must have a preparation room equipped with a kitchen where to cook the different fish samples (grill and pan), a fridge for storing fresh samples (4-6°C), a freezer to keep some of the samples frozen (-18°C) and generic kitchen cookware. Each testing booth must have individual computers and Internet connection to capture the answer of the participants. Mineral water and standard apple pieces (Golden delicious or Granny Smith) will be provided to each consumer to clean their mouths between samples.

Regarding personnel needs, in each location at least three persons will be involved in order to properly execute the test. One person will be responsible to welcome participants and explain them the different tasks to perform. The other two persons will be responsible for sample preparation and distribution. An additional person from IRTA will be 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 if needed.

4. Handling, storage and preparation of the samples.

All the samples will be shipped in advance to each location in the right conditions and guaranteeing the cold chain. Samples will be sent with detailed instructions about the right procedure to store them until analysis. Some of the samples should be stored at 4-6°C in a fridge and some of them at -18°C in a freezer:

- Fish burgers: store in a freezer at -18°C
- Salad with fish: store fish in a freezer at -18°C and salad in a fridge at 4-6°C
- Fish spreads: product sterilised, can be stored at room temperature but if possible in a fridge at 4-6°C
- Smoked fillets: store in a fridge at 4-6°C
- Fish fillets in olive oil: product sterilised, can be stored at room temperature but if possible in a fridge at 4-6°C
- Fish steak for grilling: store in a freezer at -18°C

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

Fish burgers and fish steaks (after adding 1 gram of salt/kg of product) will be grilled in a pan until they reach an internal temperature of 63°C (USDA, 2016). Then each burger/fillet will be cut in pieces of approximately 25 grams, placed in a dish and served to each participant as fast as possible to prevent them from cooling down. Fish fillets to be added to the salad will be cut in dices of 1.5x1.5 cm approximately. Salt (1 g/100 g fish weight) and diluted apple cider vinegar (70:30, v/v) will be 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 will be removed and the fish dices will be allowed to drain. The product will be served at room temperature on a mixed salad (green leaves and tomato) and dressed with a mustard vinaigrette (1g lemon zest (1.6%), 7.5g lemon juice (11.9%), 7.5g extra virgin olive oil (11.9%), 20g of Dijon mustard (31.8%), 1.5g of oregano (2.4%), 25g of honey (39.7%), 0.3g of salt (0.5%) and 0.15g pepper (0.2%) mixed in a conventional blender). Fish spread will be dished up alone in tasting spoons to avoid any interference from other products such as bread. Smoked fillets and fish fillets in



olive oil will be also served alone in small dishes or trays. All the ingredients and special cookware will be also provided by IRTA. The researcher from IRTA will assist local people during the preparation and cooking of the samples to ensure the same methodology within and across countries.

All the samples will be presented following a balanced design.

5. Test design and execution.

A total of ten tasting sessions will be held in each location in two consecutive days. The expected length of each tasting session will be between 1 and 1.5 h. Therefore, groups of 10 participants will be convened every 2 h in order to have enough time to prepare the sensory booths between sessions. Depending on the local habits and convenience for the host labs, the five tasting sessions to be held might be arranged from 9 to 11h, 11 to 13h, 14 to 16h, 16 to 18h and from 18 to 20h.

Each tasting session will be divided in four main parts:

1. Participants will be informed about the aim of the test, how it will be developed and how to use the computers for capturing their answers (see Annex 1) (5 min).
2. Overall expectation: consumers will assess the expected acceptability for each of the six selected products ready to be eaten, one by one (see the design for the different presentation orders in **Table 2**), based on the pictures shown in the computer screen without any additional information about them (see instructions and questionnaire in Annex 2) (10 min).
3. Blind tasting: participants will evaluate the overall acceptability for each product after having tasted it. In addition, they will also have to assess the acceptability of the odour, flavour and texture. Finally, respondents will receive a multiple-choice questionnaire with a list of sensory descriptors, where they will have to tick the options that they consider applicable to each product (Check-all-that-apply or CATA) (Adams et al. 2007). All these tasks will be done product-by-product according to the order described in **Table 2** (30-40 min) (see instructions and questionnaires in Annex 3).
4. Overall expectation in informed condition: participants will be shown a picture of each product together with its full description according to the product information described in Deliverable D28.2. They will have to assess their expected acceptability. In addition, participants will have to indicate their purchase probability in a 10-point scale for each product. Again, products will be shown one by one in a pre-established order (**Table 2**) (15 min) (see instructions and questionnaires in Annex 4).

All the products in the different parts will be presented in the same order within a tasting session. This presentation order will be different in each session according to the design shown in **Table 2** (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 of the six new products in each session for all the countries.

Products to assess	Tasting session									
	1	2	3	4	5	6	7	8	9	10
Idea 6: Fish burgers shaped as fish (meagre)	1st	2nd	4th	6th	5th	3rd	2nd	1st	3rd	6th
Idea 33: Ready-made fish fillets in olive oil (grey mullet)	3rd	1st	2nd	4th	6th	5th	4th	2nd	1st	5th
Idea 2: Thin smoked fillets (grey mullet)	5th	3rd	1st	2nd	4th	6th	6th	4th	2nd	3rd
Idea 34: Fresh fish steak for grilling in the pan (greater amberjack)	6th	5th	3rd	1st	2nd	4th	5th	6th	4th	1st
Idea 4: Ready to eat meal: salad with fish (meagre)	4th	6th	5th	3rd	1st	2nd	3rd	5th	6th	2nd
Idea 9: Fish spreads / pate (pickeperch)	2nd	4th	6th	5th	3rd	1st	1st	3rd	5th	4th

References

Adams, J., Williams, A., Lancaster, B., Foley, M. (2007). *Advantages and uses of check-all-that-apply response compared to traditional scaling of attributes for salty snacks*. 7th Pangborn Sensory Science Symposium, 12–16 August 2007, 574. Minneapolis.

Amerine, M. A., Pangborn, R. M., Roessler, E. B. (1965). *Principles of Sensory Evaluation of Foods*. Academic Press, New York, 602 pp.

ISO (2007). ISO 8589:2007. *Sensory analysis - General guidance for the design of test rooms*. International Organization for Standardization, Geneva, Switzerland.

MacFie, H., Bratchell, N., Greenhoff, K., Vallis, L.V. 1989. Designs to balance the effect of order of presentation and first-order carry-over effects in hall tests. *Journal of Sensory Studies*, 4, 706,129–148.

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Annex 1. Example of instructions to be provided to participants at the beginning of the tasting session.

"Welcome to this session and thank you very much for coming. Today you are going to taste different fish products and you will have to tell us how much you like them.

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.

You also have a computer screen in each sensory booth in order to capture your answers.... (explain how the specific hardware works in each laboratory).

The test that you are going to perform today has three different parts and it will last about 1 hour in total.

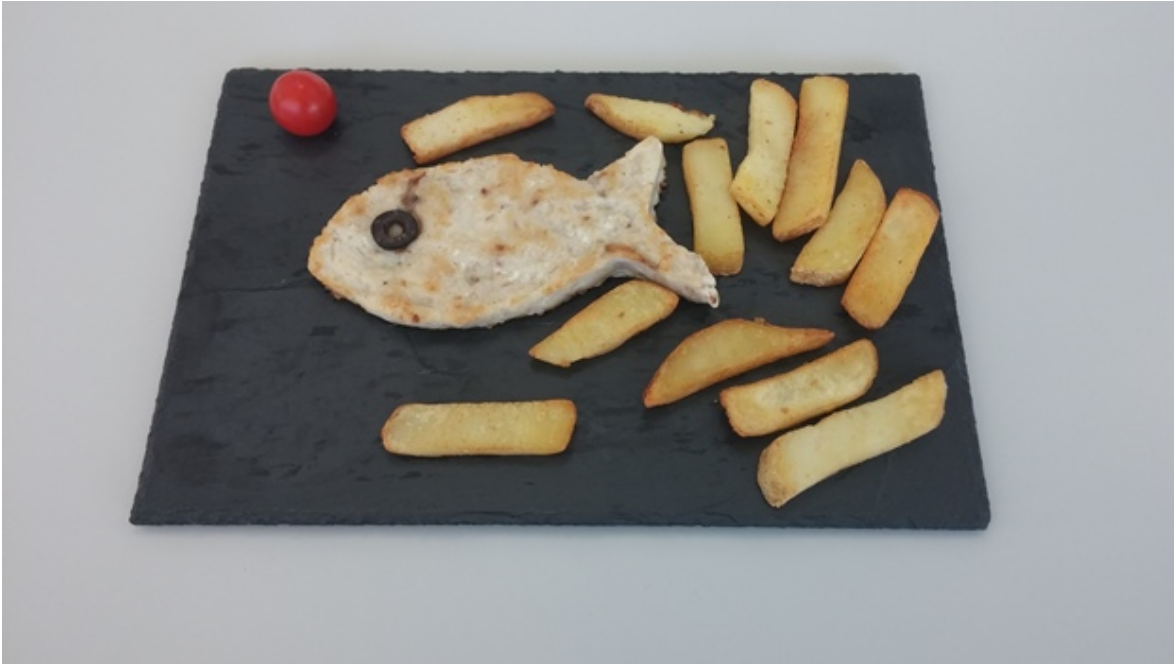
Now, if you have any question we will be happy to answer it. If not, we will start with the first part of the test (answer questions, if any)."



Annex 2. Instructions and questionnaire for the overall expectations without information.

"In your computer screen you will see pictures of different fish products. Please, look at them and try to imagine how much you think you would like each of them."

Example of product to be displayed on the computer screen according to the presentation orders shown in **Table 2** (fish burgers shaped as a fish):



Question to ask: Please indicate in the scale below how much you think you would like this product

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am sure I would not like it at all								I am sure I would like it very much	



Annex 3. Instructions and questionnaires for blind testing.

"Now you will receive different fish products for tasting. You will have to assess them three times, so split the sample in three similar pieces. Remember to eat a piece of apple and to rinse your mouth with mineral water between samples".

Each of the three questions to ask will be displayed in different screens and participants will not be allowed to go back to check previous answers.

Question to ask: Please, taste a little bit of the product provided and indicate how much you like it in the following scale:

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I do not like it at all					I like it very much				

Question to ask: Please, taste the product again and indicate how much you like the odour, the taste and the texture in the following scales:

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I do not like the odour at all					I like the odour very much				

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I do not like the taste at all					I like the taste very much				

1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I do not like the texture at all					I like the texture very much				



Question to ask*: Please, taste the product once more and tick in the following list all the sensory descriptors that you perceive

- | | | | |
|----------------------------------|---------------------------------|---------------------------------|---------------------------------|
| <input type="checkbox"/> Sweet | <input type="checkbox"/> Bitter | <input type="checkbox"/> Rancid | <input type="checkbox"/> Crispy |
| <input type="checkbox"/> Vinegar | <input type="checkbox"/> Garlic | <input type="checkbox"/> Earthy | <input type="checkbox"/> Sticky |

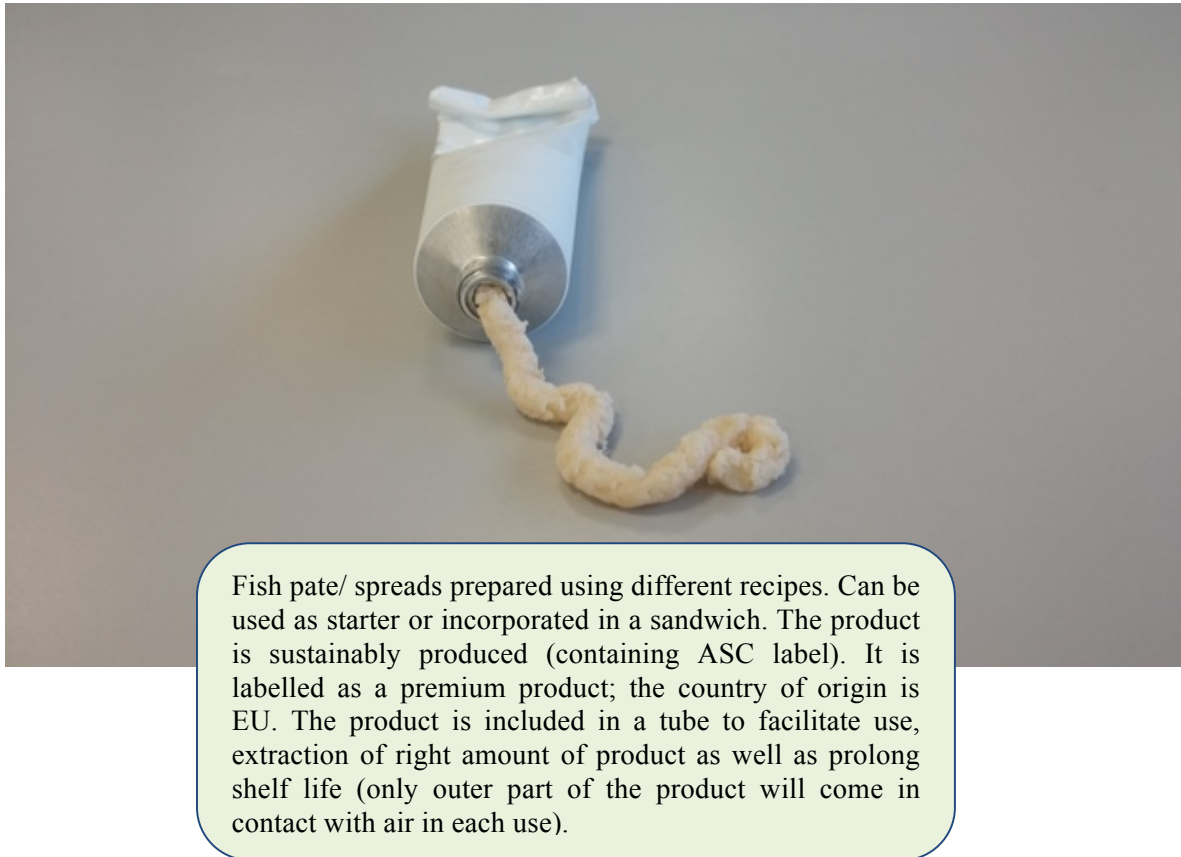
*: the final list of descriptors to include in the CATA list will be decided once the six new products are sensory characterized.



Annex 4. Instructions and questionnaire for the overall expectation with full information.

"In your computer screen you will see pictures of different fish products together with their description. Please, look at them, read the information provided and try to imagine how much you think you would like each of them."

Example of product to be displayed on the computer screen according to the presentation orders shown in **Table 2** (fish spreads):



Question to ask: Please indicate in the scale below how much you think you would like this product

	1	2	3	4	5	6	7	8	9	10	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
I am sure I would not like it at all											I am sure I would like it very much



Question to ask: Would you buy this product?

Score	Verbal equivalent
0	No chance, almost no chance [1 in 100]
1	Very slight possibility [1 chance in 10]
2	Slight possibility [2 chances in 10]
3	Some possibility [3 chances in 10]
4	Fair possibility [4 chances in 10]
5	Fairly good possibility [5 chances in 10]
6	Good possibility [6 chances in 10]
7	Probable [7 chances in 10]
8	Very probably [8 chances in 10]
9	Almost sure [9 chances in 10]
10	Certain, practically certain [99 chances in 100]