Consumer attitudes and acceptance of new fish products: the case of meagre

Co-funded by the Seventh Framework Programme of the European Union
What we know...

- Aquaculture supply approximately 50% of global food fish production compared with just 9% in 1980s

![Relative contribution of aquaculture and capture fisheries to fish for human consumption](chart)

FAO, The state of World Fisheries and Aquaculture, 2016
What we know...

• Aquaculture is still far from its full potential development since European aquaculture production represent about 20% of the total fish production

• European consumers perceive farmed fish as being of lower general quality than wild fish

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
<th>Utilities</th>
<th>Relative importance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country of origin</td>
<td>Spain</td>
<td>1.7396</td>
<td>42.96</td>
</tr>
<tr>
<td></td>
<td>Norway</td>
<td>-0.7122</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Morocco</td>
<td>-1.0275</td>
<td></td>
</tr>
<tr>
<td>Storage conditions</td>
<td>Fresh fish</td>
<td>0.6765</td>
<td>20.58</td>
</tr>
<tr>
<td></td>
<td>Frozen fish</td>
<td>-0.6765</td>
<td></td>
</tr>
<tr>
<td>Purchasing price</td>
<td>6 €/kg</td>
<td>0.4264</td>
<td>19.31</td>
</tr>
<tr>
<td></td>
<td>12 €/kg</td>
<td>0.4168</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 €/kg</td>
<td>-0.8432</td>
<td></td>
</tr>
<tr>
<td>Obtaining method</td>
<td>Wild fish</td>
<td>0.5918</td>
<td>18.01</td>
</tr>
<tr>
<td></td>
<td>Farmed fish</td>
<td>-0.5918</td>
<td></td>
</tr>
</tbody>
</table>

Intercept 4.9707, higher utility values correspond to higher consumer preference.

Only one segment of consumers (19.6%) preferred farmed sea fish instead of wild sea fish.

What we know...

• The relative low market share of aquaculture can also be a direct consequence of the poor variety of aquaculture products in the market, and in particular because of the lack of processed aquaculture foodstuffs

• Variety has been identified as a relevant factor in order to stimulate consumers’ purchase, thus avoiding boredom and satisfying individual curiosity

• Diversification: new species and new products, DIVERSIFY
Number of new fish products launched in the EU market

Source: Mintel GNPD-database, 2016
Fish product launches per year for 5 EU countries

Source: Mintel GNPD-database, 2014
What we know... In favour of the new farmed species

THE BLUE REVOLUTION

DEMAND
Our global population will grow an additional 2.7 billion in the next 50 years.

SUSTAINABILITY
Our fisheries are 2.5x larger than what our ocean can support.

VARIETY
We will need 70% more protein by 2050.

FEED CONVERSION
For 1 lb of meat:

- 8/9 lb of feed
- 80 liters of water

VS
1 lb of feed

TRACEABILITY
WILD FISH
No idea what kind of water they came from.

2X
More fish is consumed globally than beef.

OCEANS ARE OUR BIGGEST SOURCE OF PROTEIN FEEDING 2.6 BILLION

+500
Species of farmed fish + 10 fish
Objectives

(a) to explore consumers beliefs about farmed and wild fish

(b) to identify segment of consumers with different attitudes towards new products from new species

(c) to elicit and assess ideas for new products

(d) to develop new products based on selected ideas/concepts

(e) to assess consumer perception of new products from new farmed species in the five countries investigated (i.e., Germany, France, United Kingdom, Italy and Spain)

(f) To define the most appropriate extrinsic properties for the new products
What consumers think about farmed fish

B1. Farmed fish is safer than wild fish
B2. Wild fish is more affected by marine pollution (spillages) than farmed fish
B3. Wild fish contains more heavy metals than farmed fish
B4. Wild fish contains more antibiotics than farmed fish
B5. Wild fish is more affected by parasites (anisakis) than farmed fish
B6. Farmed fish has a healthier diet than wild fish
B7. Farmed fish is healthier than wild fish
B8. Farmed fish is of better quality than wild fish
B9. Farmed fish is fresher than wild fish
B10. Farmed fish is more nutritious than wild fish
B11. Wild fish is more fatty than farmed fish
B12. Farmed fish tastes better than wild fish
B13. Farmed fish is firmer than wild fish
B14. Farmed fish is more controlled than wild fish
B15. Farmed fish is more handled than wild fish
B16. Wild fish is more artificial than farmed fish
B17. Farmed fish provides more guarantees than wild fish
B18. Farmed fish is easier to find than wild fish
B19. Farmed fish is cheaper than wild fish
What consumers think about farmed fish

Beliefs

Cluster 1 “Neutral”:
- < 40 years
- France, United Kingdom

Cluster 2 “Pro-farmed fish”:
- > 50 years
- Germany
- 15.6%

Cluster 3 “Pro-wild fish”:
- > 50 years
- Female

Cluster 1 (N=1151)
Cluster 2 (N=391)
Cluster 3 (N=969)
Should we worry?

The Spanish case:

- 2008 vs. 2014 vs. 2016
- Low effectiveness
B1. Farmed fish is safer than wild fish
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B3. Wild fish contains more heavy metals than farmed fish
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B15. Farmed fish is more handled than wild fish
B16. Wild fish is more artificial than farmed fish
B17. Farmed fish provides more guarantees than wild fish
B18. Farmed fish is easier to find than wild fish
B19. Farmed fish is cheaper than wild fish
Efforts should be more oriented towards an improvement of the image of farmed fish than towards an enhancement of the sensory properties.
Contradictory messages

- choose sustainable seafood
- invest in sustainable aquaculture
- eat more seafood
- choose certified seafood
- learn about aquaculture

- eat more local freshwater fish
- eat more mussels

- aquaculture is negative
- ask your fishmonger

- eat more aquaculture products
- eat more farmed salmon
- eat more local carp
- eat more local fish
- invest in communication

- beware of unsustainable aquaculture
- boycott unsustainable salmon
- discover "Ombrine mascaraire"
- discover aquaculture
- discover fish
- eat more trout
- eat more certified seafood
- eat more European products
- eat more local farmed fish
- eat more local trout

- stop industrial aquaculture
- stop local aquaculture expansion

Communication campaigns on Aquaculture, EU (EC, 2014; N=85)
Consumers segments: acceptance of new farmed fish

Confidence ellipses (95%)
Two potential segment for new products

Psychographic profile of the segments

- CI1 (Involved) Traditional
  - N=728, 30%
- CI2 (Involved) Innovators
  - N=911, 36%
- CI3 Ambiguous indifferent
  - N=872, 34%
Two potential segment for new products

<table>
<thead>
<tr>
<th></th>
<th>The “traditional” fish eaters (30%)</th>
<th>The “innovators” (36%)</th>
<th>Ambiguous indifferent (34%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PSYCHOGRAPHICS</strong></td>
<td>- Involved, knowledgeable</td>
<td>- Involved, knowledgeable, innovative when in comes to new fish</td>
<td>- Non-involved, non-knowledgeable</td>
</tr>
<tr>
<td><strong>BEHAVIOUR</strong></td>
<td>- Highest number of regular fish consumers across all fish types (farmed, wild, etc.)</td>
<td>- Highest number of regular farmed fish consumers, highest number of occasional wild fish consumers</td>
<td>- Highest number of occasional of non-consumers of all fish types</td>
</tr>
<tr>
<td><strong>PERCEPTIONS OF VALUE &amp; COST</strong></td>
<td>- Average perceived value of the new species, highest perceived cost (i.e. price, safety, effort), high WTP and PI</td>
<td>- Highest perceived value (i.e. functional, hedonic, ethical), lowest perceived cost, highest expected outcomes (i.e. satisfaction, trust, WOM), high WTP and PI</td>
<td>- Lowest value perceptions and outcomes, average cost perceptions</td>
</tr>
<tr>
<td><strong>BELIEFS</strong></td>
<td>- Overall strongest beliefs: farmed fish is handled, guaranteed, safe, tasty; wild fish suffers pollution, heavy metals, parasites</td>
<td>- Stronger beliefs about farmed fish: easier to find, cheaper, more controlled</td>
<td>- Neutral, low-strength beliefs</td>
</tr>
</tbody>
</table>
Country participation

CL.1: INVOLVED TRADITIONAL
- UK: 18%
- Germany: 21%
- Italy: 23%
- Spain: 18%
- France: 20%

CL.2: INVOLVED INNOVATORS
- UK: 17%
- Germany: 25%
- Italy: 18%
- Spain: 25%
- France: 15%
New product development

• Generation and evaluation of ideas

- Focus groups (n=10, 2/country)
- Internal experts opinion (WP28) (n=6)
- Generation of ideas (n=43)
- Evaluation of ideas (n=43)
- External experts interviews (n=13)
- 19 key aspects
- Attractiveness
- Innovativeness
- Price
- Fish species
- Distribution channels
- Technical feasibility
- Final selected ideas for NPD (n=12, 3/species)
New product development

• Technical properties:

Meagre is a fast grower. Its usual commercial sizes are between 1-2 kg, while it can reach up to 8 kg. Smaller commercial sizes starting from 600g have been also used recently, but with some issues of inferior texture, darker appearance and higher edible losses. Its large sizes allow flexibility in cutting (cuts, fillets). Small quantities of processed forms, in specific frozen fish, smoked fillets and sushi have been also reported for meagre. Its flesh is characterized as white of medium firmness, mild flavour and has very low fat contents. The muscle fat of farmed meagre ranges, according to the literature, from 0.73-2.93%. Its low muscle fat content may be a limiting factor in processing forms where flesh drying takes place (e.g. smoking, salting).
New product development

Selected ideas for NPD

Based on technical feasibility and the opinion of experts (19 factors: Nutritional benefit, Healthiness, Convenience in preparation (easy-to-cook), Convenience in consumption (ready-to-eat), Cost for consumer (price), Technical feasibility (equipment & raw material), Technical feasibility (know-how), Specific consumer targeting, Familiarity, Newness/innovativeness, Existence of similar/competitive products, Shares characteristics of successful products, Perceived consumer freshness, Safety, Shelf life, Packaging, Added value, Attractiveness (Appearance/presentation), Recipes)

<table>
<thead>
<tr>
<th>Species</th>
<th>Growth rate</th>
<th>Fillet Size</th>
<th>Yield</th>
<th>Firmness</th>
<th>Fat content</th>
<th>Flavor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey Mullet</td>
<td>Slow</td>
<td>300-500g</td>
<td>Low</td>
<td>High</td>
<td>Medium/high</td>
<td>Bitter</td>
</tr>
<tr>
<td>Meagre</td>
<td>Fast</td>
<td>1-2kg</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>Mild</td>
</tr>
<tr>
<td>Greater Amberjack</td>
<td>Fast</td>
<td>3-5kg</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
<td>Sour</td>
</tr>
<tr>
<td>Wreckfish</td>
<td>Fast</td>
<td>&gt;8kg</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Neutral</td>
</tr>
<tr>
<td>Pikeperch</td>
<td>Medium</td>
<td>1-2kg</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Earthy</td>
</tr>
</tbody>
</table>
### New product development

Selected descriptors used for the final descriptive profile along with their description.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Color intensity from white to light brown inside the flesh of the fish</td>
</tr>
<tr>
<td>Color intensity</td>
<td>Color homogeneity inside the flesh of the fish without black veins or spots</td>
</tr>
<tr>
<td>Color uniformity</td>
<td>Quantity of liquid released after cooking the sample</td>
</tr>
<tr>
<td>Exudate quantity</td>
<td>Fat released in fish exudate in the form of oil droplets</td>
</tr>
<tr>
<td>Fat droplets</td>
<td>Visual distinction of muscular structures when removing the skin of the fish</td>
</tr>
<tr>
<td>Laminar structure</td>
<td>Suspended particles in exudate that block transparency</td>
</tr>
<tr>
<td>Odor</td>
<td>Intensity of odor like butanediione</td>
</tr>
<tr>
<td>Butter</td>
<td>Intensity of odor like humid earth</td>
</tr>
<tr>
<td>Earthy</td>
<td>Intensity of odor like fish oil</td>
</tr>
<tr>
<td>Sardine</td>
<td>Intensity of characteristic odor</td>
</tr>
<tr>
<td>Sea food</td>
<td>Flavor like citric acid</td>
</tr>
<tr>
<td>Flavor</td>
<td>Flavor like cooked vegetable</td>
</tr>
<tr>
<td>Boiled vegetable</td>
<td>Flavor intensity like butanediione</td>
</tr>
<tr>
<td>Butter</td>
<td>Flavor like quinine</td>
</tr>
<tr>
<td>Bitter</td>
<td>Flavor like humid earth</td>
</tr>
<tr>
<td>Earthy</td>
<td>Flavor like seafood</td>
</tr>
<tr>
<td>Sea food</td>
<td>Number of chews before swallowing</td>
</tr>
<tr>
<td>Texture</td>
<td>Degree of fish disintegration in the first bite</td>
</tr>
<tr>
<td>Chewiness</td>
<td>Force required to deform the fillet between the tongue and palate</td>
</tr>
<tr>
<td>Crumbliness</td>
<td>Liquid released when chewing the fish sample</td>
</tr>
<tr>
<td>Firmness</td>
<td>Degree in which fish turns in to a paste after chewing</td>
</tr>
<tr>
<td>Juiciness</td>
<td>Degree in which fish sticks between molars</td>
</tr>
</tbody>
</table>

#### Sensory properties

- Panel of eight assessors (with previous experience in sensory analysis of different foods)
- A list of 22 descriptors was used

![Graph showing sensory properties](image-url)
New product development

Selected ideas for NPD

1. Frozen fish fillets with different recipes
2. Thin smoked fillets
3. Ready to eat meal: fish soup
4. Ready to eat meal: salad with fish
5. Ready to eat meal: fish risotto
6. Fish burgers shaped as fish
7. Fish balls
8. Dried fish sticks with accompanying dip
9. Fish pate/spreads
10. Fish broth in cubes
11. Fish powder/seasoning
12. Fish sauces
13. Frozen fish fillet that is seasoned or marinated
14. Fresh fish fillet with herbs and spices
15. Whole deep frozen fish
16. Frozen whole fish filled with spices and with organic vegetables
17. Fresh whole fish filled with spices and with organic vegetables
18. Frozen fish fillet with potatoes and vegetables
19. Deep frozen white fish fillet in the transparent packaging with additional information
20. Fresh back fish fillet
21. Fresh fish fillet with different ‘healthy’ seasoning and marinades
22. Frozen fish and seafood salad
23. Varied meal with fish fillet, burgers sausages
24. Fresh fish Carpaccio
25. Frozen back fish fillet in transparent packaging and accompanying marinades
26. Fresh ready to eat meal with fish fillet with different cheese and fine herbs
27. Fish sausages and fish hamburgers
28. Liquid fish to make soups or drink.
29. Fresh fish fillet medallions with garnish and sauce, separately packed.
30. Ready-made fish tartar with additional soy sauce
31. Whole fresh fish with information how to be prepared
32. Bread crusted crispy frozen fish product with a topping
33. Ready-made fish fillets in olive oil
34. Fresh fish steak for grilling in the pan
35. Steamed fish fillets
36. Ready-made larger pieces of fish without bones
37. Fresh fish fillet in a simple package
38. Fresh fish Carpaccio 2
39. Bottarga sliced as medallions
40. Fresh fish fillet sliced presented in the shape imitating of fish scales
41. Ready-made fish fillet / fish dice accompanied with cereals and vegetables
42. Fresh fish roast
43. Fresh fish fillet that comes with 3-day plan
# New product development

- Selection of the new products to test

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

L: low processing; M: mid processing; H: high processing.
Recruitment of participants

100 consumers

- 50% of the individuals per country "Involved innovators" and "Involved traditional"

- Balanced fish consumption (farmed and wild), age, gender, income and marital status, trying to fit the average frequencies in their respective segments per country
Consumer test

Preparation of the samples
Consumer test

Test design and execution

• Ten tasting sessions (1-1.5h) in each location in two consecutive days (10-12 participants)

• 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 liking expectation and image for each of the 10 different ideas
  3) Blind tasting: liking of the six selected products
  4) Overall expectation in informed condition: overall acceptability and personal perception of each product by means of a semantic differential scale (made up of 11 adjectives)
## Consumer test

### Liking expectations

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

- Higher preference for those products having the genuine sensory properties of fish, without any interference (recruitment criteria)
• Higher preference for those products having the genuine sensory properties of fish, without any interference (recruitment criteria)
Consumer test

Image/perception of the different products or ideas

• All the products were perceived quite positively
Consumer test

Effect of image/perception on expectations (all countries)
## Consumer test

### Blind tasting (6 products)

<table>
<thead>
<tr>
<th>Product</th>
<th>Overall</th>
<th>DE</th>
<th>ES</th>
<th>FR</th>
<th>IT</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish olive oil</td>
<td>6.3\textsuperscript{b}</td>
<td>6.0\textsuperscript{b}</td>
<td>6.7\textsuperscript{ab}</td>
<td>7.2\textsuperscript{abc}</td>
<td>6.0\textsuperscript{bc}</td>
<td>5.7\textsuperscript{bc}</td>
</tr>
<tr>
<td>Grilled fillet</td>
<td>7.1\textsuperscript{a}</td>
<td>6.9\textsuperscript{a}</td>
<td>7.0\textsuperscript{a}</td>
<td>7.5\textsuperscript{a}</td>
<td>6.8\textsuperscript{a}</td>
<td>7.3\textsuperscript{a}</td>
</tr>
<tr>
<td><strong>Hamburger</strong></td>
<td>6.5\textsuperscript{b}</td>
<td>6.2\textsuperscript{ab}</td>
<td>6.9\textsuperscript{ab}</td>
<td>7.1\textsuperscript{abc}</td>
<td>6.4\textsuperscript{ab}</td>
<td>6.0\textsuperscript{bc}</td>
</tr>
<tr>
<td>Pate</td>
<td>5.8\textsuperscript{c}</td>
<td>5.2\textsuperscript{c}</td>
<td>6.4\textsuperscript{ab}</td>
<td>6.6\textsuperscript{c}</td>
<td>5.3\textsuperscript{c}</td>
<td>5.3\textsuperscript{c}</td>
</tr>
<tr>
<td><strong>Salad</strong></td>
<td>6.3\textsuperscript{b}</td>
<td>6.0\textsuperscript{b}</td>
<td>6.2\textsuperscript{b}</td>
<td>7.4\textsuperscript{ab}</td>
<td>5.5\textsuperscript{c}</td>
<td>6.4\textsuperscript{b}</td>
</tr>
<tr>
<td>Smoked fillet</td>
<td>6.2\textsuperscript{b}</td>
<td>6.3\textsuperscript{ab}</td>
<td>6.7\textsuperscript{ab}</td>
<td>6.7\textsuperscript{b}</td>
<td>5.6\textsuperscript{c}</td>
<td>5.9\textsuperscript{bc}</td>
</tr>
<tr>
<td>Std. Error</td>
<td>0.088</td>
<td>0.200</td>
<td>0.192</td>
<td>0.166</td>
<td>0.186</td>
<td>0.228</td>
</tr>
</tbody>
</table>

- Agreement with the previously reported expected liking
Consumer test

Overall liking in the full informed condition

Product: Frozen fish (meagre) burgers shaped as fish. The burgers are ready to cook and prepared with a mild seasoning and can be incorporated in a sandwich or prepared as a part of a meal. The product is produced in an environmentally sustainable way. It is labelled as a premium product, the country of origin is EU. The product is included in a transparent vacuum-packed bag or in a plastic tray with transparent plastic on the top. Information on fish for educative purposes (children) and playful gifts (e.g. sticker) are included in the packaging.

<table>
<thead>
<tr>
<th>Product</th>
<th>Overall</th>
<th>DE</th>
<th>ES</th>
<th>FR</th>
<th>IT</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish olive oil</td>
<td>6.4 bc</td>
<td>6.0 bc</td>
<td>7.0 ab</td>
<td>6.9 ab</td>
<td>6.0 b</td>
<td>5.8 b</td>
</tr>
<tr>
<td>Grilled fillet</td>
<td>7.1 a</td>
<td>7.0 a</td>
<td>7.3 a</td>
<td>7.5 a</td>
<td>6.8 a</td>
<td>7.1 a</td>
</tr>
<tr>
<td>Hamburger</td>
<td>6.2 c</td>
<td>5.7 bc</td>
<td>6.5 b</td>
<td>6.8 ab</td>
<td>6.0 b</td>
<td>5.7 bc</td>
</tr>
<tr>
<td>Pate</td>
<td>5.6 d</td>
<td>5.2 c</td>
<td>6.5 b</td>
<td>6.5 b</td>
<td>4.9 c</td>
<td>4.8 c</td>
</tr>
<tr>
<td>Salad</td>
<td>6.3 bc</td>
<td>5.9 bc</td>
<td>6.4 b</td>
<td>7.5 a</td>
<td>5.5 bc</td>
<td>6.2 ab</td>
</tr>
<tr>
<td>Smoked fillet</td>
<td>6.5 b</td>
<td>6.5 ab</td>
<td>7.1 ab</td>
<td>6.9 ab</td>
<td>6.2 ab</td>
<td>6.1 b</td>
</tr>
</tbody>
</table>

- Similar to what was observed in the blind tasting (low impact of the species)
Consumer test

Confirmation/disconfirmation of expectations

- In most cases the difference between the blind and the fully informed tasting was not significant.
Consumer test

Confirmation/disconfirmation of expectations (all countries)

<table>
<thead>
<tr>
<th></th>
<th>Grilled fillet</th>
<th>Smoked fillet</th>
<th>Fish olive oil</th>
<th>Salad</th>
<th>Hamburger</th>
<th>Pate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>7.5</td>
<td>6.5</td>
<td>5.5</td>
<td>7.0</td>
<td>6.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

The diagram shows the confirmation/disconfirmation of expectations for different food items across all countries.
Consumer test

Product image with full information

• Positive perception

• High discrepancies between countries, perception clearly different when dealing with the main intangible dimensions that might define the different products
Take-home messages

• Sensory dimension seems to have an important contribution to the overall acceptance of the product and to its purchase probability

• The products already developed were not able to reach the initial expectations that they produced in the participants

• Products with a lower degree of processing were those who generated higher expected scores and higher acceptability in the blind test (recruitment criteria)

• The environmental friendly character of the products did not affect the preference in an important way (it was included in the description of the different products)
The team

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New species for EU aquaculture
What we know...

• Percentage of income spend on food has declined in most countries due to the crisis, but this will (partly) recover

• Tuna, cod, salmon and shrimps are most consumed across the EU. The fish market for flatfish and small pelagics is saturated but market needs for shrimps, groundfish, salmonids and tuna are not satisfied with local production/catches. Good filets and hardly any or easy bones

• Northern EU countries eat more processed fish than southern EU countries, but this changes rapidly. Market shares of supermarkets are growing for fresh products in the southern EU

• Minorities grow faster than locals in most countries, so ethnic developments change the eating habits and assortments in supermarkets
What we know...

• Personal well-being and (health) impact are growing motives for food choices

• Value for money have become a leading buying motive due to the crisis

• Increase of fresh fish assortment in supermarkets

• Concentration in sea food consumption areas is fading out to other areas due to increasing high quality availability in supermarkets and hypermarkets all-over the countries

• Increasing demand for value added products like marinated fish

• Saturation of the protein market in the EU. Growth can only be reached by defeating the competition
What we know... in favour of the new farmed species

- Government programmes support fish intake, since fish is perceived as more healthy than meat, or higher fish consumption is stimulated from a more varied protein consumption perspective.

- Aquaculture is perceived as more sustainable than wild catch.

- Aquaculture of these new species can bring employment in regions with high unemployment.

- Increasing world wide demand for proteins, which might increase the price for fish products.

- Consumers decrease meat and meat product consumption for health reasons (WHO advice).