What do Italians think about aquaculture fish and the products made from it?
What we know...

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

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.

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.
Objectives:

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

(b) 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)

What we know...

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
What Italians 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
Should we worry?

The Spanish case:

- 2008 vs. 2014 vs. 2016
- Low effectiveness
B1. Farmed fish is safer than wild fish
B2. Wild fish is more affected by marine pollution (spillages) than farmed fish
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Does information affect consumer liking of farmed and wild fish?

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Overall liking of wild and farmed fish in the blind and informed conditions.

<table>
<thead>
<tr>
<th></th>
<th>Overall liking</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Wild fish</td>
<td>Farmed fish</td>
<td>RMSE</td>
</tr>
<tr>
<td>Informed condition</td>
<td>7.4</td>
<td>6.7</td>
<td>1.803</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Blind condition</td>
<td>6.3</td>
<td>6.7</td>
<td>2.095</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>RMSE</td>
<td>2.003</td>
<td>1.950</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p Value</td>
<td>&lt;0.0001</td>
<td>0.957</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
New product development

- Selection of the new products to test

| 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.
Consumer test

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)
Results

Liking expectations

Average expected degree of liking of selected product ideas.

<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</td>
<td>1.672</td>
</tr>
<tr>
<td>Fresh fillet (Idea 21)</td>
<td>7.1</td>
<td>1.843</td>
</tr>
<tr>
<td>Smoked fillet (Idea 2)</td>
<td>6.8</td>
<td>1.862</td>
</tr>
<tr>
<td>Frozen fillet (Idea 1)</td>
<td>6.7</td>
<td>1.716</td>
</tr>
<tr>
<td>Salad (Idea 4)</td>
<td>6.7</td>
<td>1.867</td>
</tr>
<tr>
<td>Fish olive oil (Idea 33)</td>
<td>6.6</td>
<td>1.879</td>
</tr>
<tr>
<td>Frozen marinated fillet (Idea 13)</td>
<td>6.6</td>
<td>1.858</td>
</tr>
<tr>
<td>Hamburger (Idea 6)</td>
<td>6.2</td>
<td>1.929</td>
</tr>
<tr>
<td>Tartar (Idea 30)</td>
<td>5.8</td>
<td>2.273</td>
</tr>
<tr>
<td>Pate (Idea 9)</td>
<td>5.8</td>
<td>2.184</td>
</tr>
</tbody>
</table>

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

- 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)
Results

Image/perception of the different products or ideas

• All the products were perceived quite positively
Results

Effect of image/perception on expectations (Italy)
Results

Blind tasting (6 products)

Mean acceptability values for the different products per country.

<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^b</td>
<td>6.0^b</td>
<td>6.7^ab</td>
<td>7.2^abc</td>
<td>6.0^bc</td>
<td>5.7^bc</td>
</tr>
<tr>
<td>Grilled fillet</td>
<td>7.1^a</td>
<td>6.9^a</td>
<td>7.0^a</td>
<td>7.5^a</td>
<td>6.8^a</td>
<td>7.3^a</td>
</tr>
<tr>
<td>Hamburger</td>
<td>6.5^b</td>
<td>6.2^ab</td>
<td>6.9^ab</td>
<td>7.1^abc</td>
<td>6.4^ab</td>
<td>6.0^bc</td>
</tr>
<tr>
<td>Pate</td>
<td>5.8^c</td>
<td>5.2^c</td>
<td>6.4^ab</td>
<td>6.6^c</td>
<td>5.3^c</td>
<td>5.3^c</td>
</tr>
<tr>
<td>Salad</td>
<td>6.3^b</td>
<td>6.0^b</td>
<td>6.2^b</td>
<td>7.4^ab</td>
<td>5.5^c</td>
<td>6.4^b</td>
</tr>
<tr>
<td>Smoked fillet</td>
<td>6.2^b</td>
<td>6.3^ab</td>
<td>6.7^ab</td>
<td>6.7^bc</td>
<td>5.6^c</td>
<td>5.9^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>

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

• Agreement with the previously reported expected liking
## Results

### Overall liking in the full informed condition

Mean acceptability values for the different products per country.

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

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

- Similar to what was observed in the blind tasting

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.
Results

Confirmation/disconfirmation of expectations

• In most cases the difference between the blind and the fully informed tasting was not significant
Results

Confirmation/disconfirmation of expectations (Italy)

- Grilled fillet
- Smoked fillet
- Fish olive oil
- Hamburger
- Salad
- Pate

Blind Expectations Full info
Results

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
Results

Italian consumers
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 (it was included in the description of the different products)
DIVERSIFY
New species for EU aquaculture