

# What do Italians think about aquaculture fish and the products made from it?



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

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

## What we know...

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

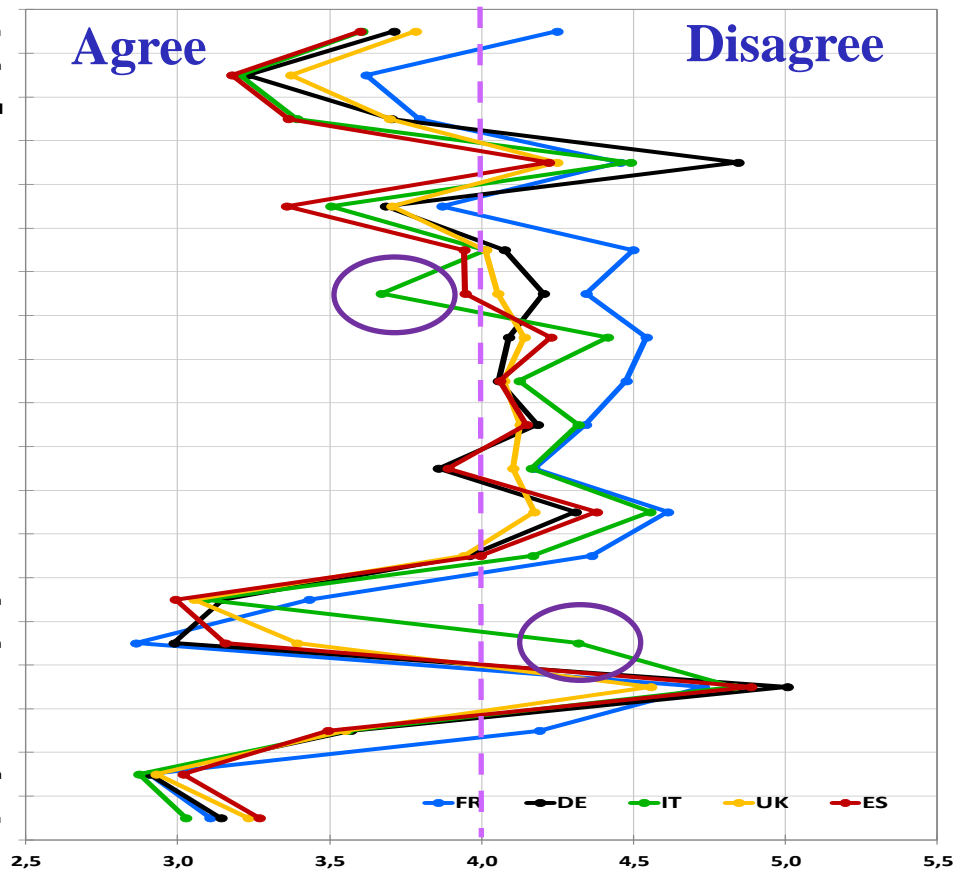
Diversification: new species and new products, DIVERSIFY

### 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 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

### ACUICULTURA ESPAÑOLA: GARANTÍA Y FRESCURA TODO EL AÑO



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# QUÉ

¿QUÉ ES LA ACUICULTURA?

La acuicultura es el cultivo de organismos acuáticos, abarcando peces, moluscos, crustáceos, plantas acuáticas y algas.



¿DÓNDE SE REALIZA EL CULTIVO DE LAS ESPECIES?

CULTIVOS EN AGUAS SALOBRES



CULTIVOS EN MAR



CULTIVOS EN TIERRA



# ACUICULTURA

¿POR QUÉ ES ACCESIBLE EL PRODUCTO DE ACUICULTURA?

La disponibilidad durante todo el año de los productos de acuicultura y su calidad homogénea hacen que los precios sean más accesibles para el consumidor.

¿CÓMO DIFERENCIO LAS ESPECIES DE ACUICULTURA EN MI PESCADERÍA?

Por su etiqueta. Todo producto piscícola debe estar acompañado por una etiqueta. En ella aparecen un apartado en el que se indica el método de producción y sabe estar marcado. Acuicultura.

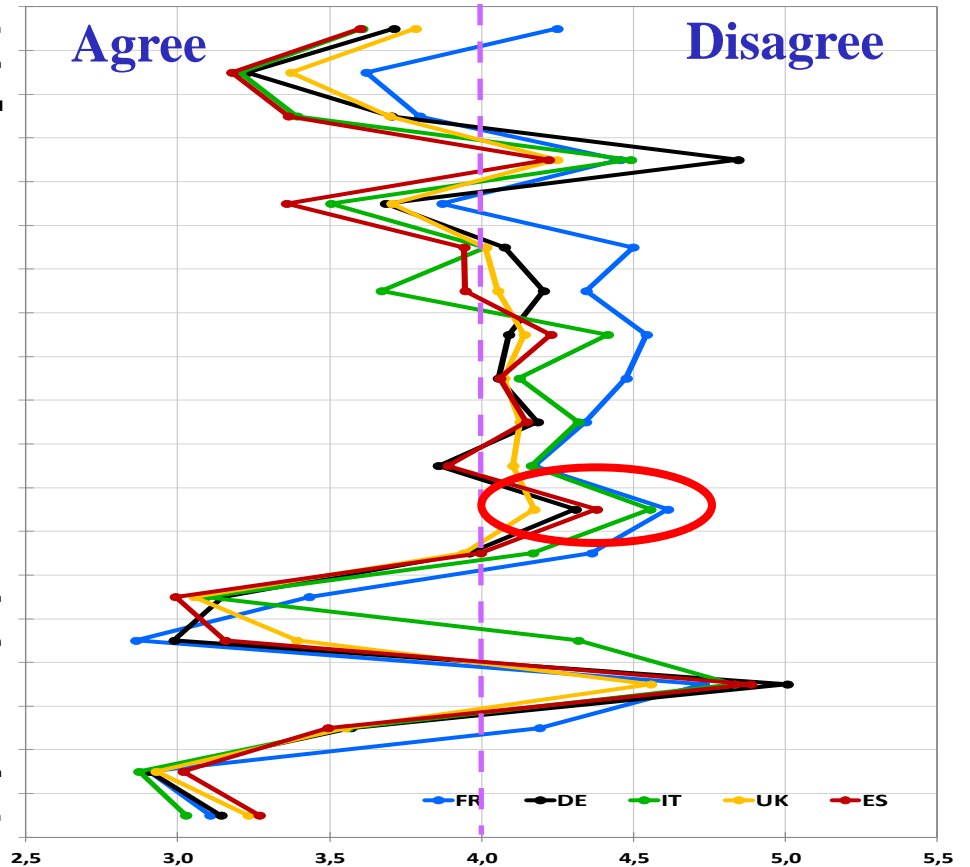
¿TODAS LAS ESPECIES DE ACUICULTURA QUE ENCUENTRO EN MI PESCADERÍA SON PRODUCIDAS EN ESPAÑA?

No siempre. Puedes conocer su procedencia u origen leyendo la etiqueta que lo acompaña, en ella debe aparecer dicha información.



apenas medíamos unos milímetros,

- 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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Aquaculture

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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.

	Overall liking		RMSE	p Value
	Wild fish	Farmed fish		
Informed condition	7.4	6.7	1.803	<0.0001
Blind condition	6.3	6.7	2.095	<0.0001
RMSE	2.003	1.950		
p Value	<0.0001	0.957		

# New product development

- Selection of the new products to test



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

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.

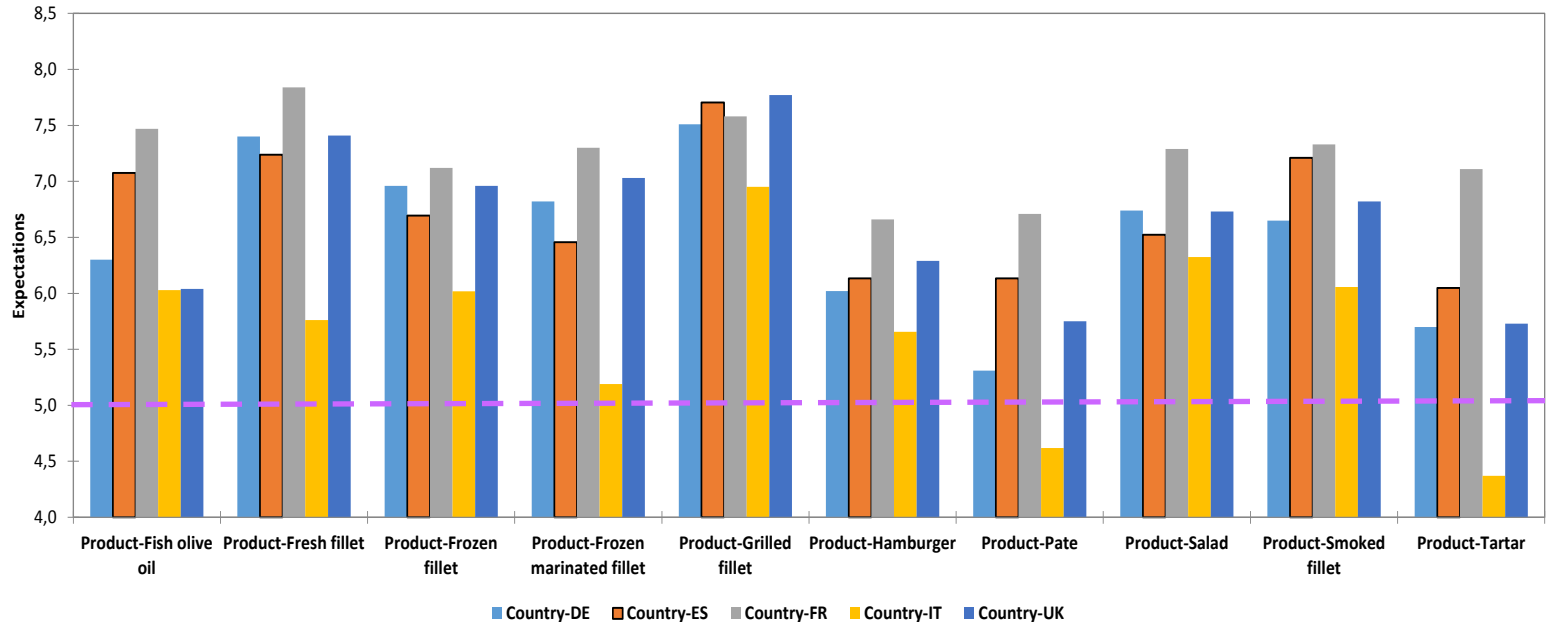
Idea	Mean value	Standard deviation
Grilled fillet (Idea 34)	7.5 <sup>a</sup>	1.672
Fresh fillet (Idea 21)	7.1 <sup>b</sup>	1.843
Smoked fillet (Idea 2)	6.8 <sup>bc</sup>	1.862
Frozen fillet (Idea 1)	6.7 <sup>c</sup>	1.716
Salad (Idea 4)	6.7 <sup>c</sup>	1.867
Fish olive oil (Idea 33)	6.6 <sup>c</sup>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

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)

# Results

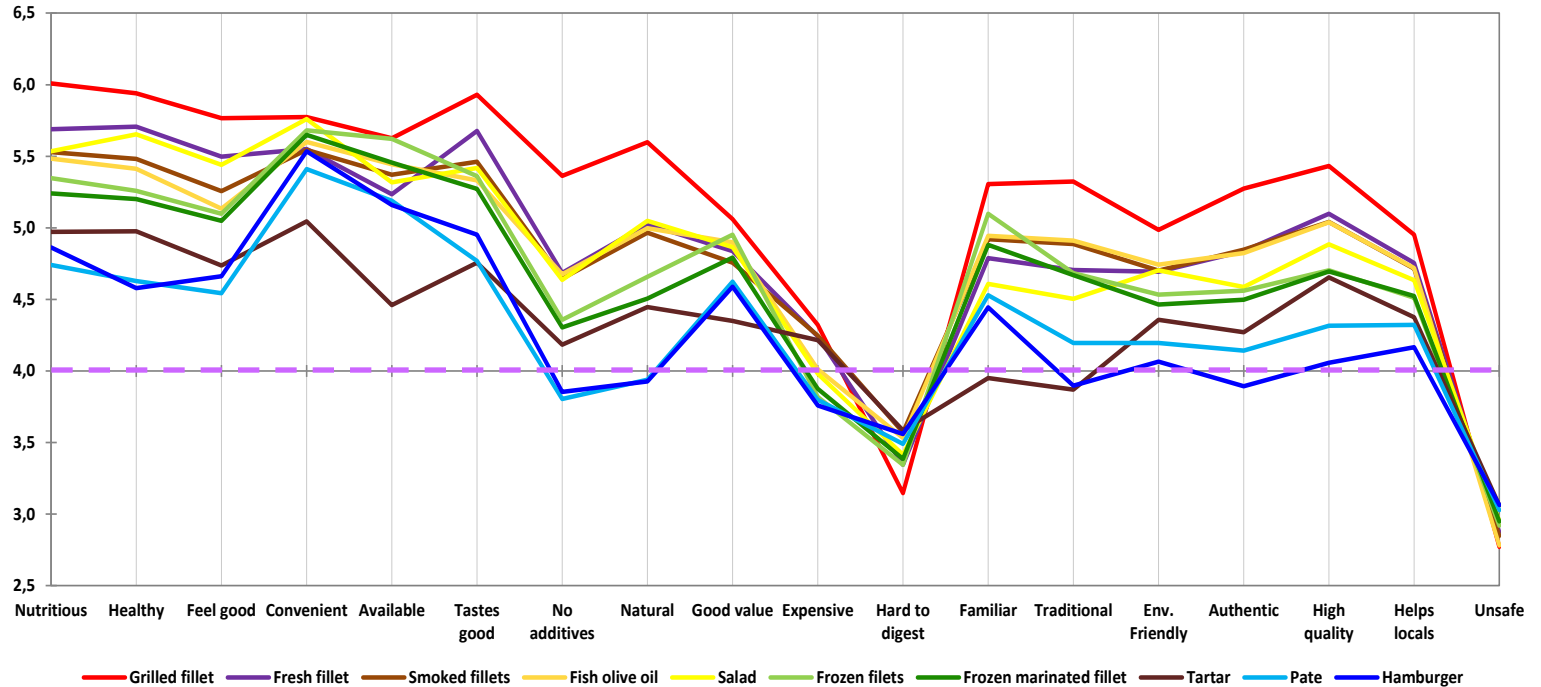
## Liking expectations



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

# Results

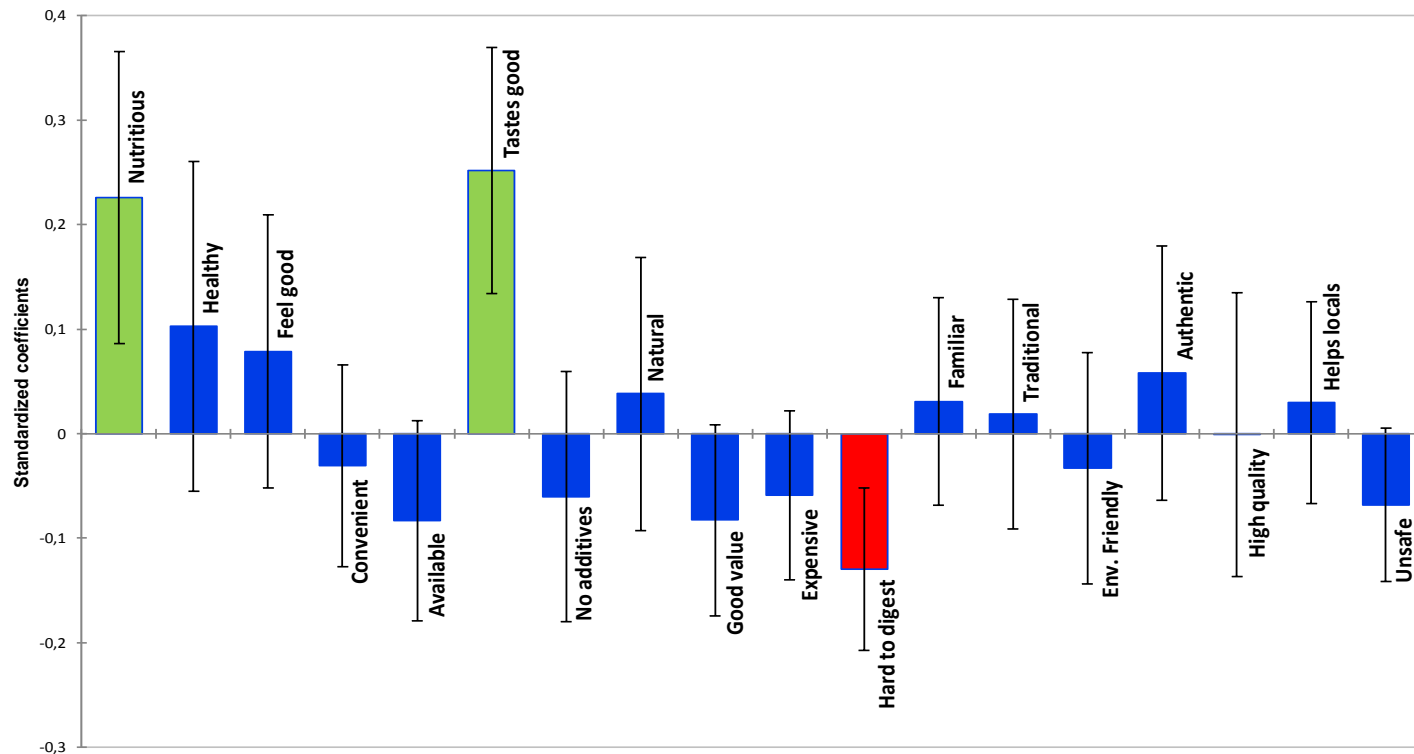
## Image/perception of the different products or ideas



- 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.

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

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

- Agreement with the previously reported expected liking



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

### Overall liking in the full informed condition

Mean acceptability values for the different products per country.

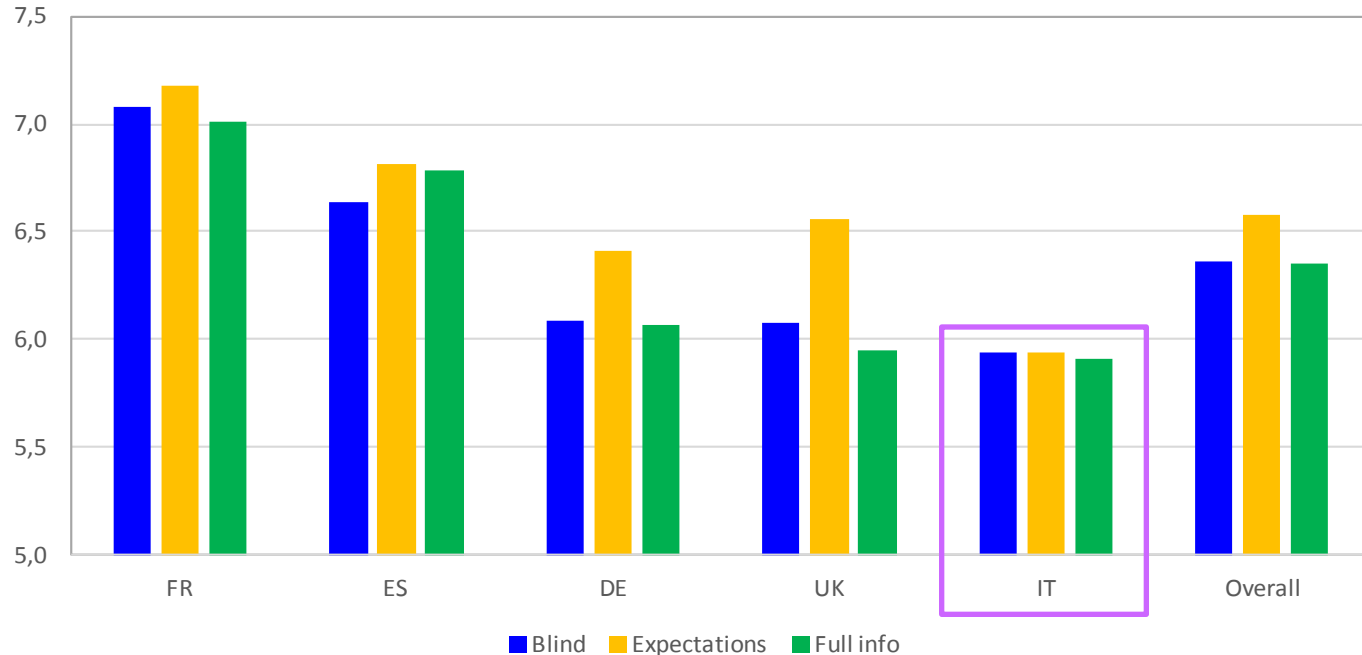
Product	Overall	DE	ES	FR	IT	UK
Fish olive oil	6.4 <sup>bc</sup>	6.0 <sup>bc</sup>	7.0 <sup>ab</sup>	6.9 <sup>ab</sup>	6.0 <sup>b</sup>	5.8 <sup>b</sup>
Grilled fillet	7.1 <sup>a</sup>	7.0 <sup>a</sup>	7.3 <sup>a</sup>	7.5 <sup>a</sup>	6.8 <sup>a</sup>	7.1 <sup>a</sup>
Hamburger	6.2 <sup>c</sup>	5.7 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

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

# Results

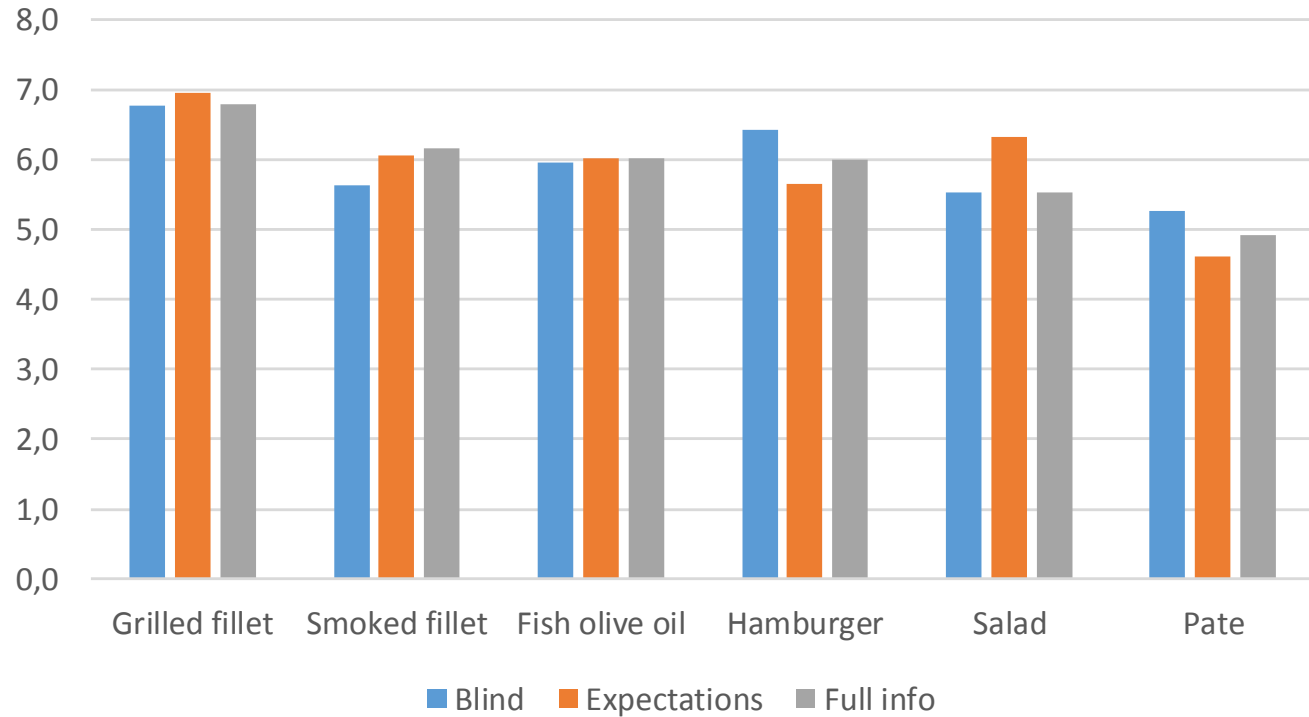
## Confirmation/disconfirmation of expectations



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

# Results

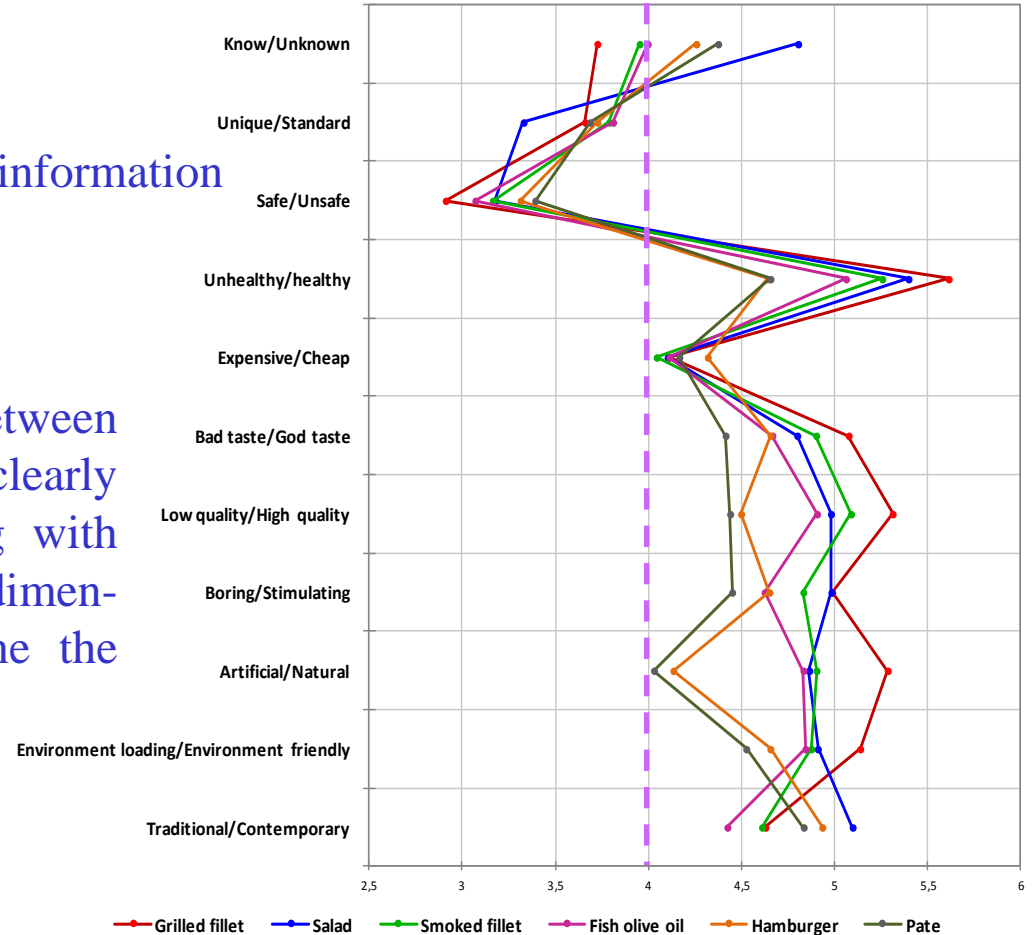
## Confirmation/disconfirmation of expectations (Italy)



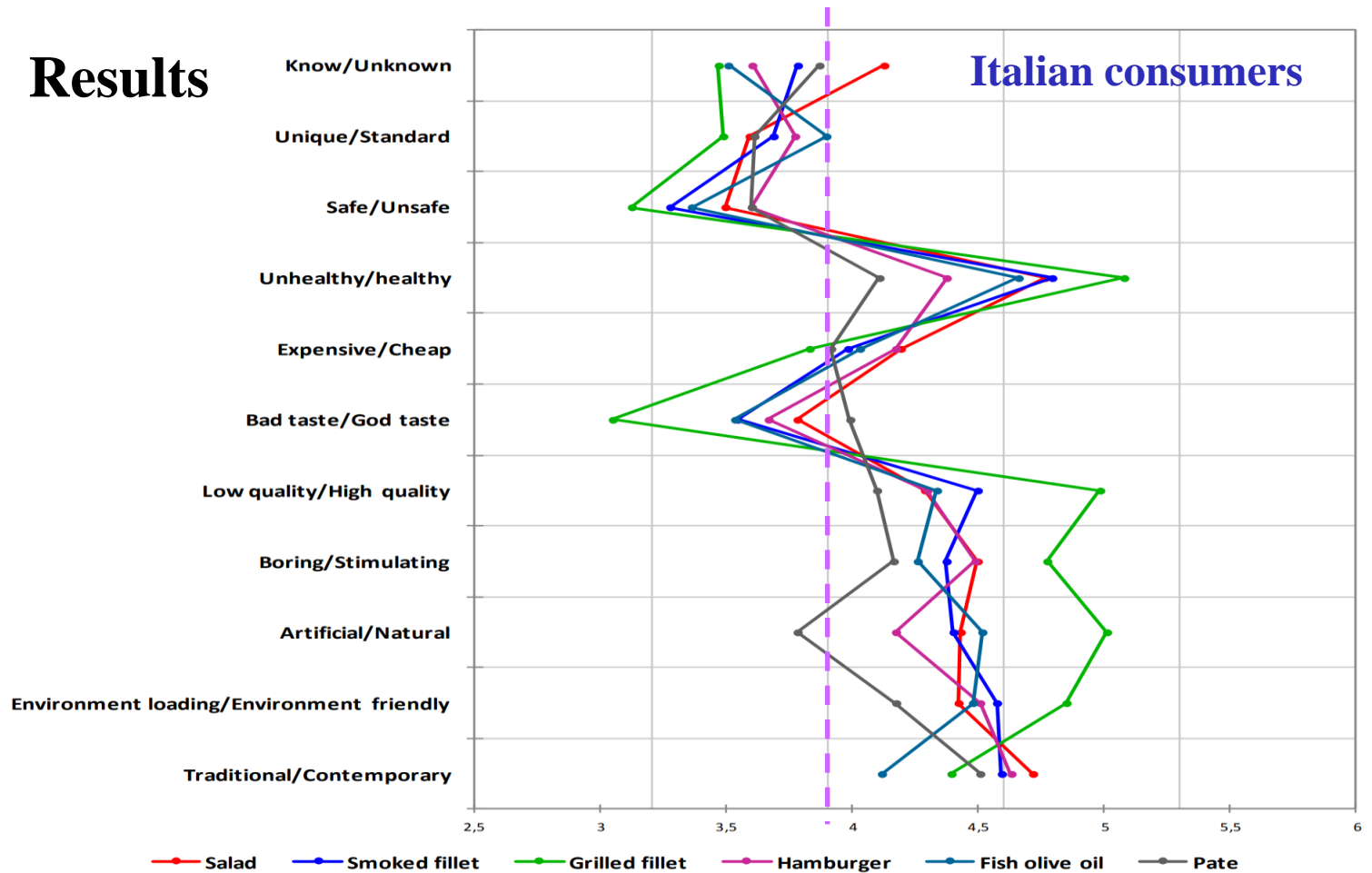
# Results

## 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



## 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**