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**Grant Agreement number: 635188**

**SUCCESS**

**Strategic Use of Competitiveness towards Consolidating  
the Economic Sustainability of the  
European Seafood sector**

**Start date of project: 01/04/2015**

**Duration: 36 Months**

**D2.4: Report on the potential of selected  
innovative products in European markets**



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## EXECUTIVE SUMMARY

This work has been undertaken as part of the SUCCESS project (Work Package 2: Consumer preferences, market acceptance and social awareness towards seafood) funded by the EC (H2020, GA 635188). Deliverable 2.4 focuses on the results of task 2.4. of the project. In this task innovative seafood products with potential for different national markets were identified and investigated. The research focused on species which were perceived to be relevant in different European countries and which were supposed to have an additional market potential. Relevant in this context means that they were relevant for different producer groups and 'innovativeness' was interpreted as new preparation forms of well-known, even traditional, species and production systems. The focus was on likely market potential with respect to consumer reaction. Specific cases for which an increase in demand on the European market will be particularly beneficial for producers were analysed and were selected in close cooperation with project partners and the SUCCESS case studies, and tested for consumers' reactions and preferences. Included species were carp, plaice, trout and scallops plus coastal fisheries as production system.

The research combined qualitative and quantitative methods. In a first step a series of focus group discussion was conducted aiming at exploring consumers' perceptions of selected species according to the relevance in the respective study country. Based on the outcome of the focus group discussions, a standardised questionnaire was developed and a quantitative online survey was conducted. Based on the insights of the two research steps, potentials for the tested seafood products on selected European markets are shown and ways for an improved communication of the tested seafood products and for sustainable seafood are outlined.

Focus group discussions took place in France, Germany, Iceland, Italy, Poland and the UK and the online survey covered France, Italy, Germany, Poland and the UK.

The presented research highlights market potentials for the seafood species under investigation as well as for seafood from coastal fisheries. Consumers' preferences and perceptions of the analysed species and of coastal fisheries show some similarities but also significant differences. Therefore, any promotion strategy has to consider the country specific differences with respect to seafood consumption in the EU in order to be successful.

The **carp** case revealed that a potential for "new" carp products exist in Germany and in Poland. In particular, the bonecut carp filet appears as a promising "new" product. The wider introduction of a bonecut filet to the market, a better availability of carp products and the avoidance of off-flavors are important prerequisites for an increased economic success of carp. In order to decrease the knowledge gap about carp and to enhance interest in it, the provision of recipes, in particular non-traditional ones, might help. An increased offering of carp dishes in the out of home food sector with particular focus on non-traditional recipes may support an increase in carp consumption.

In the case of **plaice** differences between Germany and the UK became obvious. Even though plaice was viewed as a tasty and easy to prepare fish in both countries, the UK consumers rather perceive plaice as a special and seasonal fish and indicated the high price of plaice to be a major barrier for consumption. In contrast, in Germany plaice was more often perceived as a common food fish and the inconvenience in preparation presented the most important barrier. Consumers in both countries agreed that low availability was another main barrier for plaice consumption. Promising ways to promote plaice consumption are on the one hand the offering of preparation advice and recipes and on the other hand the highlighting of the origin of plaice from local waters in a concise manner in combination with a sustainability indication.

As for **salmonids**, trout was less known than salmon: in all study countries the consumption of fresh and smoked salmon was higher than the consumption of fresh and smoked trout. Of interest for the project, the question on substitutability of trout and salmon is not yet finally concluded: the focus

SUCCESS Deliverable 2.4



groups and the online survey provide no evidence of substitutability between trout and salmon. Some consumers stressed similarities in taste especially for smoked product. As a consequence, trout promotion should be based on its own qualities and not as a substitute for salmon. Since domestic origin of the production is an important purchase attribute of trout, its local origin as well as eco-friendly aspects of trout farming might support its consumption.

Mostly, consumers in the studied countries had a positive attitude towards **coastal fisheries**. Coastal fisheries were associated with freshness, importance for coastal communities, eco-friendly fishing and high quality seafood as well as a great variety of seafood.

The majority of participants in each country perceived a coastal fisheries label as useful. However, country differences exist so that a label for communicating the origin from coastal fisheries appears to be particularly promising for France and Italy. A prerequisite for the success of a labelling approach is that the included seafood products hold up to the expectations of consumers. Products certified by such a label, should be fished in an eco-friendly manner and should be of a very high quality. Pointing at the origin from a particular domestic area appears promising, too. For the promotion of clams/scallops, the survey revealed that the communication of sustainable fishing practices is promising in all study countries. The use of sustainability labels such as the MSC (or the Label Rouge for high quality including animal welfare) presents an opportunity.

The presented research reveals that a promotion of European seafood based on its domestic/local origin, its sustainable production and its big variety is a promising promotion approach. As shown in D2.2 sustainable European production is not an issue for all consumers but for a significant share and in all study countries a part of the consumers was interested in these attributes and attached importance to them in their purchase decision.

The communication of sustainability through labels presents one approach in this context. In this line it should be considered that consumers are also sceptical about labels and many of them are overwhelmed by the amount of labels already present on the market. Therefore, the choice of labels for communicating the sustainability of a particular seafood product should be carefully considered. Cultural preferences for specific sustainability labels need to be taken into account.

## GOALS

The goals of research underlying this deliverable (D2.4) were the identification of innovative seafood products with potential in different national markets and to investigate promising ways of communication. The research focused on species which were perceived to be relevant in different European countries and which were supposed to have an additional market potential. Relevant in this context means that they were relevant for different producer groups. 'Innovativeness' was interpreted as new preparation forms also of well-known, even traditional, species and production systems. The focus was always on likely market potential with respect to consumer reaction. The selection of species took place in close cooperation with the case studies which were under investigation in this project.

## KEY HIGHLIGHTS / OUTCOMES

### Carp

- Carp was perceived as a tasty, healthy and traditional fish. It was foremost associated with festive seasons.
- Main barriers for carp consumption were: Insufficient knowledge about carp, moldy taste and too many bones, low availability.
- A potential for new carp products does exist in Germany and in Poland. Especially the boneless filet was met with interest in both countries.
- A wider availability of carp and the avoidance of off-flavours are important prerequisites for an increased economic success of carp. In order to decrease the knowledge gap about carp and to enhance interest in it, the provision of recipes, in particular non-traditional ones, might help. Also an increased offering of carp dishes in the out of home food provision sector with particular focus on non-traditional recipes can support an increase in carp consumption.

### Plaice

- Plaice was viewed as a tasty and easy to prepare fish. In the UK plaice was perceived more as a special and seasonal fish and more strongly associated with the North Sea than it was the case for Germany.
- Whereas German participants named inconvenience in preparation as the main barrier to purchase plaice, for UK participants it was the high price of plaice. The second most important barrier was a knowledge deficit about plaice in both countries. Also participants of both countries equally often mentioned low availability as a barrier for plaice consumption.
- Consumers in Germany and the UK attached more importance to the catching of plaice in line with sustainability considerations than to the origin from the North Sea.
- The lack of preparation skills can be addressed by offering preparation advice and recipes through multiple channels.
- A promising approach for increasing the consumption of plaice might be to highlight the origin of plaice from local waters in a concise manner (specifying the area in the North Sea further) and to combine this claim with a sustainability indication.

### Trout

- Trout was viewed as a tasty, healthy and domestic product.
- While a substitutability was mentioned regarding the smoked forms of trout and salmon in the focus groups, participants of the online survey did not associate marked differences in taste between both species, neither with smoked nor with fresh fish. This might lead to the conclusion that substitution exists. However, no final 'decision' regarding substitutability can be made and further research on this topic is needed.
- Promotion of local origin of trout as well as highlighting the eco-friendliness might be promising.

## Coastal fisheries

- French, Italian and UK consumers generally had a positive attitude toward coastal fisheries. Coastal fisheries are associated with high freshness, being important for coastal communities, being eco-friendly, and offering high quality, healthy seafood as well as a large variety of different types of seafood.
- The majority of participants in each country perceived a coastal fisheries label as useful. However, some scepticism about such a label and the perception of having already enough labels on seafood were also expressed.
- The promotion of seafood from coastal fisheries by stressing its very high freshness and pointing out the origin from a particular domestic area appears to be promising.
- Particularly in France and Italy the promotion of seafood from coastal fisheries via the underlining of artisanal fishing practices, where applicable, can also support market differentiation.
- Participants were mostly in favour of a coastal fisheries label. In particular Italian consumers expect a guaranty of very high freshness from such a label, whereas UK consumers expect the support of local, coastal communities and thus the limitation of such a label to domestic coastal areas. French consumers had a special interest in artisanal fishing practices. There might be some confusion among consumers regarding coastal and artisanal fisheries.
- Using a label for communicating the origin from coastal fisheries appears to be particularly promising for France and Italy, under the prerequisite that the labelled seafood products also hold up to all other consumer expectations. Products certified by such a label should be fished in an eco-friendly manner and should be of a very high quality.
- For the promotion of clams/scallops, the survey revealed reveals that the communication of sustainable fishing practices is promising in all study countries. The use of sustainability labels such as the MSC (or the Label Rouge for high quality including animal welfare) for communicating this attribute presents an opportunity. Moreover, it was shown that particularly fresh scallops/clams can profit from the underlining of European/domestic origin. This is especially the case for France and Italy and to a lesser degree for the UK.

## Sustainability labels for seafood

- In each of the studied countries, a share of consumers was aware of sustainability labels on seafood products and attached importance to them in the purchase situation as well as they had confidence in the underlying standards.
- In Germany, Poland and the UK participants attached the highest importance to the MSC label in the shopping situation, whereas French and Italian participants perceived the respective domestic organic label as the most important one in their purchase decision.

## 1 INTRODUCTION

The EU fisheries sector faces strong competition from imports which to a large extent is caused by high production costs in many European countries. One strategy to improve the competitiveness of the sector is to communicate specific attributes such as sustainable and/or European production with the aim to increase demand and willingness to pay for EU seafood products by European consumers. An important prerequisite for addressing European consumers in a promising manner is the knowledge about consumers' preferences. Only then, marketing strategies can be developed which consider consumer preferences and expectations.

The European fisheries sector is characterised by a large variety of species and fishing practices, respectively production/fishing systems and traditions. The market relevance of many of these methods and traditions is declining due to price pressure but also due to consumers who concentrate more and more on only few seafood species and products. Examples are the decrease of the demand for plaice in northern European countries, the decrease in trout and carp consumption, the increases in salmon consumption, the increase in the consumption of fish preparations (e.g. breaded fish) during the last decades or the decrease of coastal fisheries.

In this task, innovative seafood products with potential for different national markets were identified. Innovative products were not necessarily meant to be new products but also popular products in specific countries with low demand in other countries. Therefore, in the context of this report, innovativeness also refers to new ways of marketing products already known in some European countries and sometimes being thus far niche products. Specific cases for which an increase in demand on the European market will be particularly beneficial for producers were analysed. Studied species and production systems were selected in close cooperation with project partners and the SUCCESS project's case studies, and tested for consumers' reactions and preferences. Included species are carp, plaice, trout and scallops plus coastal fisheries as production system.

Based on the research in task 2.2 of the SUCCESS project which showed that the promotion of sustainable production would be a promising way to foster the consumption of European seafood (Feucht et al. 2017), we also explored consumers' trust in different information sources, consumers' perceptions of a retailer/store decision to sell only sustainable seafood and consumers' perceptions of different sustainability labels on seafood products. In addition to the results of Deliverable 2.3 (Feucht and Zander 2017) we investigate the use of smartphones for informing oneself about seafood while shopping and the willingness to purchase seafood online.

The research combined qualitative and quantitative methods. In a first step a series of focus group discussion was conducted aiming at exploring consumers' perceptions of selected seafood species. Based on the outcome of the focus group discussions, a standardised questionnaire was developed and a quantitative online survey was conducted. This way the results of the qualitative focus groups were quantified, resulting in the identification of the potential of various seafood products in the markets. Based on the outcomes of the two steps, prospects for the tested seafood products on selected European markets are shown and ways for an improved communication of the tested seafood products and for sustainable seafood are delineated.

## 2 METHODOLOGICAL APPROACH

Prior to the quantitative research which builds the core of this report, focus group discussions were conducted in six countries. The results of these focus groups are summarised shortly since they help to better understand the quantitative results presented here. Accordingly, this report starts with a presentation of the methodological approaches of the focus groups followed by the description of the quantitative survey.

The focus groups were conducted in Germany, France, Iceland, Italy, Poland and UK in cooperation with our project partners. The focus groups aimed at exploring consumers' perceptions of and possible market opportunities for innovative seafood species (carp, trout and plaice, arctic char), products made out of them as well as seafood from coastal fisheries. Also, ways of communicating these products were explored.

### 2.1 FOCUS GROUPS

The focus groups aimed to answer the following research questions:

- What are consumers' associations with carp?
- Why does the consumption of carp remain low even though product innovations have removed many barriers for consumption?
- How do consumers perceive innovative carp products?
- Do consumers differentiate plaice from other whitefish species?
- Is trout (arctic char in Iceland) perceived as substitute for salmon by consumers?
- What are distinctive attributes of trout (arctic char in Iceland) which could be used for an improved marketing of both fish species?
- Is the communication of plaice as a 'local and sustainable' fish a promising approach?
- How do consumers perceive coastal fisheries?
- Will the introduction of a coastal fisheries label be a promising approach for increasing market relevance of coastal fisheries?

In order to answer the questions above, 19 focus groups with in total 129 participants were conducted in six European countries: France, Germany, Iceland, Italy, Poland and the UK. In order to cater for regional differences the focus groups were conducted in different locations in each country. The focus groups in France took place in Brest, Dunkirk and Paris. The German focus groups were conducted in Brunswick and Hamburg. All focus groups in Iceland took place in Reykjavik. The focus groups in Italy were held in Ancona and Salerno. The Polish focus groups were conducted in Cieszyn and Gdynia. All focus groups in the UK took place in Edinburgh.

The participants of the focus groups were recruited by means of a convenience sample. All participants had to be at least partly responsible for grocery shopping in their household and had to consume fish. People employed in agriculture, fisheries, food industry and market research were excluded.

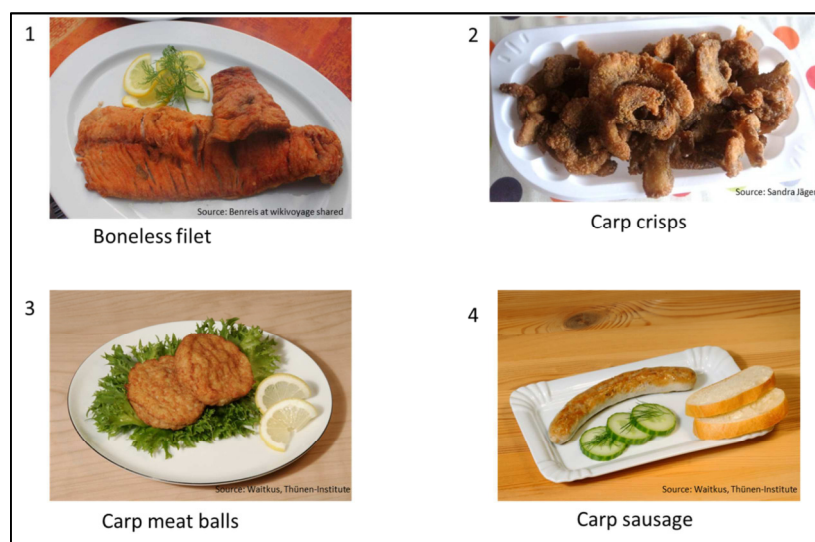
In all countries, the focus groups were split into two parts, one part dedicated to different fish species and/or coastal fisheries and one common part. The topics (fish species, coastal fisheries) discussed in the focus groups varied between countries (Table 1). Arctic char was only discussed by Icelandic participants since it was only there a relevant species.

**Table 1: Topics discussed in the focus groups per study country**

	DE	FR	IS	IT	PL	UK
Carp	X				X	
Plaice	X	X		X		X
Trout and salmon		X	X		X	
Arctic char and salmon			X			
Coastal fisheries – fish and shell fish		X		X		X

In the section about carp, the consumers' perceptions of carp and of four innovative carp products were explored. The innovative carp products differed between Germany and Poland in line with the respective consumer preferences and existing (niche) products on the markets. In Germany the presented products were: Bonecut filet, carp crisps, carp burger and carp sausage (Figure 1 for the German case). All pictures displayed prepared, ready to eat products. The bonecut filet was depicted as 'boneless' since the expression 'bonecut' might have confused the participants.

**Figure 1: Carp products shown to the German focus group participants**



In Poland, Bonecut filet, smoked carp filet, carp sausages, carp meat balls in vinegar, carp ham and carp crisps were selected as test products.

The section about plaice explored consumers' knowledge about plaice and about its substitution with other fish species by showing four to five pictures of plaice products (depending on the study country) to the participants (Figure 2). The species indications were removed from the packages and participants were asked to identify the fish species used for the displayed products. The shown products varied for each study country according to the products available at the respective market. In a next step, consumers' associations with plaice were discussed. Afterwards, motives and barriers for plaice consumption and participants' perception of the claims 'locally caught' and 'eco-friendly produced' were analysed.



**Figure 2: Plaice products shown to the German focus group participants**



The section about trout (arctic char) and salmon aimed to elicit how far trout, or in the Icelandic case, arctic char was seen as a substitute for salmon by consumers. At the beginning participants were asked for their associations with trout/arctic char and salmon. Afterwards, motives and barriers for the consumption of trout/arctic char were explored and similarities and differences between trout/arctic char and salmon were discussed. In the Icelandic case the different questions were accompanied by slides presenting pictures of arctic char and salmon.

In the subsequent section, consumers' knowledge about the concept of coastal fisheries was explored. Coastal fisheries species are landed by vessels fishing in domestic coastal areas including sedentary species (mostly shellfish like scallop, clams, etc. from all type of vessels) and non-sedentary species (mostly fish from small size vessels using passive fishing techniques like nets or lines).

The participants were asked for their associations with coastal fisheries and the purchase barriers and motives for preferring seafood from coastal fisheries were discussed. In a next step, participants were asked if it was important to them to be informed that the product they intended to purchase originated from coastal fisheries and if so, how they would like to be informed. The interest in a coastal fisheries label was elicited.

The common part was identical in all study countries and focused on consumers' perceptions of organic fish compared to captured fish, the communication about sustainability with respect to seafood (e.g. through labelling), and the perception of sustainability commitments made by the retail.

## 2.2 ONLINE SURVEY

The quantitative online survey aimed at substantiating the results of the qualitative focus groups and at identifying the potential of different seafood species and coastal fisheries at the European markets. Additionally, a focus was laid on communication approaches linked to sustainability attributes of the considered seafood species and of coastal fisheries, since the Deliverable 2.2 (Feucht et al. 2017) showed that sustainability attributes might be an option for market differentiation in Europe. In this respect, also consumers' perceptions of different sustainability labels were elicited.

The online survey was conducted with 2503 consumers in five European countries (France, Germany, Italy, Poland and the United Kingdom) in November and December 2017. An online panel run by a private market research agency was used for purposive quota sampling. Quotas were set for gender relations (two thirds women and one third men) considering the fact that more women than men are still responsible for shopping (e.g., Vanhonacker et al. 2013, Zander and Hamm 2010). Representativeness was required with regard to age and regional distribution. All participants had to be fish consumers.

Statistical analyses were performed using the statistical software SPSS version 25. Bivariate analyses including cross-tabulation with chi-square statistics and one-way ANOVA comparison of means with Tukey post-hoc tests were used to analyse the data. Differences were considered statistically significant if  $p < 0.05$ .

In what follows, first the sample is described and afterwards the content of the survey.

### 2.2.1 SAMPLE DESCRIPTION

Over all countries people between the age of 55 to 70 were the most represented in the sample, whereas the youngest age group (18 to 24 years) had the lowest share (Table 2). The participants in Italy were slightly younger than in the other countries. The French and Italian participants were somewhat older compared to the other countries. These age distributions are representative for the study countries since they follow the quotas set beforehand. In comparison to census data, people with higher education (sixth form/college, university degree) were overrepresented in our data for all study countries. The dominance of higher educated people is obvious and can hardly be explained by the fact that only fish consumers were allowed to take part in the survey. Myrland et al. (2000) and Hicks et al. (2008) found that people with a higher education level tend to have higher fish consumption.

The highest fish consumption frequency was found in Italy followed by the UK and France. German and Polish participants consumed the least frequently fish. These consumption frequencies are in line with findings by DG Mare (2008) and Pieniak et al. (2009) who point out that fish is most frequently consumed in Southern European countries while Polish as well as Germans have a comparatively low fish consumption frequency.



**Table 2: Summary statistics for variables on socio-demographic criteria (%)**

	All	DE <sup>1</sup>	FR	IT	PL	UK
Number of observations	2503	500	499	504	499	501
<b>Age of test persons</b>						
18 to 24 years	7.8	8.2	9.0	6.7	7.2	7.8
25 to 34 years	20.9	18.4	20.8	18.8	25.7	21.0
35 to 44 years	22.7	23.4	22.8	25.4	20.0	21.8
45 to 54 years	20.8	22.4	19.4	19.4	20.4	22.0
55 to 70 years	27.8	27.6	29.6	29.6	26.7	27.5
<b>Gender</b>						
Female	63.3	64.2	62.1	64.5	64.7	62.3
Male	36.4	35.8	37.9	35.5	35.3	37.7
<b>Education (years of school visit)</b>						
No formal qualification	1.7	0.2	3.0	0.0	0.2	4.4
Secondary (GCSE or O'Level)	25.4	50.2	16.0	12.3	22.8	25.7
Sixth form/College (A'Level)	33.0	28.2	38.3	53.2	18.6	26.7
University degree	39.8	21.4	42.7	34.5	57.5	43.1
<b>Fish consumption</b>						
Occasional fish consumers	49.3	61.8	48.1	32.7	55.3	48.3
Less than once per month	9.9	14.0	12.6	3.4	8.0	11.8
Once per month	11.8	16.8	11.4	5.0	14.8	11.0
Two to three times per month	27.6	31.0	24.4	24.4	32.5	25.5
Regular fish consumers	50.7	38.2	51.5	67.3	44.7	51.7
About once per week	34.2	29.4	35.3	41.3	33.1	31.7
More than once per week	16.5	8.8	16.2	26.0	11.6	20.0

<sup>1</sup> DE-Germany, FR-France, IT-Italy, PL-Poland, UK-United Kingdom

The survey was developed in English and German and then translated into the other languages by professional translation services. The content of the survey and the translations were discussed and reflected upon with the project partners in the respective countries. The survey was pretested with 15 participants in Germany. On average, participants spent between 20 to 25 minutes to complete the survey.

## 2.2.2 CONTENT OF THE SURVEY

Based on the findings in the focus groups, consumers' perceptions of carp, plaice, trout and of coastal fisheries as well as some ways to promote these species and topics were further explored. Scallops and clams were taken as examples for coastal fisheries. In each country, two species/topics were addressed. The selection was based on results from earlier research as well as on requirements of the project's case studies. Table 3 gives an overview of the included topics per country. In Italy we explored clams instead of scallops as an example for a species derived from coastal fisheries since scallops do not present a major seafood product in Italy, whereas clams are of interest for the Italian case.

Arctic char was included in each country with a short question in order to explore how familiar consumers outside of Iceland are with this species.

**Table 3: Topics addressed in the online survey per study country**

Topic	DE	FR	IT	PL	UK
Carp	X			X	
Plaice	X				X
Trout and salmon		X	X	X	
Coastal fisheries – shellfish*		X	X		X

DE-Germany, FR-France, IT-Italy, PL-Poland, UK-United Kingdom

\* Test products: Scallops for FR and UK, Clams for IT

The questionnaire was divided into four sections:

- consumption frequency of the seafood investigated in each country,
- associations with the tested seafood species/coastal fisheries,
- knowledge, attitudes and actual behaviour regarding sustainability information and labelling, and
- socio-demographic data.

For eliciting the consumption frequency of the seafood species under investigation we asked participants to describe their consumption habits regarding the studied species on a scale ranging from 'I do not know this species' 'I eat it at least once a month'. This question addressed only the species included in the study country plus arctic char.

#### 2.2.2.1 ASSOCIATIONS WITH THE INVESTIGATED SEAFOOD SPECIES AND COASTAL FISHERIES









The section focusing on associations with the investigated seafood species and coastal fisheries differed according to the species in question. In the following the content with respect to each species is briefly described.<sup>1</sup>

For **carp**, the questionnaire included six questions. In the first question participants were asked to indicate their associations with carp using a numbered semantic differential scale ranging from one to five and based on 13 bipolar pairs. The ordering of the pairs was randomized in order to avoid any order effect. Next, participants were asked to indicate up to three barriers for consuming (more) carp from a list of 8 statements plus the possibility to make own suggestions.

Afterwards, participants were presented with four carp products which differed between Germany and Poland (Figure 3). The carp products were chosen in line with the preferences found in the focus groups. In Germany all four products tested in the focus groups were included while for Poland the four most popular out of six were chosen. The carp products were presented in a randomized order and the test persons were asked to state their opinion on these products based on six given statements. The perception of these statements was measured on a 5-point Likert scale ranging from 'I do not agree at all' to 'I totally agree'.

<sup>1</sup> The complete questionnaire can be found in the appendix A.  
SUCCESS Deliverable 2.4

**Figure 3: Carp products shown to the survey participants according to study country**

Germany	Poland
 <p>Source: Benreis at wikivoyage shared</p> <p>Boneless filet</p>	 <p>Source: Archiwum</p> <p>Boneless filet</p>
 <p>Source: TI/C. Waitkus</p> <p>Carp burger</p>	 <p>Source: Archiwum</p> <p>Carp meat balls in vinegar</p>
 <p>Source: TI/C. Waitkus</p> <p>Carp sausage</p>	 <p>Source: lubelskie.pl</p> <p>Carp ham</p>
 <p>Source: S. Jäger</p> <p>Carp crisps</p>	 <p>Source: J. Mróz</p> <p>Carp crisps</p>

For **plaice** the questionnaire included three questions. First we asked participants to state their associations with plaice using a numbered semantic differential scale ranging from one to five and based on 11 bipolar pairs. The order of appearance of the pairs was randomized. Next, participants were asked to indicate up to three barriers for consuming (more) plaice from a list of 8 statements




**SUCCESS Deliverable 2.4**

plus the possibility to make own suggestions. Finally, participants assessed how important it was to them that the plaice they eat was caught in the North Sea and in line with sustainability considerations on a 5-point Likert scale ranging from 'Not important at all' to 'Very important'.

Regarding **trout**, an important aim was to detect substitution effects between trout and salmon. The focus groups revealed that consumers differentiated between both preparation forms and pointed at potential substitutions between smoked salmon and smoked trout. Given this, we segregated both preparation forms in the survey in order to gain a better idea of potential substitution effects between trout and salmon. Six questions focused particularly on trout in comparison to salmon. Four questions were based on semantic differential scales ranging from one to five. The first focused on trout in general, the second on fresh trout, the third on smoked trout and the last one on salmon. The order of pairs was always randomized. Following this task participants were asked to state up to three attributes which they perceive as being most important in their purchase of salmon. Afterwards they were asked to do the same for trout based on an identic item list which was expanded by the attribute 'domestic production'. The last two questions were only addressed to those participants who stated to have tried the respective species at least once to twice.

**Coastal fisheries** (shellfish) were addressed in the questionnaire based on six questions. First, participants were presented with a numbered semantic differential scale containing 11 pairs. The order of pairs was randomized. Next, participants from France and the UK who indicated to have at least tried scallops once or twice were asked about the geographical origin of the scallop products they consume. Afterwards, the same group of participants was presented with four different preparation forms of scallops (see Figure 4) and asked what kind of scallop products they mostly purchase.

**Figure 4: Scallop products shown to the participants in France and UK**

 <p>Source: TI/Y. Feucht</p>	Frozen nuts
 <p>Source: Fishor Consulting LTD/S. Mardle</p>	Whole fresh scallops
 <p>Source: Fishor Consulting LTD/S. Mardle</p>	Fresh scallops with roe
Other prepared/preserved products with scallops	For example soup



In a next step, participants of France, Italy and the UK, who had either indicated to have at least tried scallops or, in the case of Italy, clams, were asked to assess the importance of European origin and different sustainability/quality indications with respect to their consumption of scallops/clams on a 5-point Likert scale ranging from 'Not important at all' to 'Very important'. Then, the questionnaire inquired upon the participants' view on a coastal fisheries label using a list of five items and a 5-point Likert scale ranging from 'I do not agree at all' to 'I totally agree'. Finally, participants were probed for their expectations of a coastal fisheries label based on a list of attributes of which they had to choose a maximum of three.

#### 2.2.2.2 SUSTAINABILITY COMMUNICATION ABOUT SEAFOOD

The focus of this section is the investigation of participants' opinions on different ways of information provision and communication about sustainability to consumers. It starts with different agents and their credibility, followed by awareness and relevance of labels for shopping, the use of smartphones while shopping and online shopping opportunities.

We inquired how far the participants trusted information issued by NGOs, state institutions, and retailers/stores. The degree of trust was measured on a 5-point Likert scale ranging from 'Do not trust' to 'Do trust'. Next, we explored participants' views on retailer/store decisions to sell only sustainable seafood based on a list of nine statements and a 5-point Likert scale ranging from 'Do not agree' to 'Agree'.

Participants' awareness of common sustainability labels on seafood products was tested by presenting them a list of sustainability labels. They were asked if they had seen the labels before while shopping fish. The list of labels differed according to the study country in order to account for country differences regarding existing labels on the respective markets. Following this, participants were asked to assess the importance of the labels which they indicated to might have seen and have seen on a 5-point Likert scale ranging from 'Not at all important' to 'Very important'. Finally, participants were asked to state their degree in confidence in labels on a 5-point Likert scale ranging from 'I have no confidence at all' to 'I have total confidence'.

Participants were asked how often they used their smartphone for getting information about seafood products while they were shopping. Answer options were: 'Never', 'Sometimes', 'Regularly' and 'I do not possess a smartphone'. Finally we asked participants if they would be prepared to purchase seafood online. To this question they could either answer with 'No', 'Maybe' or 'Yes'.

### 3 RESULTS AND DISCUSSION

In this chapter we first shortly describe and discuss the results of the focus groups, followed by the results of the online survey. The reason to include the focus group results in this report is a) that they are not published elsewhere and b) that the quantitative online research presented here was based on the outcome of the focus groups. Therefore, a short summary of the focus group results helps to better understand the outcome of the online survey.

#### 3.1 FOCUS GROUPS

The key results of the focus group are presented as bullet points in order to give an overview and at the same time being short. This section starts with the results on the tested seafood species, followed by the perception of organic fish and of ways of communication sustainable seafood production.

##### 3.1.1 PERCEPTIONS OF DIFFERENT FISH SPECIES AND COASTAL FISHERIES, PROMISING APPROACHES FOR PROMOTION

###### Carp

- Carp was foremost perceived as a seasonal fish (Christmas and New Year's Eve).
- Carp was depicted as local specialty with low availability outside the main production areas and out of season.
- Older people, in particular in Poland, possess the skills to prepare carp and appreciate it. Younger people lack these traditional preparation skills and perceive carp as being inconvenient.
- In particular German consumers were concerned about a constant good quality in carp.
- Tested innovative products were met with interest in both study countries. Given this, there is a potential for new carp products in both markets.
- Ways to promote carp consumption: New recipes which are easy to prepare, offering of more convenient products with constant good quality. Offering of carp in restaurants.

###### Plaice

- Processed plaice products are frequently confused with other white fish species in Germany and in Poland. In France, plaice is not part of the white fish but the flat fish segment.
- In France and Italy fresh plaice seems not to be widely known.
- In Italy, a major barrier for fresh plaice is that sole is more known and preferred over other flatfish species originating not from the Italian coast. Therefore increasing the consumption of fresh plaice in Italy will be difficult.
- General barriers: Expensive compared to other whitefish species, low availability, many consumers stated to lack preparation skills for plaice.
- Promising approach to promote plaice consumption in DE and UK: Highlighting its origin from local waters in a concise manner e.g., from the North Sea and then specifying further from which area. The term local alone was perceived as misleading. Sustainability certification appreciated but less important than geographic origin.

### **Trout/Arctic char compared to salmon**

- Trout/arctic char was mainly not perceived as a substitute for salmon and vice versa. Similarities were mostly perceived between the smoked versions of trout/arctic char and salmon. Consumers mostly mentioned that smoked salmon can be a substitute for smoked trout/smoked arctic char and vice versa.
  - Salmon was perceived as a more mundane fish compared to trout.
  - Participants had some concerns about farmed salmon from Norway with respect to taste and healthiness.
  - Polish as well as French participants were more familiar with salmon than with trout and described it as easy to prepare.
  - In Iceland: Arctic char was perceived more as a delicacy and was less available than salmon.
  - In Iceland: Trout and arctic char were perceived as easy to prepare, tasty, local and sometimes as eco-friendly. Barriers for consumption were mainly higher prices and lower availability compared to salmon. Some of the Icelandic participants described salmon as hard to cook compared to Arctic char.
- ➔ Promising approach for the promotion of trout/arctic char: Highlighting its local origin. Trout and arctic char should not be promoted as substitutes for salmon. Instead, their own specific qualities should be emphasised.

### **Coastal fisheries**

- In general participants had a positive view of coastal fisheries. Participants appreciated the particularly high freshness of coastal fisheries products and the economic benefits for local economies. They associated it with an artisanal, traditional and sustainable production.
- Negative associations with coastal fisheries were: Potential of contaminated products due to polluted fishing grounds, less convenient products if not processed, short shelf life if not properly packed and higher prices compared to other fishing methods.
- Perception of a coastal fisheries label: In France and Italy welcomed. In the UK less valued but still appreciated for supermarket sales. Consistent standards and control by an independent body important. Danger of overstraining consumers with another label.
- Promising approach for promotion: Stressing the particular high freshness of the product. Italian participants favored the indication of a catch date in this respect. If applicable, traditional/artisanal catching practice and the close and long lasting relationship in a specific coastal area should be highlighted.

## **3.1.2 CONSUMERS' PERCEPTIONS OF ORGANIC FISH COMPARED TO CAPTURED FISH**

- Participants struggled to define organic aquaculture. Main associations with organic aquaculture were: Eco-friendly farming methods, free of chemicals and additives of any kind, exclusive use of natural feed ingredients.
- Some consumers in Iceland, France and Poland were unaware of the existence of organically certified fish and in all countries some consumers were confused by the differentiation of wild and organic farmed fish. For many of the participants the term organic and wild fish

were basically the same. They did not connect the term organic to farming practices in the context of fish.

- Some participants were sceptical about organic standards and the quality of organic fish. Thus, some consumers preferred wild fish over organically farmed fish. Simultaneously organically farmed fish was perceived as best alternative to conventionally farmed fish by some consumers.

### 3.1.3 COMMUNICATION OF SUSTAINABILITY IN FISH

- Participants in all countries associated sustainability in fisheries and aquaculture mainly with the ecological dimension of sustainability. An additional pronunciation on the social dimension was found in the focus groups in the UK.
- Labels were perceived as indication of quality, as pledge of control and as convenient communication mean. Generally, the presence of sustainability labels was appreciated. Participants in Germany and the UK were rather interested in sustainability labels, while Polish participants were more sceptical about sustainability labels.
- With the exception of Iceland, some participants in all study countries mentioned to be sceptical about the underlying standards and the reliability of sustainability labels. The Icelandic participants trusted domestic seafood and thus perceived no need for sustainability labels. Presumably, this is related to the common belief that the general fisheries management system is ecologically sustainable.
- Many Polish participants perceived sustainability labels not as an advantage but as another factor leading to higher prices.
- Information about sustainable seafood in form of sustainability labels and otherwise was in principal appreciated by participants of all countries. Many consumers, in particular in France and Italy, mentioned to have a lack of information and to like to know more about seafood.
- The use of different offers of information in the purchase decision was frequently questioned and the need to select relevant information in order to avoid information overload became obvious, too.
- Information about sustainable fish has to be distributed by multiple channels (e.g., product packages, internet, TV). The introduction of new sustainability labels in addition to existing ones might not actually support consumers in making more sustainable choices. This is particularly the case for Germany and the UK.
- In particular participants in the German and in the English focus groups perceived retailer commitments to sustainable seafood as convenient and expressed the desire to rely on retailers for making sustainable choices. In contrast, participants in France, Italy and Poland revealed more scepticism towards retailers and questioned if such a commitment can be trusted. The Icelandic participants perceived sustainability commitments by the retail as positive but unnecessary since domestic seafood was already sustainable in their eyes.



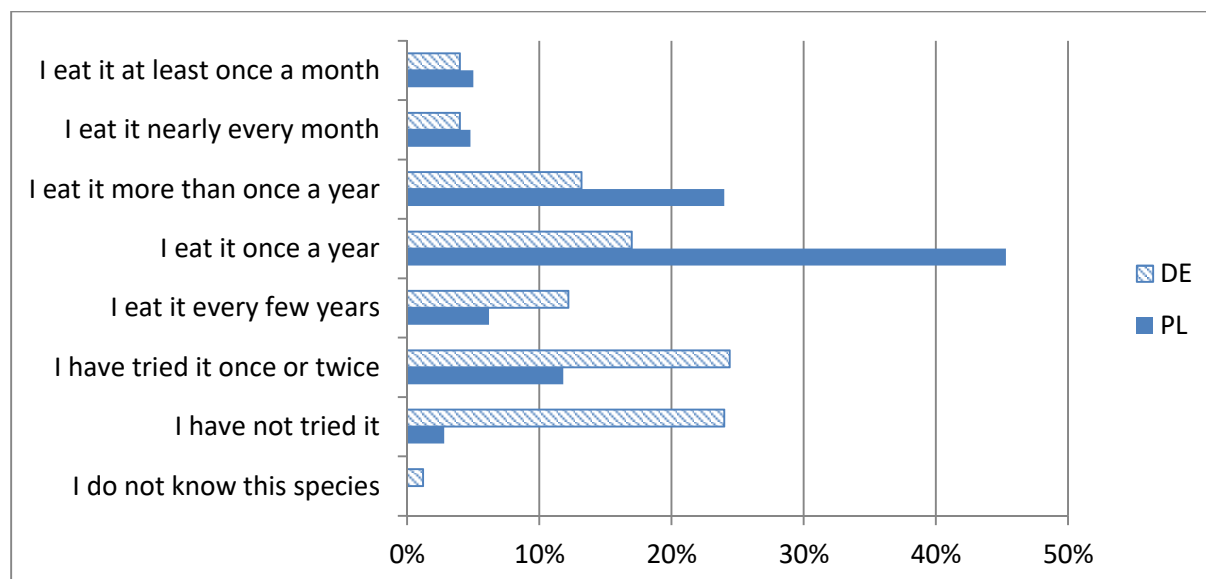
## 3.2 ONLINE SURVEY

This chapter starts with presenting the results of the case studies (seafood species and coastal fisheries) followed by the more general results on information and communication.

### 3.2.1 CONSUMPTION HABITS AND PERCEPTIONS OF CARP AND CARP PRODUCTS

The carp case was investigated in Germany and in Poland. Consumption frequencies of carp differed between Germany and Poland (Figure 5). The majority of the Polish participants (79%) indicated to consume carp once a year or more often, whereas less than half (38%) of the German participants revealed a similar consumption frequency. The share of German consumers 'having tried it once or twice' or 'not tried it at all' was equally high at about 25%.

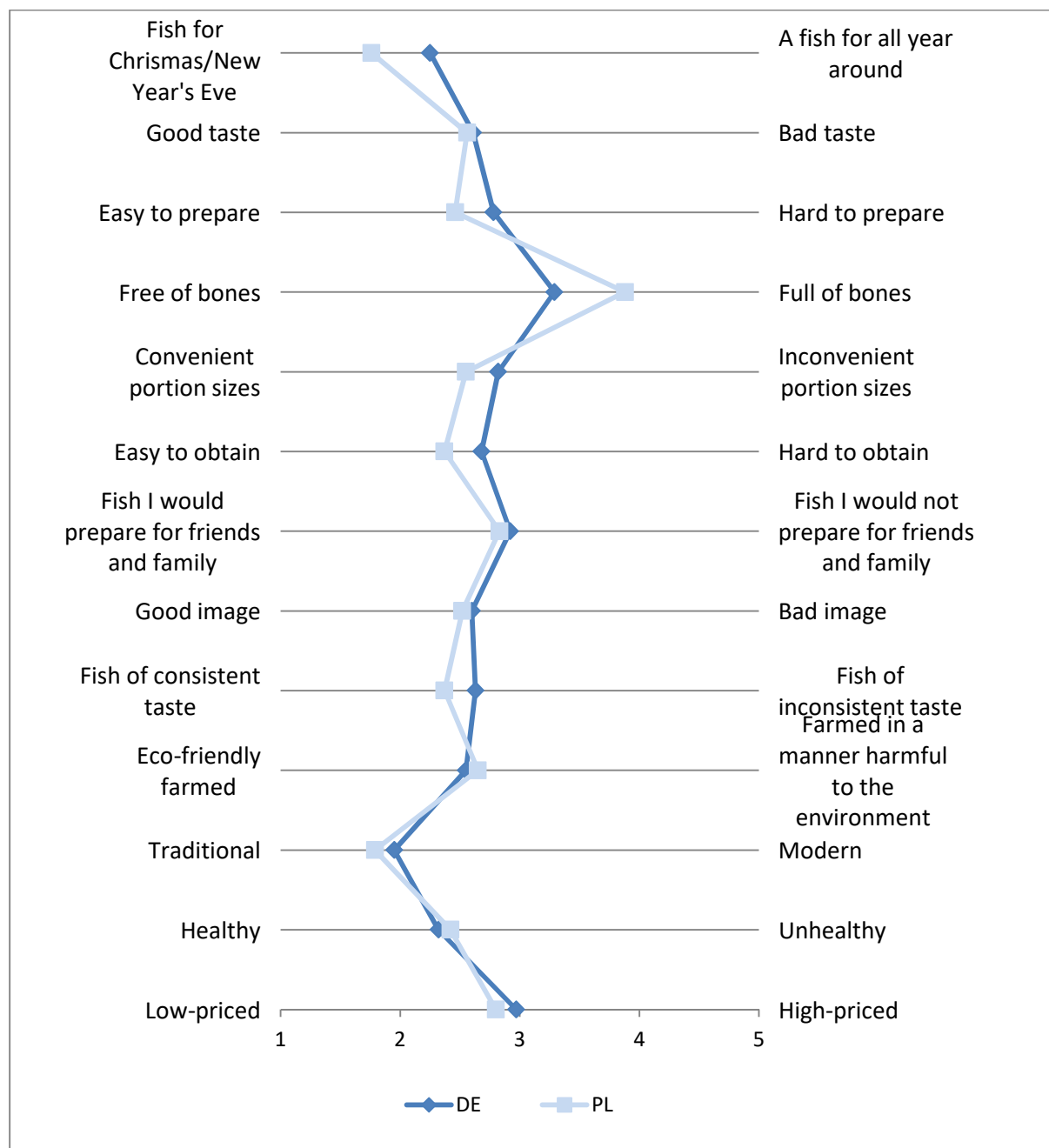
**Figure 5: Consumption frequency of carp by country (% of participants)<sup>1</sup>**



<sup>1</sup> DE-Germany, PL-Poland

In both countries, the differential semantic profile for associations with carp reveals that carp was perceived as a traditional fish for special occasions, i.e. Christmas and New Year's Eve (Figure 6). Particularly in Poland carp was associated with many bones. Interestingly, bad taste or bad image were no issues with carp, so were inconvenient portion sizes. Regarding the other possible associations, participants were mainly indecisive in Poland as well as in Germany.

**Figure 6: Differential semantic profile for associations with carp in Germany and Poland<sup>1</sup>**

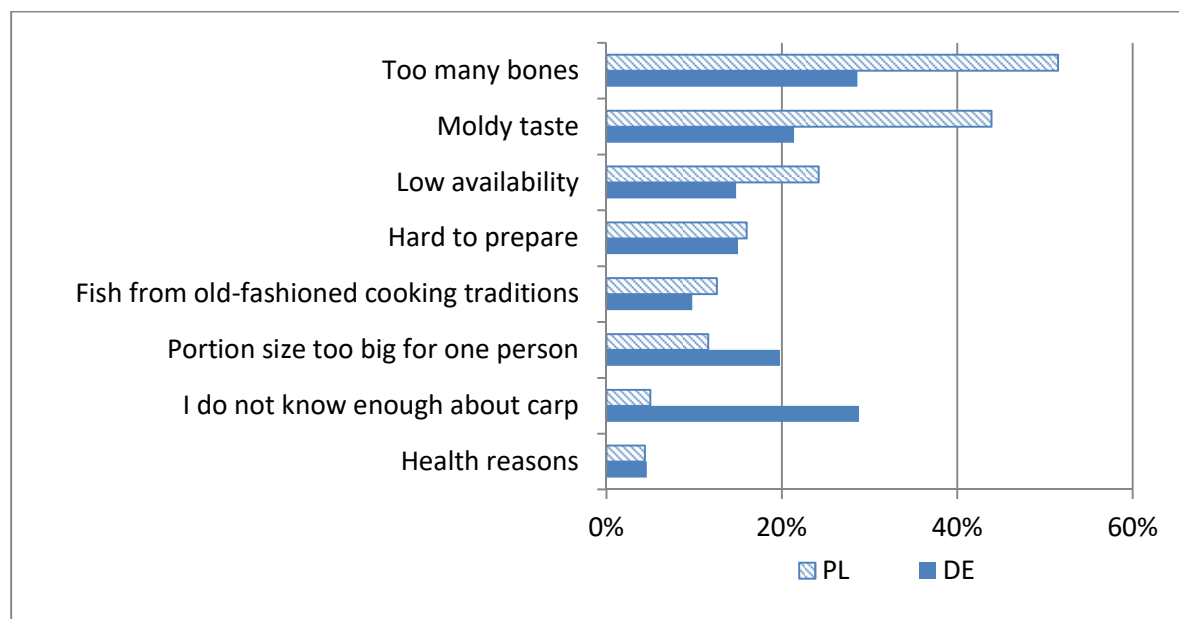


Question: What do you associate with carp? Please choose a point on the scale accordingly.

<sup>1</sup> DE-Germany, PL-Poland

Asked about the main barriers for consuming (more) carp, participants in both countries stated too many bones as being one of the major barriers (Figure 7). In Germany participants perceived insufficient knowledge about carp as an equally important barrier, whereas knowledge deficit was of less importance in Poland. For Polish participants moldy taste presented the second most frequently mentioned barrier, whereas it was the third frequently mentioned barrier in Germany. Polish participants indicated low availability of carp as the third most important barrier. The fourth most indicated barrier was 'hard to prepare' in Poland and 'portion size too big for one person' in Germany. The perception of carp as a fish from old-fashioned cooking traditions was indicated similarly often as a barrier by German and Polish consumers. Likewise, 'hard to prepare' and 'health reasons' were equally often mentioned as a barrier in both countries.

**Figure 7: Main barriers for carp consumption in Germany and Poland (% of participants)<sup>1</sup>**



Question: What mainly hinders you to consume (more) carp? Please indicate up to three reasons.

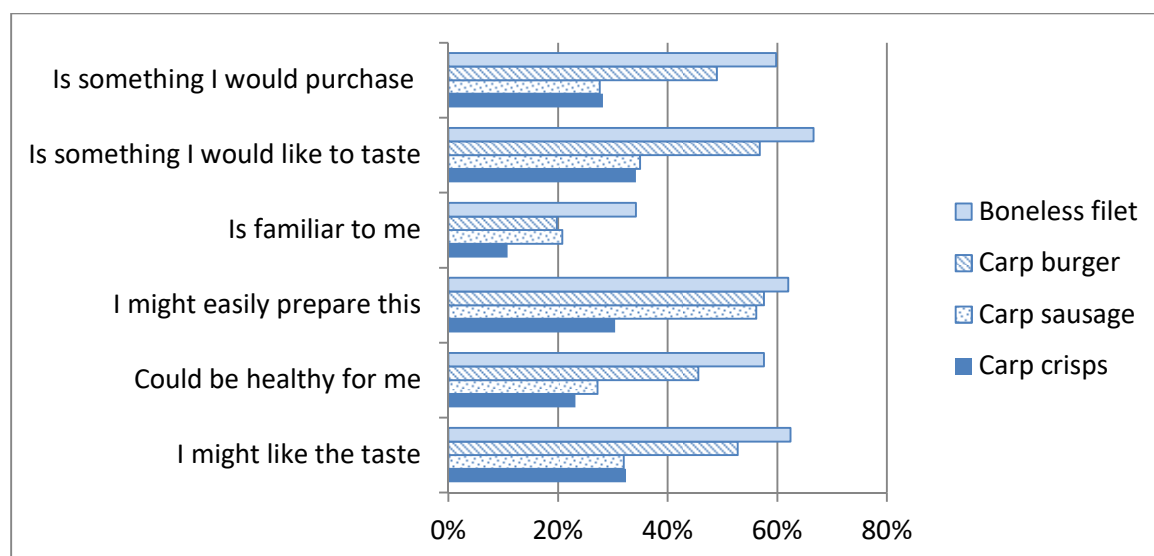
<sup>1</sup> DE-Germany, PL-Poland

Comparing these results with the findings of the focus groups, the quantitative results confirm that carp is foremost perceived as a fish for special occasions. This finding is well in line with results of EUMOFA (2015) who state that carp was mostly consumed during festive seasons (Christian and Jewish) particularly in Eastern and Central Europe. As already found in the focus group research, German participants were more concerned about a constant good quality in carp than their Polish counterparts.

Low availability was a barrier for carp consumption, particularly in Poland. The survey results confirm the existence of an age divide regarding the perception of carp as a fish being hard to prepare in Poland. Polish participants between 18 to 34 years of age described carp significantly more often as hard to prepare than older participants. In Germany, the perception of carp as a fish which is hard to prepare was equally distributed across age groups.

When comparing the different tested carp products it becomes obvious that the German participants had the most positive views about the bonecut ('boneless') filet followed by the carp burger and carp sausage (Figure 8). Carp crisps were the least appreciated by the participants. Only in the case of the bonecut filet and the carp burger, half or nearly half of the German participants could imagine that they might purchase and might like to taste the product as well as that they might like them. The bonecut filet, the carp burger and the carp sausage were perceived by the majority of the German participants as possibly easy to prepare. In the case of the bonecut filet the positive perceptions went along with the highest familiarity and the highest perception as possibly healthy. Carp crisps were the least familiar to the participants and were the least perceived as healthy as well as showed the lowest overall liking.

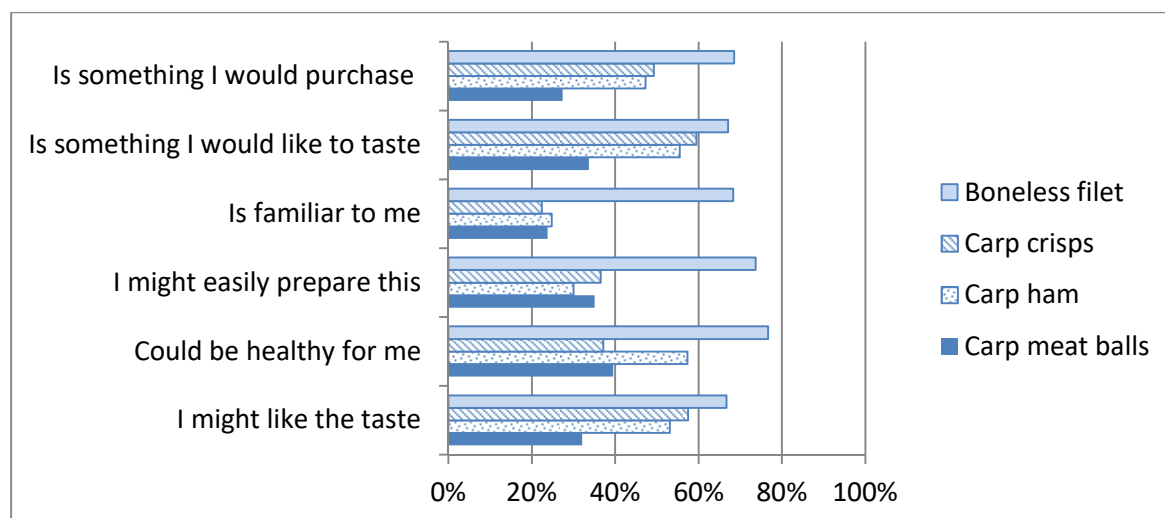
**Figure 8: Perception of different carp products in Germany (% of participants agreeing with the statements; N=500)**



Question: Imagine you see this product while you are shopping for fish. What would be your associations with this product?  
 – Measured on a 5-point Likert scale ranging from 'I do not agree at all' to 'I totally agree'. Scores of 4 and 5 were merged and classified as agreement with the statements.

Polish consumers perceived the bonecut ('boneless') filet the most positively (Figure 8). But in contrast to the German participants, Polish participants held the second most positive view about carp crisps with respect to the possibility that they might purchase the product, would like to taste it, that they might find it easy to prepare and that they might like the taste. Following the bonecut filet and the carp crisps, carp ham was the most positively perceived product. Carp meat balls in vinegar were the least appreciated by the Polish participants. The bonecut filet, the carp crisps and the carp ham were the products which nearly half or more than half of the participants could imagine to purchase, would like to taste and imagined that they might like the taste of. More than half of the Polish participants perceived the bonecut filet and the carp ham as possibly healthy. Polish participants were by far the most familiar with the bonecut carp filet.

**Figure 9: Perception of different carp products in Poland (% of participants agreeing with the statements; N=499)**



Question: Imagine you see this product while you are shopping for fish. What would be your associations with this product?  
– Measured on a 5-point Likert scale ranging from 'I do not agree at all' to 'I totally agree'. Scores of 4 and 5 were merged and classified as agreement with the statements.

Comparing these results with the findings in the focus groups, the presented survey results confirm that there is a potential for 'new' carp products in both markets. For Germany, in particular the bonecut filet and the carp burger were met with interest. In Poland, the bonecut filet and carp crisps were the most appreciated.

The combined findings of the focus groups and the online survey reveal that the abundance of fish bones was one of the main barriers for carp consumption. The bonecut ('boneless') filet is a solution to this problem. In Poland as well as in Germany consumers were interested in the bonecut filet and could imagine purchasing it. Thus, increasing the number of preparations with bonecut filets and promoting it adequately is advisable. In order to open up new market options with the bonecut filet and other carp products it is important that off-flavours (moldy taste) are as far as possible consistently avoided. Off flavors present a serious barrier for carp consumption (see also Varble and Secchi 2013).

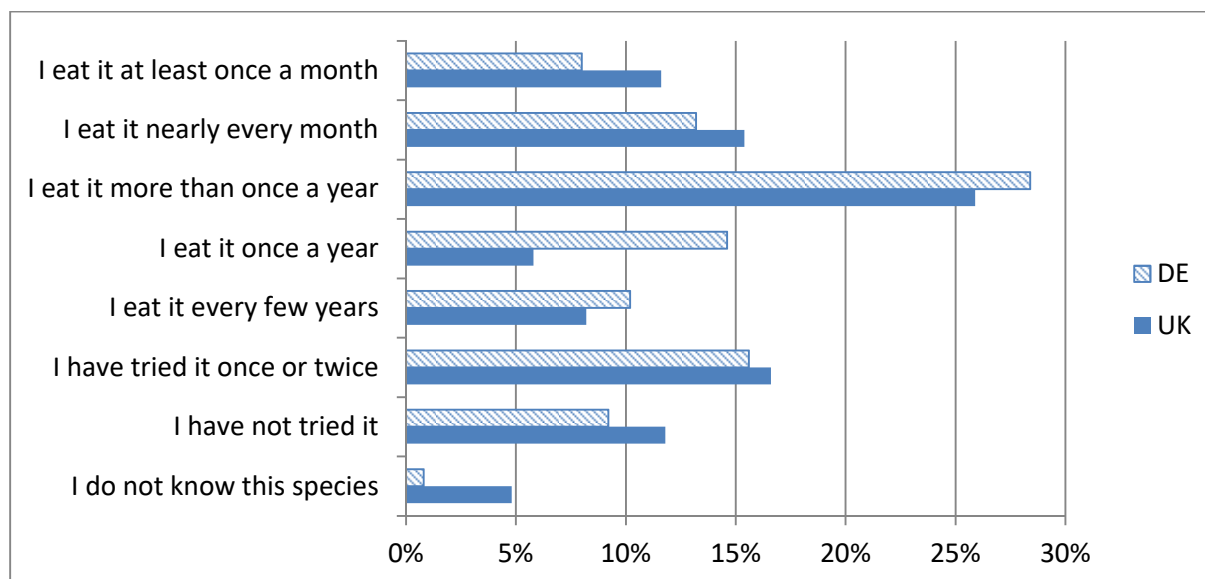
New carp products need to be available year round or according to seasonal requirements (products for barbecue) in order to tackle the barrier of low availability. Studies by, for example, Bätzing (2014) and Guerrero et al. (2009) underline that variety can support the consumption of traditional foods. Higher availability of different carp products will also help to cut the predominant association with the holiday seasons (see also Bätzing 2014). New carp products might be more successful if they are also offered in portion sizes suitable for one person.

Another way of increasing awareness of different preparation forms is to increase carp use in restaurants. The presence of carp products in restaurants can support the awareness of carp products and make carp more accessible to consumers. For example, Bätzing (2014) highlights that the increased efforts to offer carp dishes in restaurants enhanced the local carp consumption in the Aischgrund (a major carp farming area in the South of Germany). Additionally, the organization of specific local events centering on carp and being also attractive for tourists can increase the knowledge about carp and thus the consumption (Bätzing 2014; Varble and Secchi 2013). Another option to enhance knowledge about carp and about the preparation of carp is the wide provision of carp recipes through multiple channels (e.g. at the point of sale or on cooking blogs). This would especially meet the needs of German consumers and of younger Polish consumers.

### 3.2.2 CONSUMPTION HABITS AND PERCEPTIONS OF PLAICE

Study countries for plaice were Germany and the UK (France only focus groups). Consumption habits of plaice differed between participants from Germany and the UK. German participants more frequently (64%) indicated to consume plaice once a year or more often than did participants from the UK (59%) (Figure 10). The share of participants stating not to know plaice and not having tried it was higher in the UK than in Germany. In both countries more than 25% of the participants consumed plaice more than once a year. More participants from the UK indicated to eat plaice on a monthly basis or nearly every month.

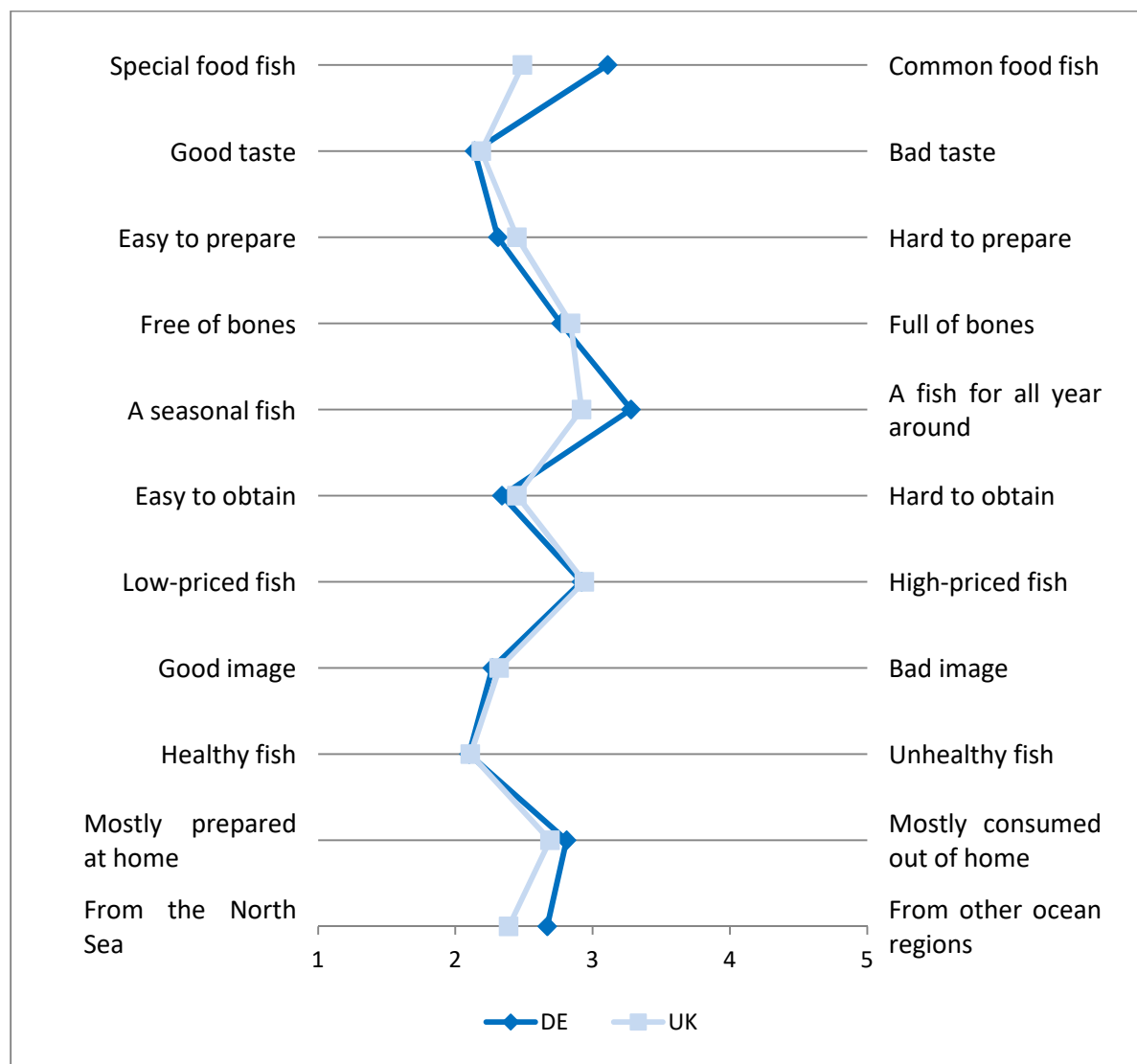
**Figure 10: Consumption frequency of plaice per country (% of participants)<sup>1</sup>**



<sup>1</sup> DE-Germany, UK-United Kingdom

The differential semantic profile for associations with plaice revealed that plaice was generally associated with good taste, easy preparation, a good image, health and good availability in both countries (Figure 11). The results are very similar for Germany and UK. On average, UK consumers more strongly perceived plaice to be a fish for special occasions.

**Figure 11: Differential semantic profile for associations with plaice in Germany and the UK<sup>1</sup>**

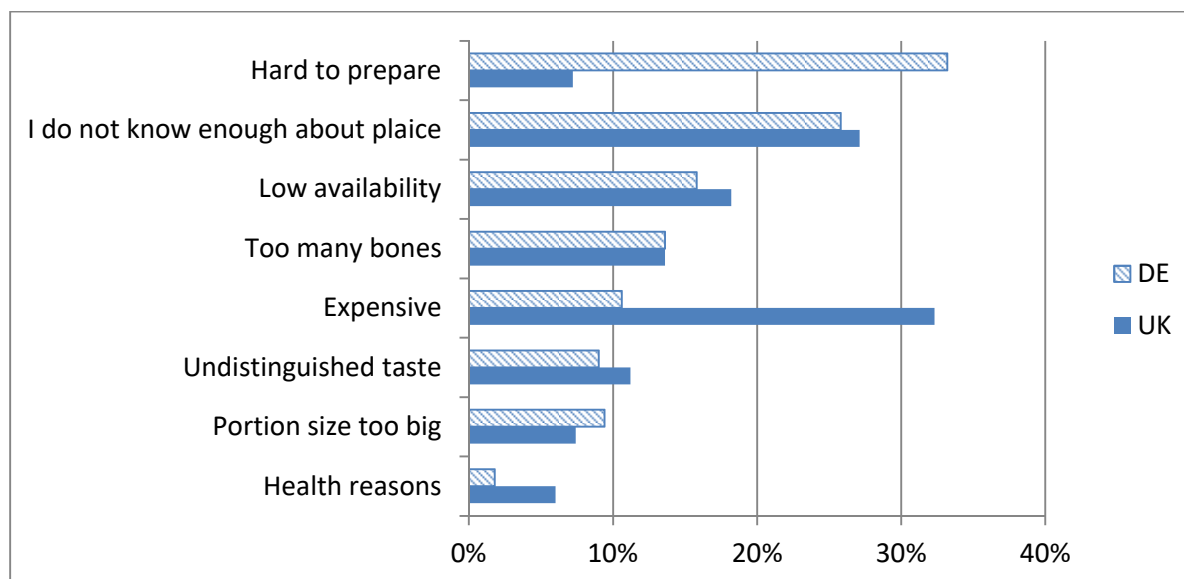


Question: What do you associate with plaice? Please choose a point on the scale accordingly.

<sup>1</sup> DE-Germany, UK-United Kingdom

Main barriers for plaice consumption are the inconvenience in preparation in Germany (it is often sold as whole fish) and the high price in the UK (Figure 12). The second most important barrier was knowledge deficit about plaice in both countries, followed by a low availability. In both countries some participants agreed upon that the amount of fish bones in plaice impedes an increase in consumption.

**Figure 12: Main barriers for plaice consumption in Germany and the UK (% of participants)<sup>1</sup>**



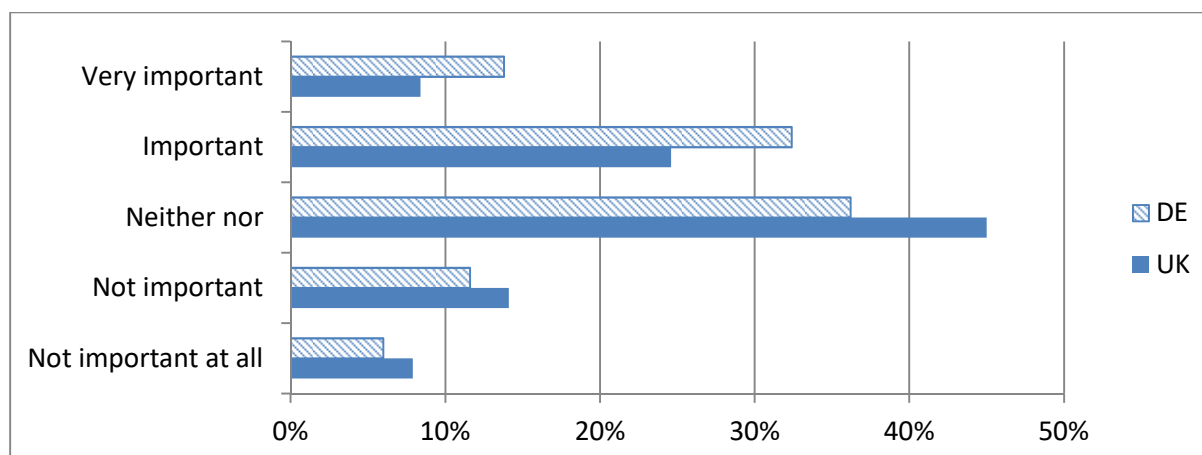
Question: What mainly hinders you to consume (more) plaice? Please indicate up to three reasons.

<sup>1</sup> DE-Germany, UK-United Kingdom

Comparing the results of the online survey with the focus group findings it becomes obvious that price is particularly a barrier for consumption in the UK and to a far lesser extent in Germany. Lack of knowledge about plaice is an issue in both countries. It can be argued that the lack of preparation skills, as found in the focus groups, is mirrored in the 'hard to prepare' barrier, mainly in Germany, as well as in 'I do not know enough about plaice'. The survey confirms low availability of plaice as one barrier for plaice consumption.

Even though UK participants tended to associate plaice more with the North Sea than German consumers, German consumers indicated more frequently (46%) that it was very important or important that the plaice they consume is caught in the North Sea (Figure 13). This share accounts for only 33% in the UK.

**Figure 13: Importance of originating from the North Sea (% of participants who indicated to eat plaice, N=418)<sup>1</sup>**



Question: How important is it to you that the plaice you consume is caught in the North Sea?

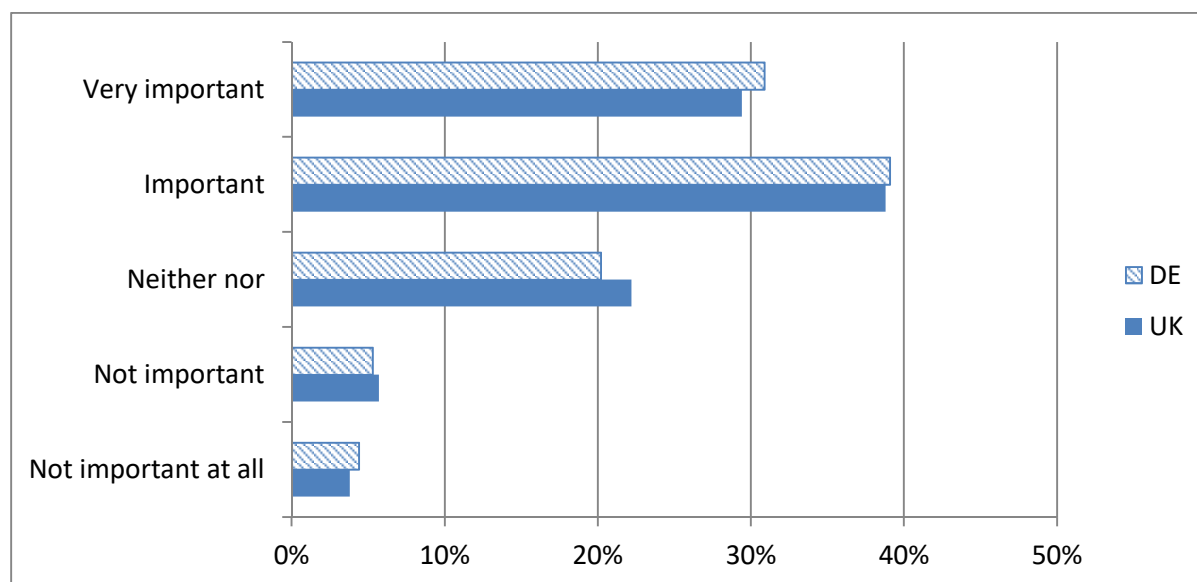
<sup>1</sup> DE-Germany, UK-United Kingdom

Comparing the importance of 'origin from the North Sea' and of 'sustainable fishing', sustainability turned out to be more important. In Germany as well as in the UK about 70% of the consumers



perceived it as 'important' or 'very important' that the consumed plaice is caught in line with sustainability considerations (Figure 14). In both countries the share of participants who attached 'no importance' to this attribute was low with about 10%.

**Figure 14: Importance of sustainability in fishing (% of participants who indicated to eat plaice, N=418)**



Question: How important is it to you that the plaice you consume is caught in line with sustainability considerations?

<sup>1</sup> DE-Germany, UK-United Kingdom

The findings of the survey and to some extent also those of the focus groups point out that some consumers lack the preparation skills for plaice. This holds particularly true for German consumers. This barrier can be addressed by offering preparation advice and recipes through multiple channels (e.g., at the point of sale and on the internet). Some stakeholders of the European fish sector are already engaged in activities of this kind. For example the German fish processor 'Deutsche See' offers a video on 'Youtube' which shows how to filet plaice at home. Such activities will increase knowledge.

The knowledge deficit and the low availability of plaice can further be addressed by offering more explicit plaice products in supermarkets. In offering plaice products which are explicitly communicated in supermarkets consumers will be more frequently confronted with plaice. The focus groups showed that plaice is frequently confused with other white fish species thus far.

In contrast to the findings in the focus groups, the survey participants in both countries attached less importance to the origin of plaice from the North Sea than to sustainability considerations. Nevertheless, almost 50% of the participants in Germany and 35% in the UK attached importance to the origin North Sea. This is in line with earlier studies (e.g., Claret et al. 2012; McClenachan et al. 2016) which found that part of fish consumers appreciate both sustainability considerations and geographic origin and that they are willing to pay a price premium for both attributes. Accordingly, the communication of the plaice's origin from local waters such as the North Sea should be combined with a sustainability indication.

### 3.2.3 CONSUMPTION HABITS AND PERCEPTIONS OF TROUT AND SALMON

Main objective of the inclusion of trout in this research step was to compare trout with salmon from the consumer perspective. Therefore many questions aimed at comparisons between trout and salmon.

In all study countries the consumption of fresh and smoked salmon was higher than the consumption frequency of fresh and smoked trout and trout was less known than salmon (Table 4). The majority of French participants (72%) consumed **fresh** salmon 'more than once a year' or even more frequently. In contrast, just about 39% of the French participants consumed fresh trout 'more than once a year' or more often. In Italy, 73% of the participants consumed fresh salmon 'more than once a year' or more often and about half of them consumed fresh trout as frequently. In Poland, the share of participants consuming fresh trout 'more than once a year' or more often was with 62% similar to salmon 63%.

**Table 4: Consumption frequency of fresh trout and fresh salmon by country (% of participants)**

	France		Italy		Poland	
	Trout	Salmon	Trout	Salmon	Trout	Salmon
I do not know this species <sup>1</sup>	2.2	1.0	1.2	0.4	0.6	0.2
I have not tried it	10.4	2.8	12.1	3.4	7.4	7.2
I have tried it once or twice	17.2	6.2	18.1	9.7	9.0	11.0
I eat it every few years	17.6	8.6	6.9	4.2	8.6	7.6
I eat it once a year	13.8	11.9	8.9	9.4	12.8	10.6
I eat it more than once a year	22.2	31.5	18.3	22.4	31.1	29.7
I eat it nearly every month	9.2	22.2	14.3	21.6	16.6	19.4
I eat it at least once a month	7.2	18.2	17.3	29.4	13.8	14.2
N	499		504		499	

1 The numbers should be the same like in table 5. Differences presumably indicate some misunderstandings by respondents about species and products.

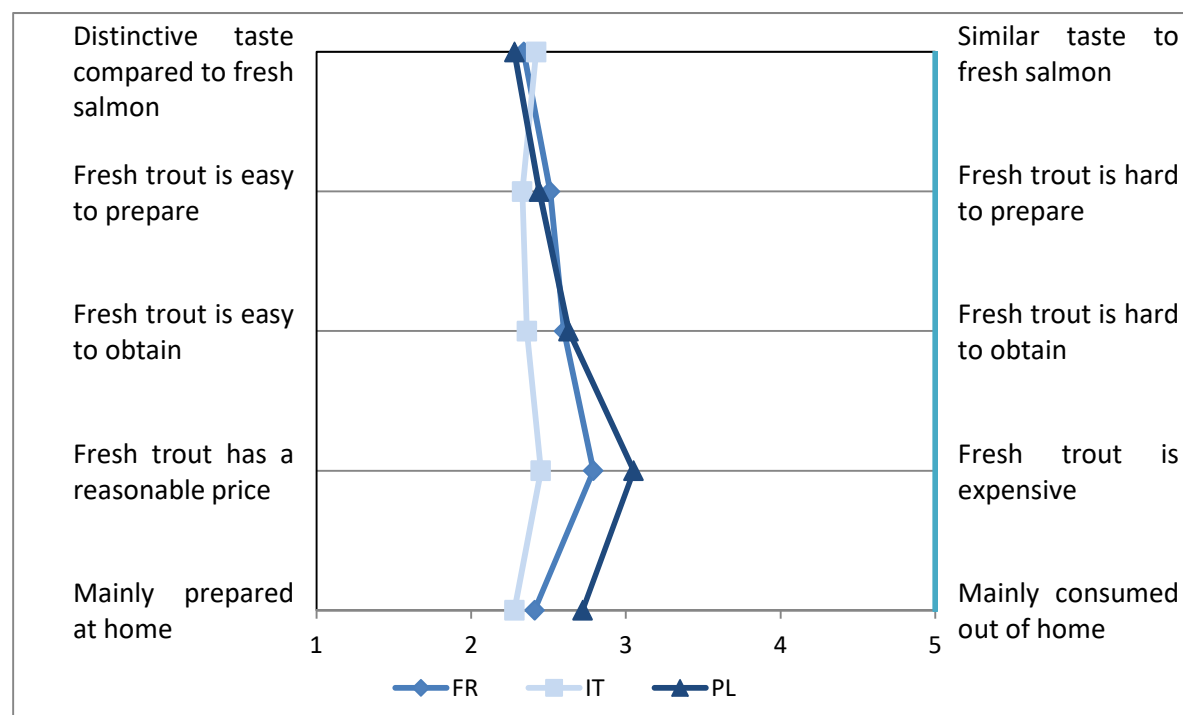
Regarding the consumption of **smoked** trout and smoked salmon a similar picture was given (Table 5). In France 76% of the participants consumed smoked salmon 'more than once a year' or more often, whereas only 49% of the participants indicated to do so for smoked trout. In Italy, 79% of the participants stated to eat smoked salmon 'more than once a year' or more often, whereas about only one third of the Italian participants indicated to consume smoked trout this frequently. 71% of the Polish participants indicated to consume smoked salmon 'more than once a year' or more often and only half of them stated to do so for smoked trout.

**Table 5: Consumption frequency of smoked trout and smoked salmon per country (% of participants)**

	France		Italy		Poland	
	Trout	Salmon	Trout	Salmon	Trout	Salmon
I do not know this species	1.0	0.6	3.6	0.2	1.6	0.6
I have not tried it	11.4	2.0	27.4	3.4	11.2	4.4
I have tried it once or twice	16.0	5.0	16.9	5.8	12.2	10.0
I eat it every few years	12.2	5.8	6.7	3.2	9.4	4.6
I eat it once a year	10.0	10.4	10.7	8.3	13.8	9.6
I eat it more than once a year	29.5	37.7	17.7	29.2	29.7	29.5
I eat it nearly every month	10.6	21.0	10.5	21.4	14.8	23.2
I eat it at least once a month	9.2	17.4	6.5	28.6	7.2	18.0
N	499		504		499	

The differential semantic profile for associations with fresh trout shows that, on average, participants in all study countries are almost indecisive when asked for differences in taste compared to fresh salmon (Figure 15). In all countries, participants described fresh trout as easy to prepare and as easy to obtain. Compared to French and Italian participants, a higher share of Polish participants perceived fresh trout to be expensive.

**Figure 15: Differential semantic profile for associations with fresh trout in France (FR), Italy (IT) and Poland (PL)**

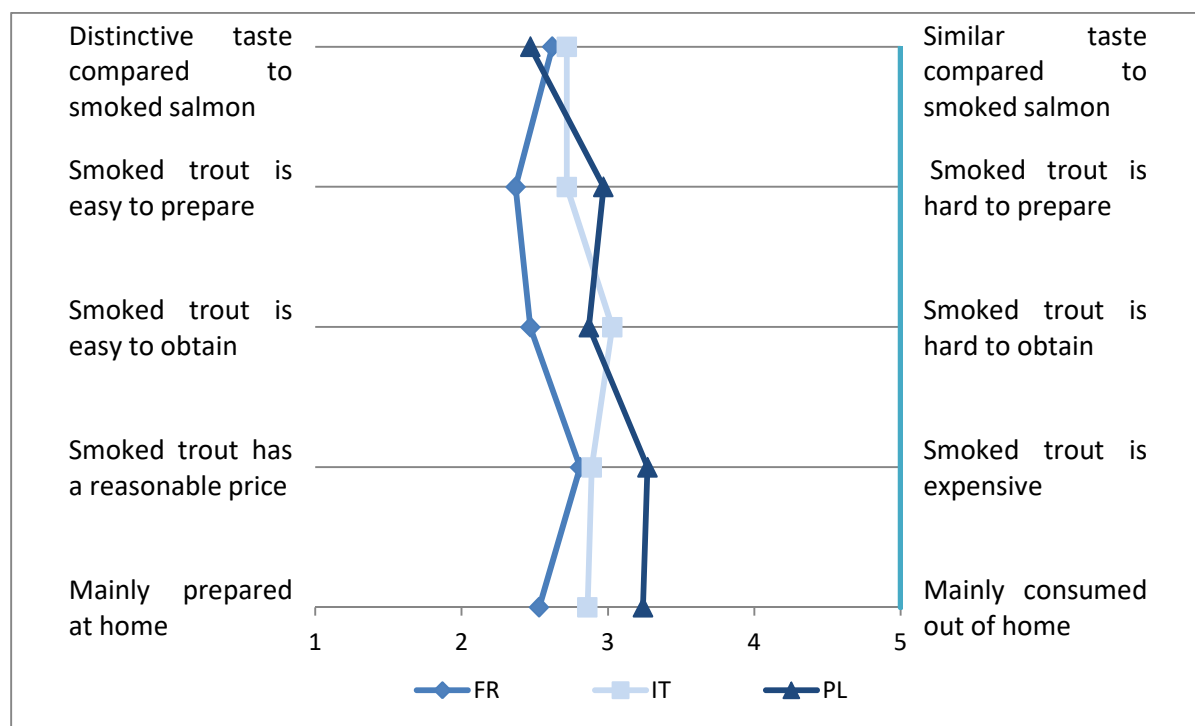


Question: What do you associate with fresh trout? Please choose a point on the scale accordingly.

With smoked trout the results differ more between countries (Figure 16). The differential semantic profile for associations reveals that participants of all study countries on average tended to opt for the neither nor option. Smoked trout was generally described as easy to prepare but more so by SUCCESS Deliverable 2.4

French consumers than by Italian and Polish ones. French consumers also tended more to state that smoked trout is easy to obtain than did Italian and Polish consumers. Regarding the price of smoked trout French and Italian participants perceived it as more reasonable than did Polish consumers.

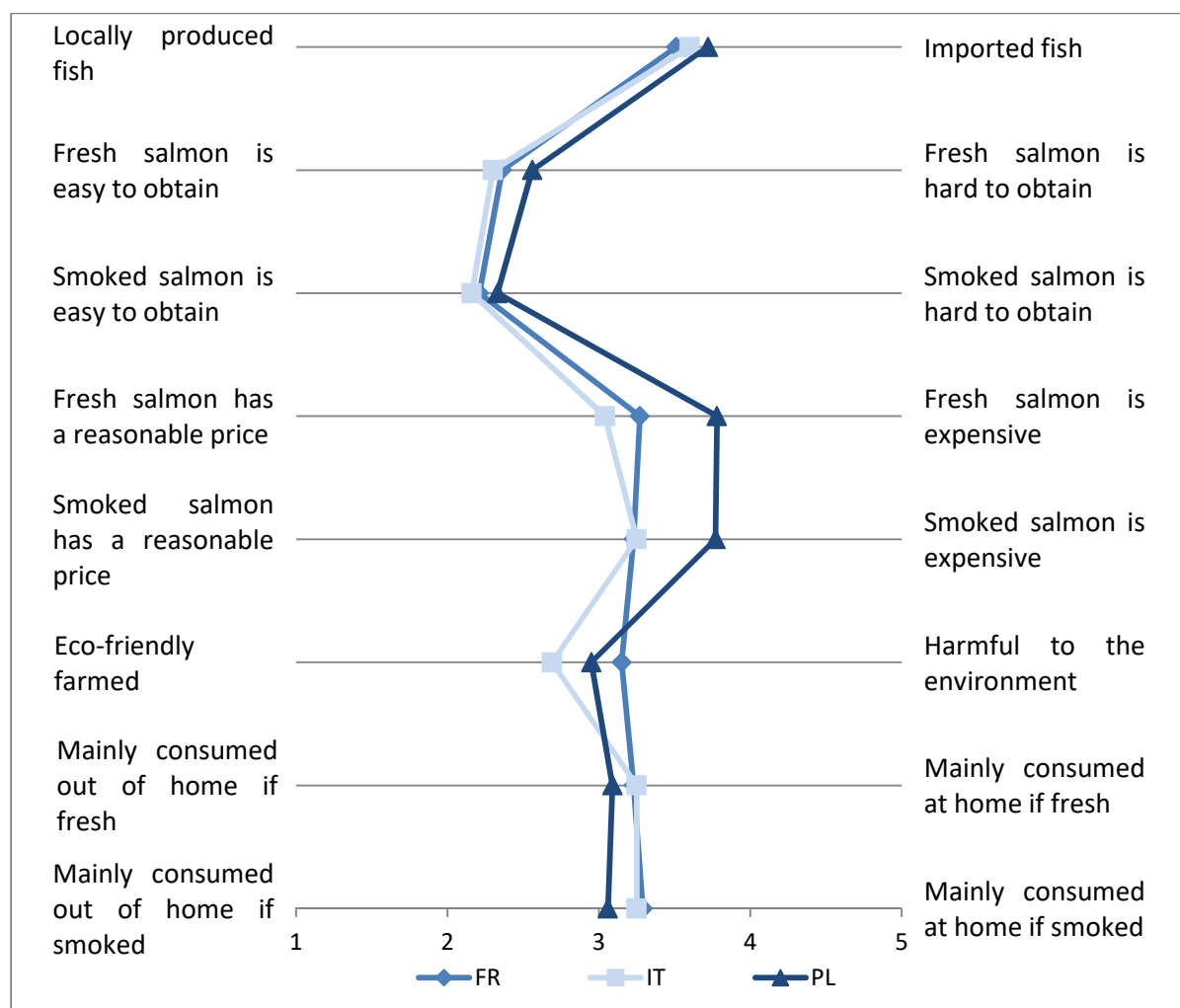
**Figure 16: Differential semantic profile for associations with smoked trout in France (FR), Italy (IT) and Poland (PL)**



Question: What do you associate with smoked trout? Please choose a point on the scale accordingly.

The differential semantic profiles for associations with salmon are very similar in all study countries (Figure 17). Fresh and smoked salmon is perceived to be rather easy to obtain. In Poland, consumers associate higher prices with fresh as well as with smoked salmon. Regarding the impact of salmon farming on the environment, on average consumers are undecided, although some differences between countries existed.

**Figure 17: Differential semantic profile for associations with salmon in France (FR), Italy (IT) and Poland (PL)**

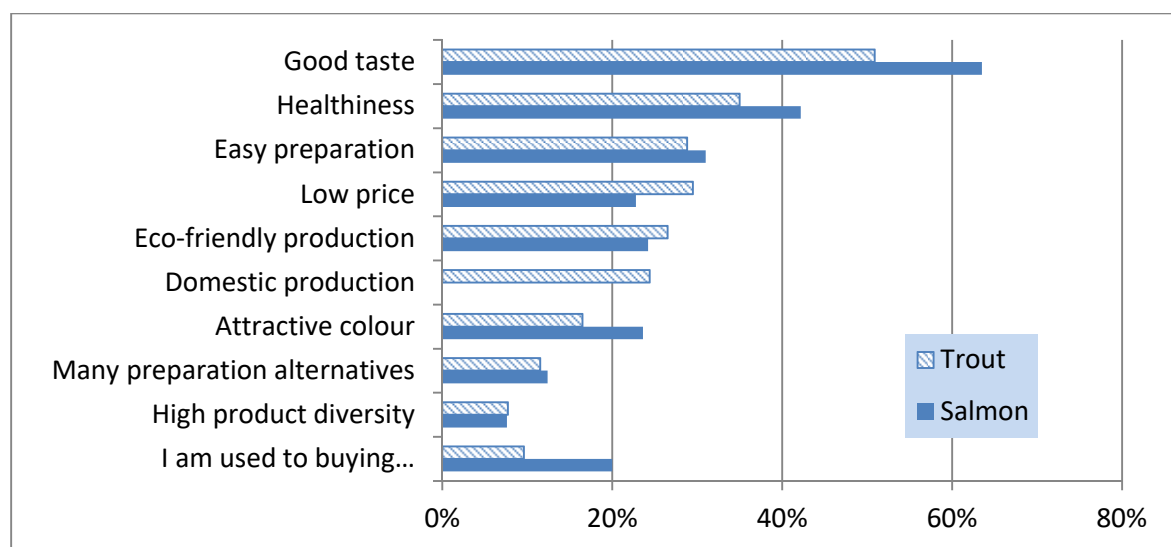


Question: What do you associate with salmon? Please choose a point on the scale accordingly.

Following the differential semantic association exercise, participants were asked which attributes are most important in their purchase of salmon respectively trout.

In France the good taste of both salmon and trout was indicated most often as an important purchase attribute (Figure 18). Good taste was significantly more often mentioned as an important attribute in the case of salmon than in the case of trout. The second most stated attribute was healthiness in both cases. Healthiness was more frequently mentioned in relation to salmon than in relation to trout. The third most frequently indicated attribute was easy preparation. Again this attribute was more frequently mentioned for salmon than for trout. In contrast, low price and eco-friendly production were more important in the purchase of trout than in the purchase of salmon. Nearly 25% of the French participants stated that the domestic production was an important purchase attribute of trout. In the purchase of salmon attractive colour and the habit of purchasing it were more important than in the case of trout. 'Domestic production' was much less important than in Italy and Poland.

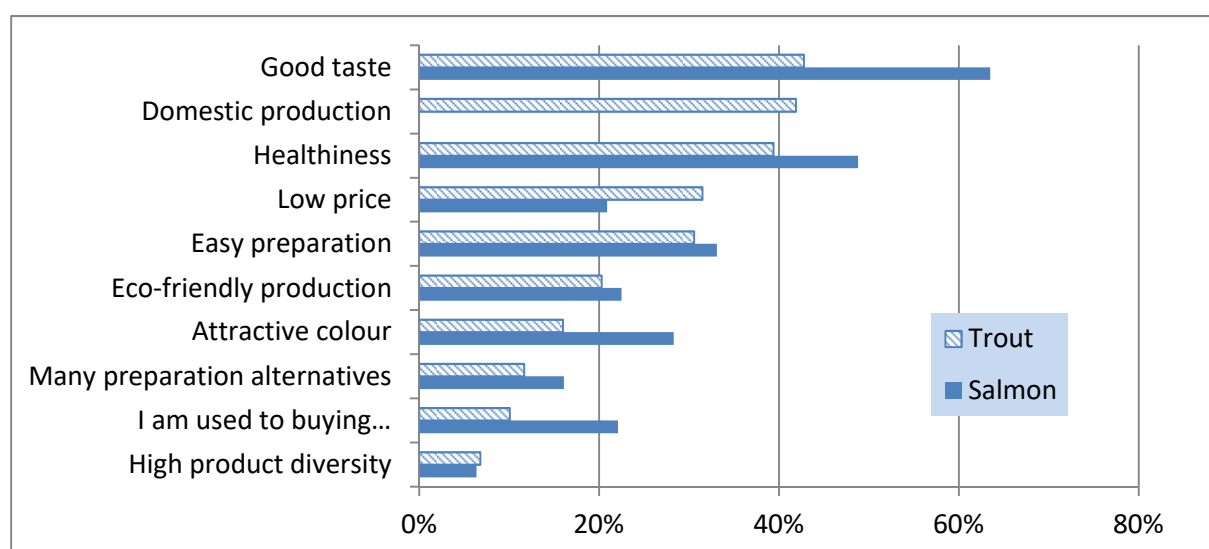
**Figure 18: Importance of attributes for the purchase of salmon/trout in France (% of participants who indicated to eat salmon/trout, N=491 (salmon), 468 (trout))**



Question: Which of the following attributes are most important for you in your purchase of salmon/trout?

The Italian consumers attached the highest importance to good taste followed by domestic production and healthiness when purchasing trout (Figure 19). In contrast, the most important purchase attributes for salmon were good taste, followed by healthiness and easy preparation. Low price, easy preparation and eco-friendly production were the fourth, fifth and sixth most mentioned purchase attributes for trout. Whereas the ranking for salmon was: Attractive colour, eco-friendly production and habit of purchasing salmon. Similar to France, the attributes 'many preparation alternatives' and 'high product diversity' were the least mentioned purchase attributes in the case of trout and of salmon.

**Figure 19: Important attributes for the purchase of salmon/trout in Italy (% of participants who indicated to eat salmon/trout, N=498 (salmon), 444 (trout))**

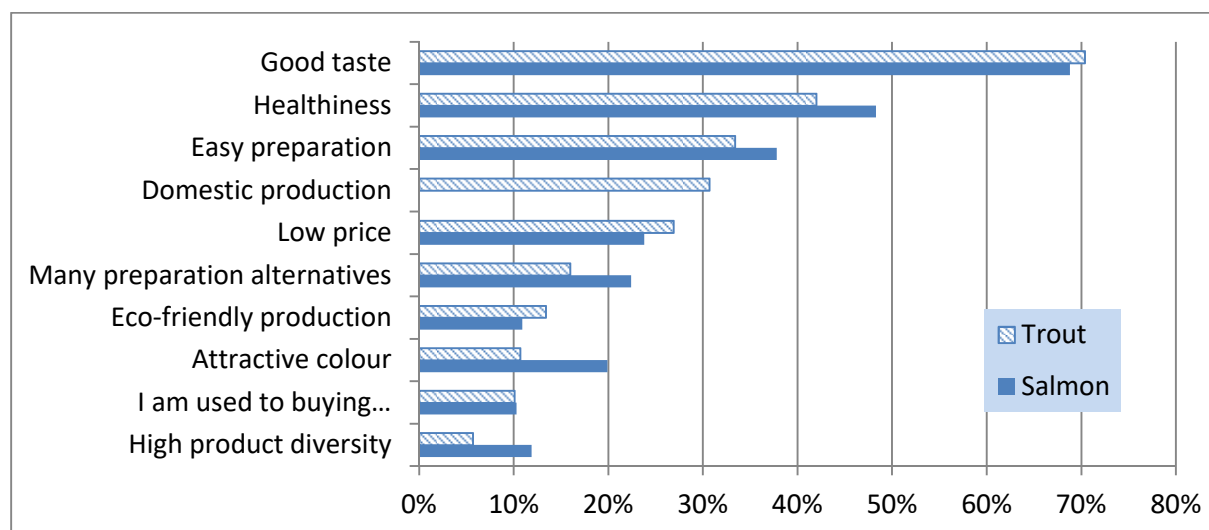


Question: Which of the following attributes are most important for you in your purchase of salmon/trout?

Polish participants attached the highest importance to good taste, healthiness and easy preparation when purchasing trout as well as salmon (Figure 20). Domestic production of trout was an important purchase attribute to 31% of the Polish consumers. Low price was the fifth most mentioned attribute for trout and the fourth most mentioned one for salmon. Low price was significantly more frequently

indicated as an important purchase attribute for trout than for salmon. ‘Many preparation alternatives’ followed the price in importance in both cases, but with significant differences. ‘Eco-friendly production’ ranked rather low. A share of 20% indicated that attractive colour was an important attribute for purchasing salmon whereas 11% of the participants stated this for trout.

**Figure 20: Important attributes for the purchase of salmon/trout in Poland (% of participants who indicated to eat salmon/trout, N=487 (salmon), N=476 (trout))**



Question: Which of the following attributes are most important for you in your purchase of salmon/trout?

In all study countries trout was less known than salmon and in the case of France and Italy participants consumed less trout than salmon. The survey results also verify that trout was viewed as a tasty, healthy and a domestic product. In Italy over 40% of the participants indicated the domestic origin of trout as an important purchase attribute. In Poland 30% of the participants and in France 24% of the participants attached importance to this attribute. Nonetheless, tastiness and healthiness were more frequently indicated as important purchase attributes for salmon than for trout.

In contrast to the focus group findings the participants in all study countries more often indicated a low price to be an important purchase attribute for trout than for salmon. Trout was associated with reasonable prices to medium prices whereas salmon was perceived as expensive in all countries. Particularly, Polish consumers perceived salmon (fresh and smoked) as expensive and also described smoked trout as rather expensive. For Eastern European consumers, price seems to be a stronger barrier for fish consumption than for Middle and Central European consumers (see also DG Mare 2008; Pieniak et al. 2011).

In the focus groups, participants stated the lower availability of trout compared to salmon as a barrier for trout consumption. This statement was to some extent reflected in the findings of the semantic differentials for trout and salmon. The perception of availability of trout differed between countries and for the two tested forms fresh and smoked. Italian participants perceived particularly fresh trout as easier to obtain than did the participants from France and Poland. In contrast, particularly French participants indicated that smoked trout is easy to obtain. In France, some reservation regarding Norwegian salmon was found in the focus groups.

One of the research questions was about substitution effects between trout and salmon. Do both fish species compete in the same market segment? While a substitution was mentioned only regarding the smoked forms of trout and salmon in the focus groups, participants of the online survey did not indicate marked differences in taste between both species, neither with smoked nor with fresh fish. This might lead to the conclusion that substitution exists. The findings of the focus groups and of the online survey did not bring evidence of substitutability between trout for and salmon, even though some consumers sensed similarities in taste when it came to the smoked



product. Further research on this topic is needed which should also consider the different products offered in different countries – in Italy and France smoked trout is orange like salmon, and in Poland pale, almost grey.

In any case, it is advisable to promote trout based on its own qualities and not as a substitute for salmon. Since the results show that domestic production is an important purchase attribute of trout and considering that our own results in the deliverable 2.2 (Feucht et al. 2017) and various further studies (e.g., Brécard et al. 2009; Claret et al. 2012) highlight that fish consumers are willing to pay price premiums for domestic origin, it appears promising to promote the local origin of trout.

### 3.2.4 CONSUMPTION HABITS OF ARCTIC CHAR

Due to its relevance for the Icelandic project partner a question on consumption habits of arctic char was included in the questionnaire. The results reveal that more than half of the participants were either unfamiliar with arctic char or had not tried it before (Table 6). The highest share of unfamiliar participants was found in the UK, followed by France and Italy. Arctic char was best-known in Germany. The share of participants in each country who consumed arctic char at least once a year or more ranged from 33% in Germany to 12% in the UK.

**Table 6: Consumption habits of arctic char by country (% of participants)**

	All	DE	FR	IT	PL	UK
I do not know this species	37.4	10.8	44.5	41.3	37.3	53.3
I have not tried it	26.4	33.8	23.2	24.4	22.6	28.1
I have tried it once or twice	8.3	13.2	7.6	6.3	10.0	4.4
I eat it every few years	5.5	9.2	6.8	3.6	5.8	2.2
I eat once a year	5.4	8.4	4.0	5.2	6.6	2.8
I eat it more than once a year	9.0	16.4	6.2	8.9	9.8	3.8
I eat it nearly every month	4.7	4.2	4.4	6.5	4.8	3.4
I eat it at least once a month	3.2	4.0	3.2	3.8	3.0	2.0

<sup>1</sup> DE-Germany, FR-France, IT-Italy, PL-Poland, UK-United Kingdom

### 3.2.5 CONSUMERS' PERCEPTIONS OF COASTAL FISHERIES AND CONSUMPTION HABITS AND PERCEPTIONS OF CLAMS AND SCALLOPS

In addition to different fish species also the potential of coastal fisheries was analysed in selected study countries. The research on coastal fisheries was combined with the two seafood species clams (Italy) and scallops (France and UK). This chapter starts with the description of the results on consumers' perceptions of coastal fisheries and a coastal fisheries label followed by the description of consumption habits and perceptions of the coastal fisheries examples of clams and scallops.

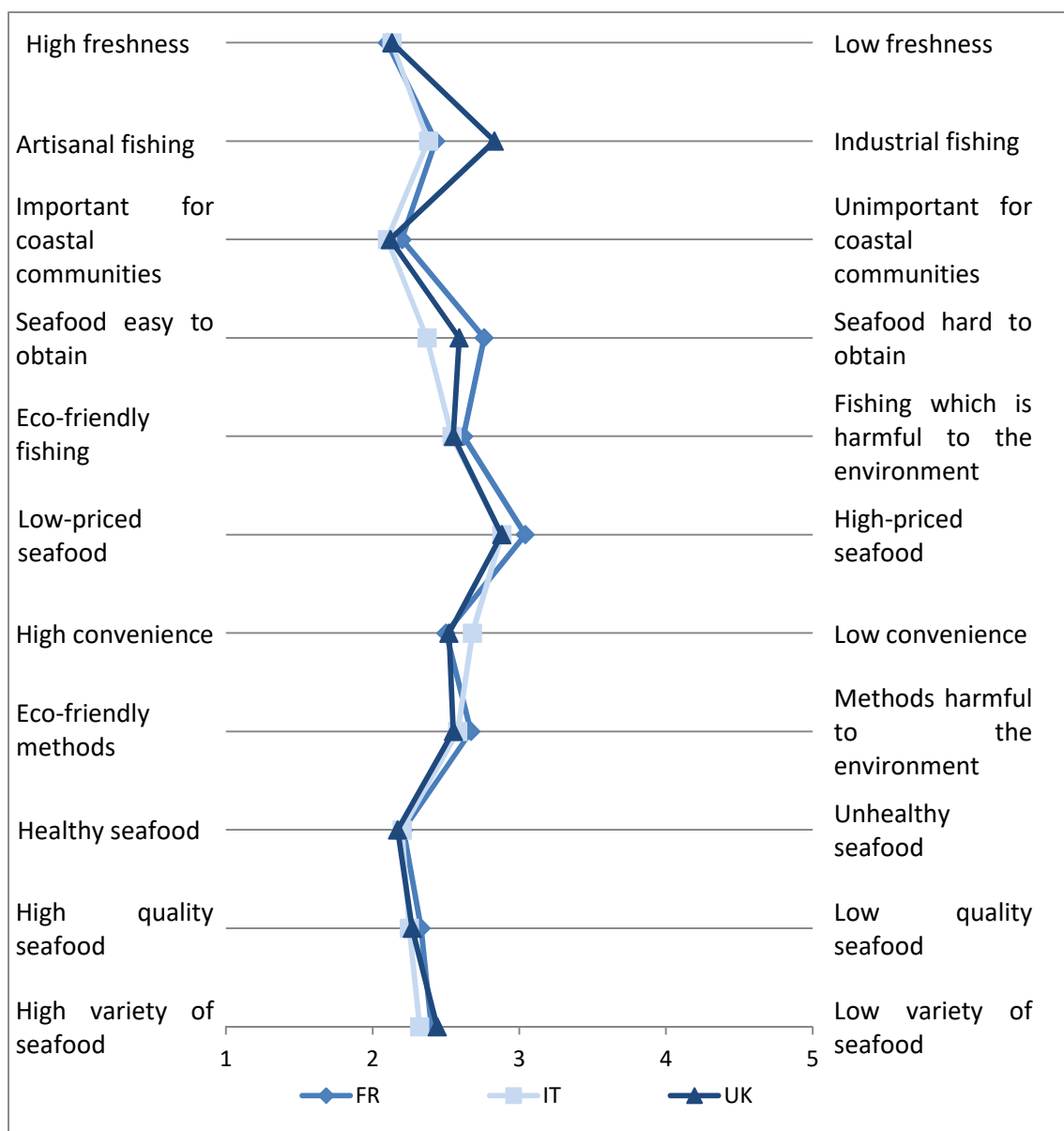
#### 3.2.5.1 CONSUMERS' PERCEPTIONS OF COASTAL FISHERIES AND A COASTAL FISHERIES LABEL

The differential semantic profile for associations with coastal fisheries revealed a generally positive attitude toward coastal fisheries (Figure 21). Participants in all three study countries had similar positive associations with coastal fisheries with respect to freshness, importance for coastal communities, healthiness and high quality as well as a great variety of seafood. Some differences



existed regarding the perceptions of coastal fisheries to be artisanal and the ease of obtaining its products.

**Figure 21: Differential semantic profile for associations with coastal fisheries in France, Italy and the UK**



Question: What do you associate with salmon? Please choose a point on the scale accordingly.

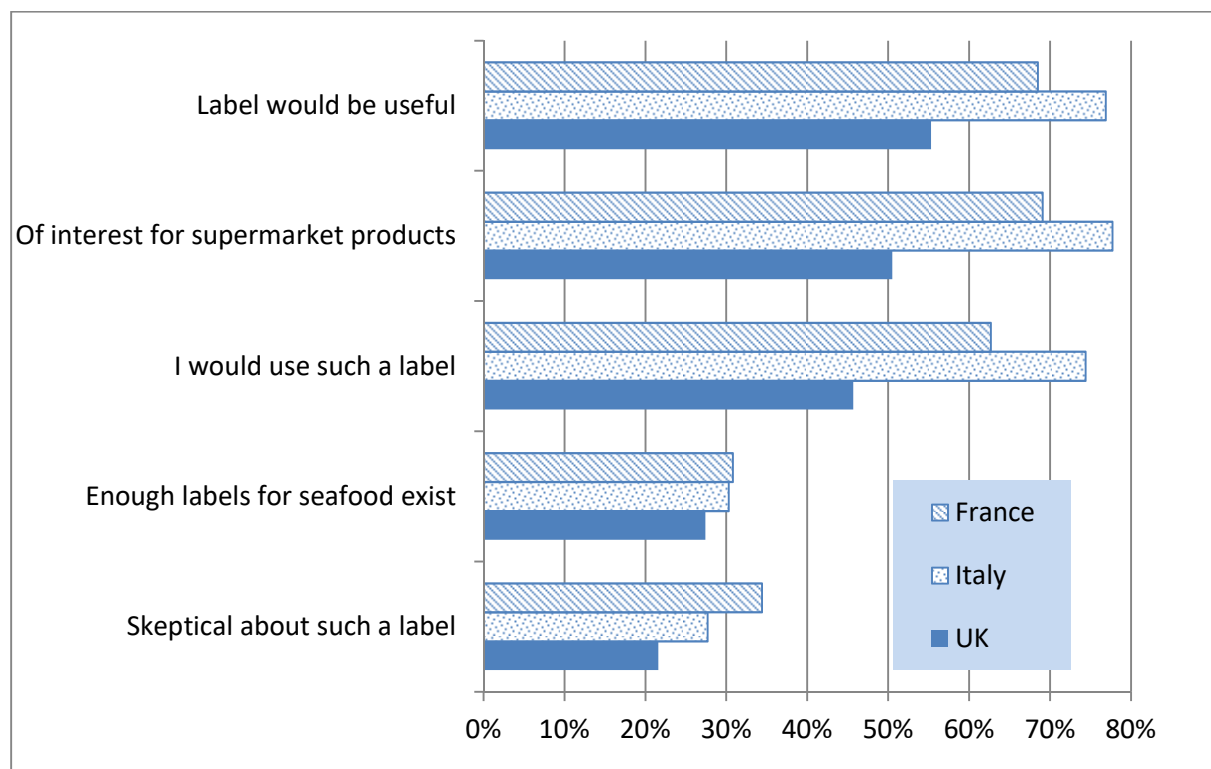
The comparison of the findings of the survey and of the results of the focus groups confirms that consumers in France, Italy and the UK generally hold a positive view of coastal fisheries. Participants appreciated a better freshness of seafood from coastal fisheries as well as the economic benefits for coastal communities. Furthermore, they acknowledged the eco-friendliness of coastal fisheries, the production of high quality seafood and a broad variety of products.

Labels are an important means of communicating specific production conditions. That is why participants were asked for their attitudes towards a coastal fisheries label (Figure 22). In all study countries the majority of the participants was in favour of a coastal fisheries label. Participants in Italy and to a slightly lesser extent in France, agreed that a coastal fisheries label would be useful,

that it would be of particular interest for supermarket products and that they would use such a label in their purchase decision. Among UK participants the support of this kind of label was less pronounced.

Even though the majority of participants in each country perceived a coastal fisheries label as useful, some scepticism about such a label and the perception of having already enough labels on seafood were also expressed. The share of sceptical participants ranged from 22% in the UK to 34% in France.

**Figure 22: Attitudes towards a coastal fisheries label<sup>1,2</sup>**



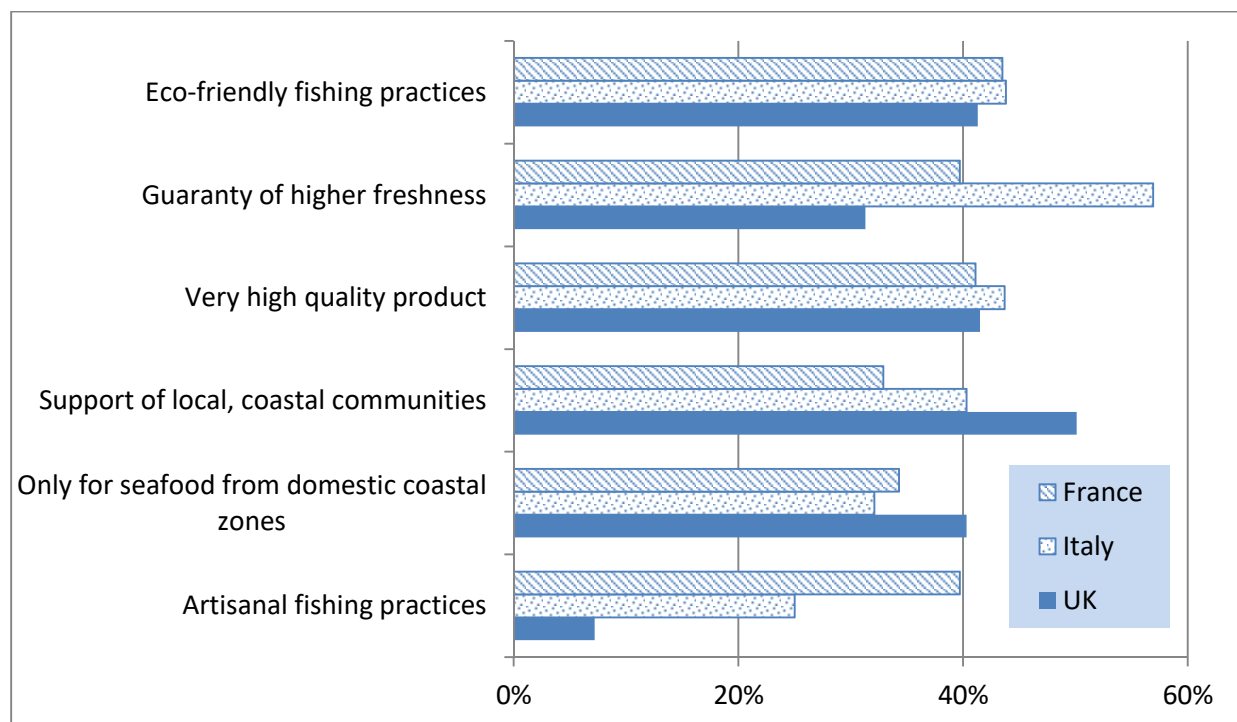
Question: What is your view on a coastal fisheries label?

<sup>1</sup> Share of participants who chose 'I agree' and 'I totally agree'. Measured on a 5-point Likert scale ranging from 'I do not agree at all' to 'I totally agree'. Scores of 4 'I agree' and 5 'I totally agree' were merged and classified as important.

<sup>2</sup> N - FR = 499, IT = 504, UK = 501

Following this exercise, participants were asked about their expectations of a coastal fisheries label (Figure 23). About 40% of the participants in all countries expected this kind of label to indicate eco-friendly fishing practices and a very high quality product. For the other listed expectations some differences were found. While for the Italian participants greater freshness was a major expectation, for UK participants the support of local, coastal communities was rather important. Participants from the UK were the most convinced that a coastal fisheries label should only be applicable for seafood from domestic coastal zones, followed by French and Italian consumers. Artisanal fishing practices were particularly appreciated to be a characteristic of this kind of label and much less by UK participants.

**Figure 23: Expectations of a coastal fisheries label in France, Italy and the UK (% of participants)**



Question: Imagine the introduction of a label indicating that the respective seafood does originate from coastal fisheries. What would you expect from such a label? Please indicate up to three expectations.

The survey results also confirm that a label for seafood from coastal fisheries would be evaluated differently by consumers in the three study countries. In all study countries, a large share of the participants agreed that a label would be useful, of interest for supermarket products and that they would use such a label. The interest in such a label was particularly high in Italy followed by France and comparatively low in the UK. Nevertheless, in all countries also some scepticism regarding a coastal fisheries label was present.

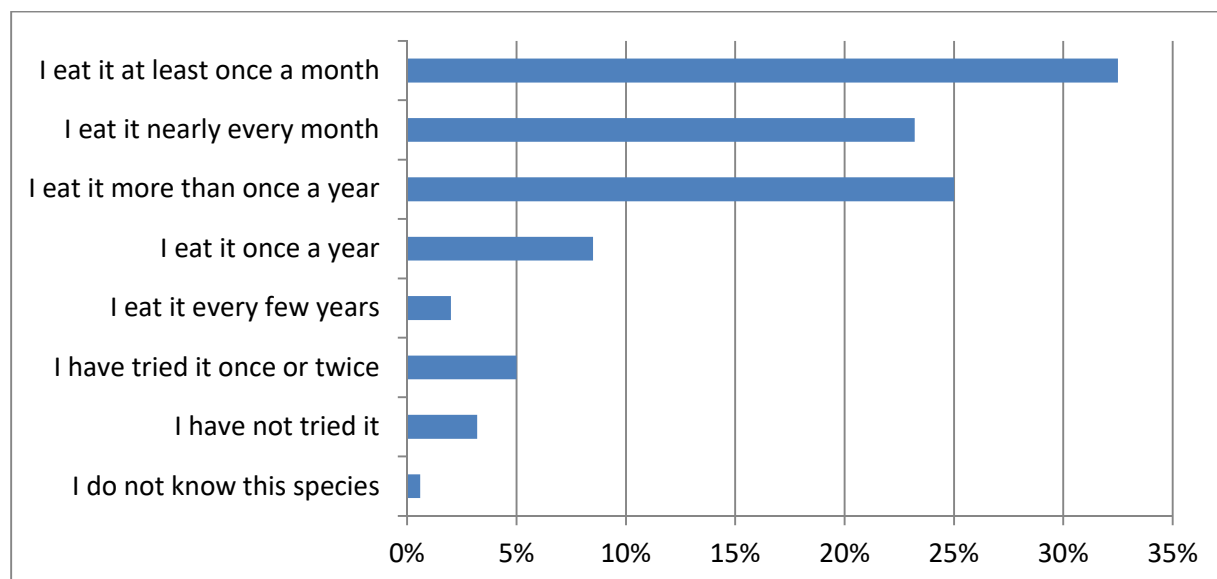
In line with the focus group findings, survey participants expected from a coastal fisheries label to indicate eco-friendly fishing practices and very high quality products. Some differences were detected for further expectations of a coastal fisheries label: Italians expected such a label to guarantee freshness, French to indicate artisanal fishing practices, and UK participants to include the support of local, coastal communities. In all study countries a coastal fisheries label including only seafood from domestic coastal zones was appreciated. The results, on the one hand show the widely varying expectations consumers have regarding such a label, on the other hand they mirror the uncertainties regarding the meaning and implications of 'coastal fisheries'.

### 3.2.5.2 CONSUMPTION HABITS AND PERCEPTIONS OF CLAMS AND SCALLOPS

In order to better align consumers with typical products from coastal fisheries important examples of seafood from coastal fisheries were given. These examples were clams in Italy and scallops in France and in the UK.

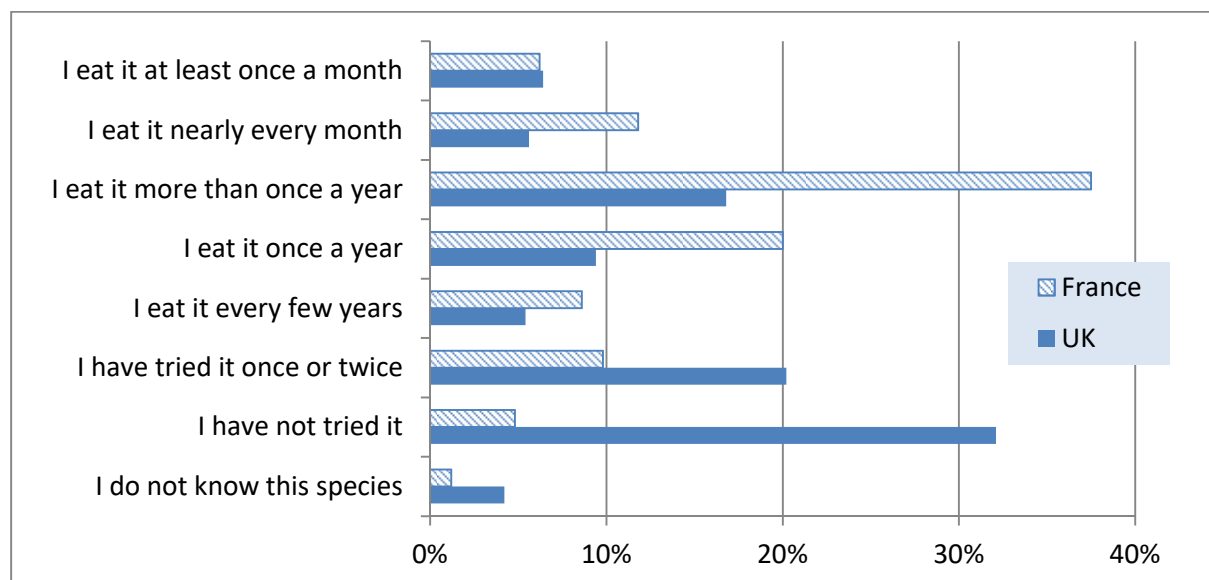
Like with the other fish species tested within this survey, test persons were asked for their consumption frequency on clams (only Italians). More than half of the Italian participants consumed clams at least once a month or nearly every month and another quarter of the Italian participants eat clams at least more than once a year (Figure 24). Only a minority of participants indicated to be unfamiliar with clams or not to have tried them yet.

**Figure 24: Consumption frequency of clams in Italy (% of participants)**



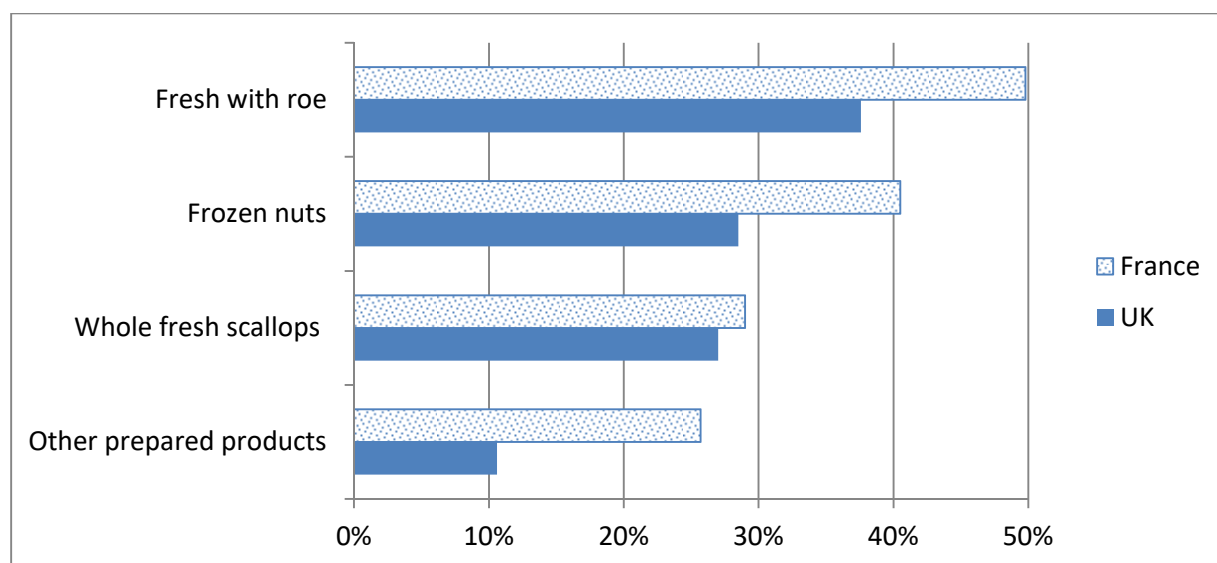
In France and in the UK, participants were asked for their consumption frequency of scallops (Figure 25). In France 56% of the participants indicated to consume scallops at least more than once a year or more often, whereas 29% of the UK participants indicated a similar consumption frequency. The highest share of the UK participants stated not to have tried scallops yet.

**Figure 25: Consumption frequency of scallops by country (% of participants)**



Participants who indicated to have eaten scallops at least once or twice were asked for the kind of scallop product they mostly purchased. French and UK participants alike indicated to consume foremost fresh scallops with roe followed by frozen nuts and whole fresh scallops (Figure 26). Other prepared products, e.g. soups, were less frequently consumed.

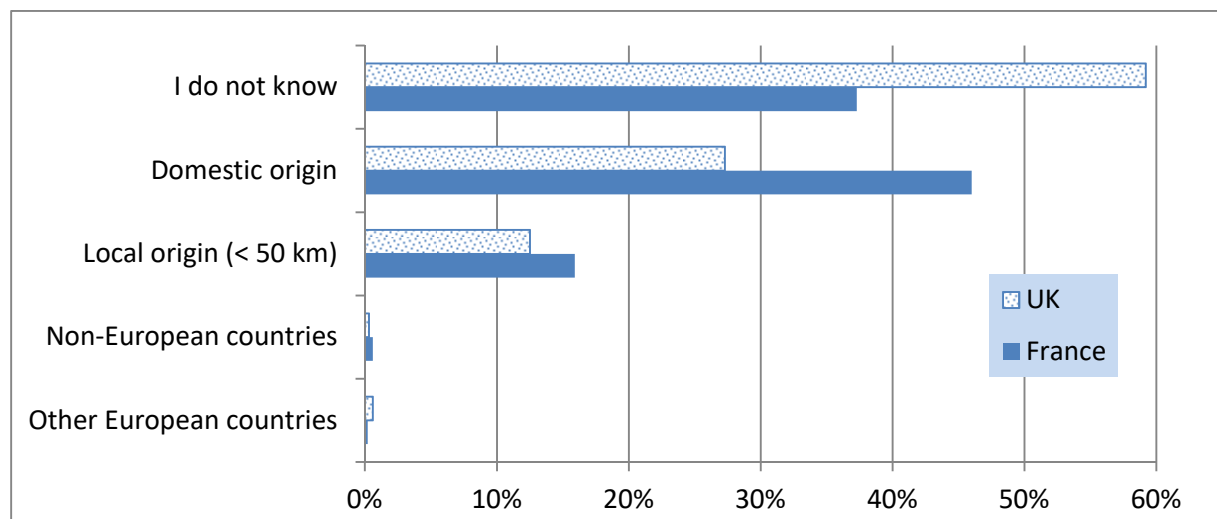
**Figure 26: Scallop products consumed by the participants in France and the UK (N=472 (France), N=319 (UK))**



Question: What kind of scallop products do you mostly purchase? Please indicate up to two products.

Asked about the origin of the scallop products that UK and French participants consumed, the majority of the participants in the UK stated to be unaware of the origin, whereas the majority of the French participants indicated to eat domestic scallop products (Figure 27). About 15% of the participants stated to consume locally produced scallops in both countries.

**Figure 27: Origin of the scallop products consumed in France and the UK (N=472 (France), N=319 (UK))**

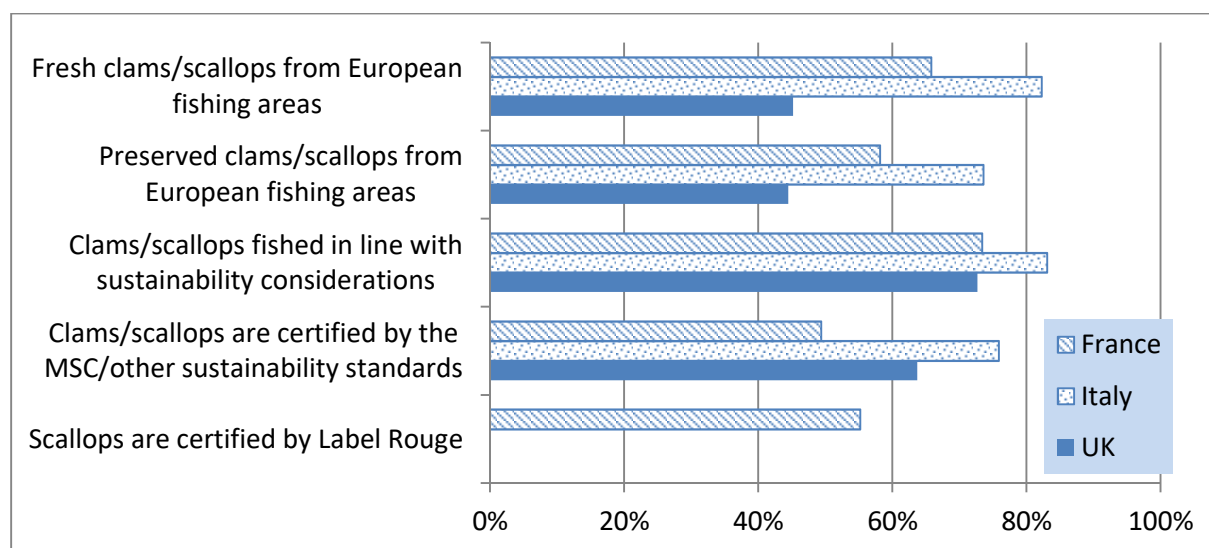


Question: You indicated to eat scallops. From where do the scallop products you consume mostly originate? Please indicate only one answer.

With respect to the relevance of European origin and certification according to sustainability considerations of scallops and clams, the online survey revealed that French consumers found it particularly important that scallops were fished in line with sustainability considerations followed by the European origin of fresh scallops (Figure 28). For preserved scallops the European origin was less important to French participants. Regarding the certification standards, a higher share of French participants attached importance to the Label Rouge than to the MSC or other sustainability standards. In Italy the fishing of clams in line with sustainability considerations and the origin of fresh

clams from European fishing areas was of similar importance. Again the European origin of preserved clams was of comparatively less importance. The majority of the Italian participants perceived the certification of clams by the MSC or other sustainability standards as important. The UK participants attached the highest importance to the fishing of scallops in line with sustainability considerations followed by the certification of scallops according to the MSC or other sustainability standards. The European origin of fresh and preserved scallops was of importance to only less than half of the UK participants.

**Figure 28: Relevance of different attributes of clams/scallops<sup>1,2,3</sup>**



Question: How important is it to you that...?

<sup>1</sup> Share of participants who chose 'important' or 'very important'. Measured on a 5-point Likert scale ranging from 'Not important at all' to 'Very important'. Scores of 4 'important' and 5 'very important' were merged and classified as important.

<sup>2</sup> N - FR = 469, IT = 485, UK = 319.

<sup>3</sup> Label rouge was asked for only in France

### 3.2.5.3 WAYS TO PROMOTE THE CONSUMPTION OF SEAFOOD ORIGINATING FROM COASTAL FISHERIES

Given that the consumers in France, Italy and the UK generally hold positive views of coastal fisheries, highlighting the origin of seafood from coastal fisheries might be a promising approach. In this respect in particular the "super" high freshness of seafood from coastal fisheries compared to other caught seafood might present an opportunity. Stressing the origin of the seafood from a particular domestic coastal area also appears promising. Some consumers are willing to pay price premiums for local products and take the origin as a quality indication (Brécard et al. 2009; Claret et al. 2012; Feucht et al. 2017). The origin of a particular domestic coastal area could further be combined with a story about the particular area and fishing tradition. Story telling helps consumers to connect themselves with the respective product and can increase trust (Feucht and Zander 2017; Ólafsdóttir et al. 2014). Particularly in France and Italy the promotion of seafood from coastal fisheries by stressing artisanal fishing practices, where applicable, can support market differentiation.

Using a label for communicating the origin from coastal fisheries also appears to be particularly promising for France and Italy. A prerequisite for this approach is that the included seafood products hold up to the additional expectations of consumers. Products certified by this kind of label should be fished in an eco-friendly manner and should be of a very high quality. In particular Italian consumers

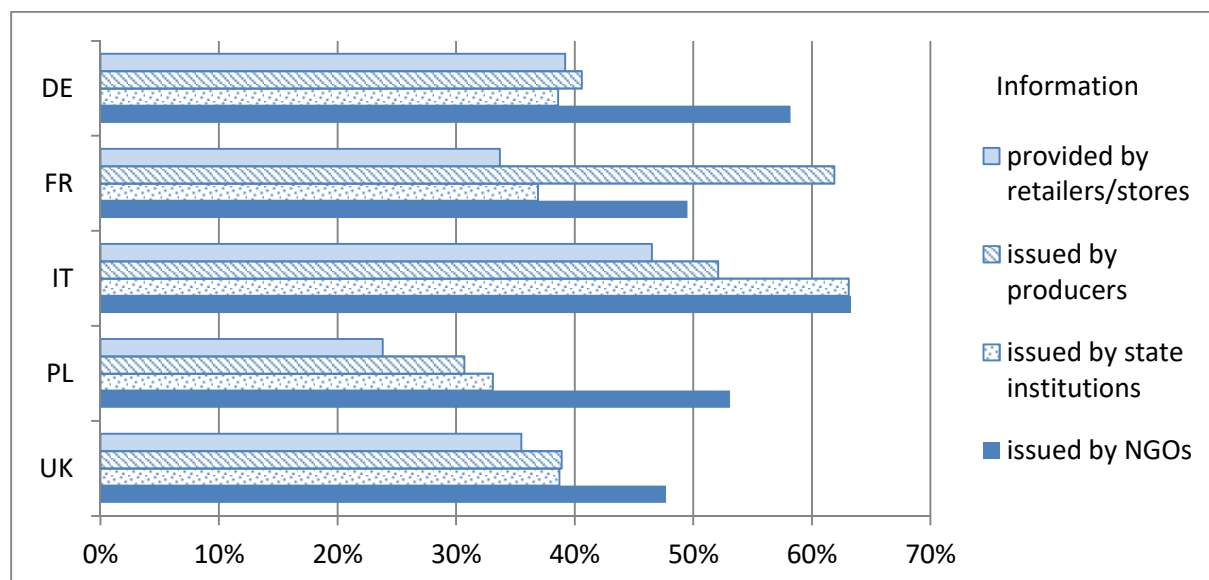
expect a guaranty of great freshness, whereas UK consumers particularly expect the support of local, coastal communities. French consumers take special interest in artisanal fishing practices. Given that the introduction of a label for coastal fisheries challenges consumers and goes along with the risk of increasing the information overload of some consumers, it is important to accompany the introduction of such a label by well-targeted information campaigns for consumers as well as for the staff at the point of sale. This way, potential confusion about an additional label on seafood products could be reduced.

Regarding the promotion of clams/scallops, the survey revealed that the communication of sustainable fishing practices would be appreciated in all study countries. The use of sustainability labels such as the MSC or the Label Rouge for communicating this attribute is promising. It was also shown that particularly fresh scallops/clams can profit from highlighting the European/domestic origin. This is especially the case for France and Italy and to a lesser degree for the UK.

### 3.2.6 TRUST IN INFORMATION SOURCES ABOUT SEAFOOD AND PERCEPTION OF A RETAILER COMMITMENT TO SUSTAINABLE SEAFOOD

Following the section about selected seafood species and coastal fisheries, participants were asked about their trust in different information sources about seafood. The results show that in Germany, Poland and the UK participants foremost trusted NGOs (Figure 29). In Italy the share of participants who trusted NGOs and those who trusted state institutions was equally high. In France participants expressed the highest trust for information provided by producers, followed by information from NGOs. With the exception of Germany, information provided by retailers/stores was the least trusted. In Germany an equal share of participants trusted retailers/stores and state institutions.

**Figure 29: Trust in information sources (% of participants)<sup>1</sup>**



Question: When considering origin, ingredients and production of seafood, how much do you trust information... - Measured on a 5-point Likert scale ranging from 'Do not trust' to 'Do trust'. Scores of 4 or 5 were merged and classified as trust.

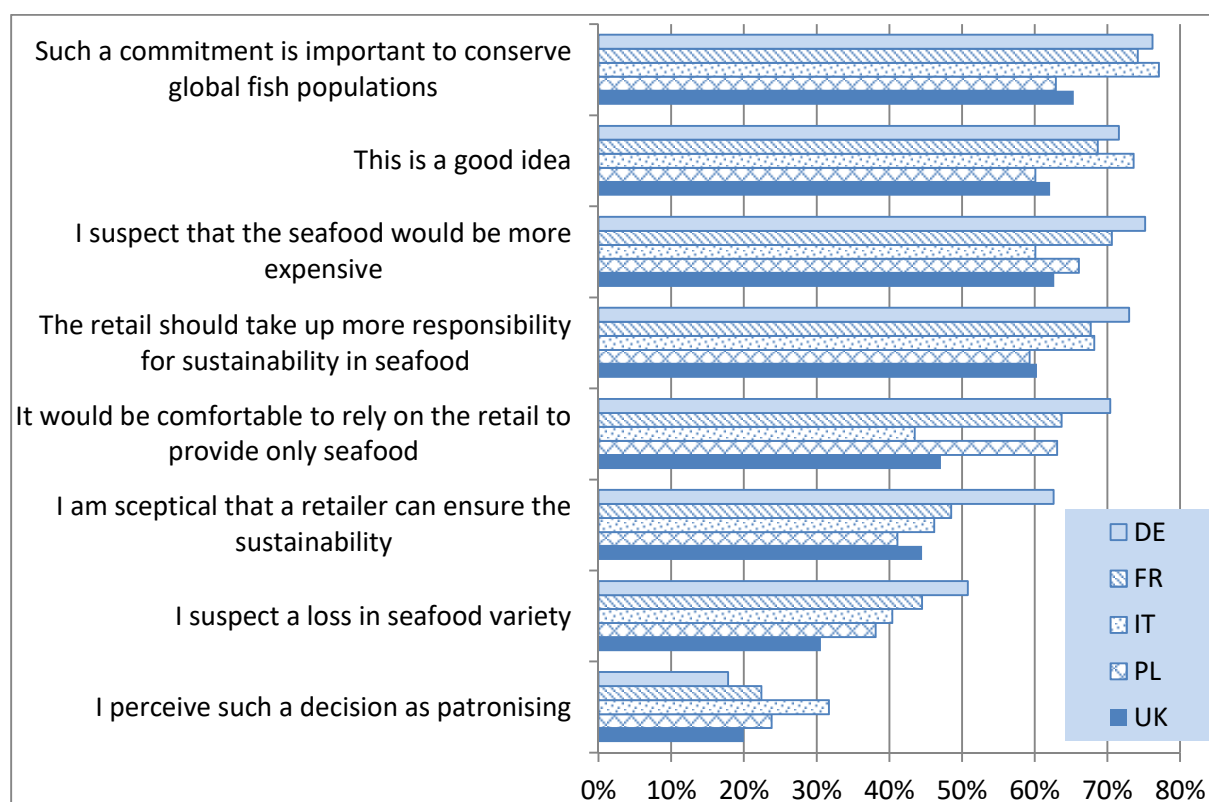
<sup>1</sup> DE-Germany, FR-France, IT-Italy, PL-Poland, UK-United Kingdom

In all study countries the majority of participants agreed that the decision of a retailer/store to sell only sustainable labelled seafood would be an important measure for the conservation of global fish populations (Figure 30). More than half of the participants in each country welcomed such a decision and pointed out that the retail should take up more responsibility for sustainability in seafood. More



than 60% of the participants in each country assumed that such a retailer/store commitment for sustainable seafood would result in higher prices. In particular German, French and Polish participants perceived a commitment by the retail/store as comfortable, whereas UK and Italian participants shared this view to a lesser degree. Scepticism regarding the effect of such a commitment was particularly expressed in Germany followed by France and Italy. Additionally, Germans feared the most that a retailer/store commitment might result in a loss in seafood variety followed by French and Italian consumers. Only a small share of participants perceived such a decision as patronizing with some differences between countries.

**Figure 30: Consumers' perceptions of a retailer/store commitment to sustainable seafood**  
(% of participants agreeing with the listed statements)<sup>1</sup>



Question: Imagine that a retailer/store would decide to sell only sustainable seafood. What are your views on the following statements? - Measured on a 5-point Likert scale ranging from 'Do not agree' to 'Agree'. Scores of 4 or 5 were merged and classified as agreement.

<sup>1</sup> DE-Germany, FR-France, IT-Italy, PL-Poland, UK-United Kingdom

All in all, a retailer/store commitment to sustainable seafood was assessed to be positive even if suspicion existed that such a commitment might lead to higher prices and a loss in seafood variety. These results confirm the findings of the focus groups conducted earlier in this research and by Alfnes (2017). The survey results also underline that some consumers are sceptical that retailers really can ensure the sustainability of seafood.

### 3.2.7 CONSUMERS' PERCEPTIONS OF SUSTAINABILITY LABELS FOR SEAFOOD

Sustainability labels are an important communication means for sustainability in fishing and aquaculture. In this section the results on consumers' awareness of and attitudes towards different sustainability labels for seafood are presented. Since most sustainability labels are country specific, for each country relevant labels were selected for testing. Organic labels were included since organic production meets the common understanding of sustainability by being eco-friendly. The term

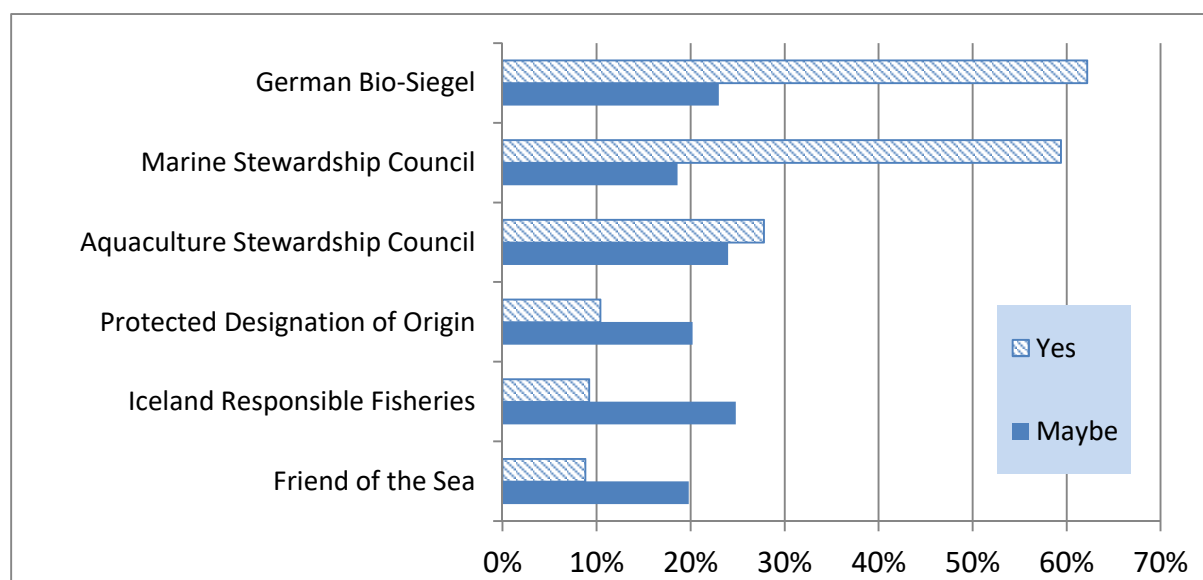
‘sustainability label’ was used in its wider sense by including ‘Label rouge’ and the ‘Moules de Bouchot’ label. ‘Label rouge’ is a quality label with a strong focus on animal welfare issues which sometimes are considered to be also part of ‘sustainability’. The same applies for the ‘Moules de Bouchot’ label which indicates traditional practices. Following the wide interpretation of sustainability, the Protected Designation of Origin (PDO) was included as well.

### 3.2.7.1 GERMAN CONSUMERS’ PERCEPTIONS OF SUSTAINABILITY LABELS

In Germany, the Marine Stewardship Council (MSC) label, the Aquaculture Stewardship Council (ASC) label, the organic label (German Bio-Siegel), the Iceland Responsible Fisheries (IRF) and the Friend of the Sea (FOS) label were tested.

The German organic label was best known, followed by the MSC label and the ASC label. The FOS label was the least known one (Figure 31).

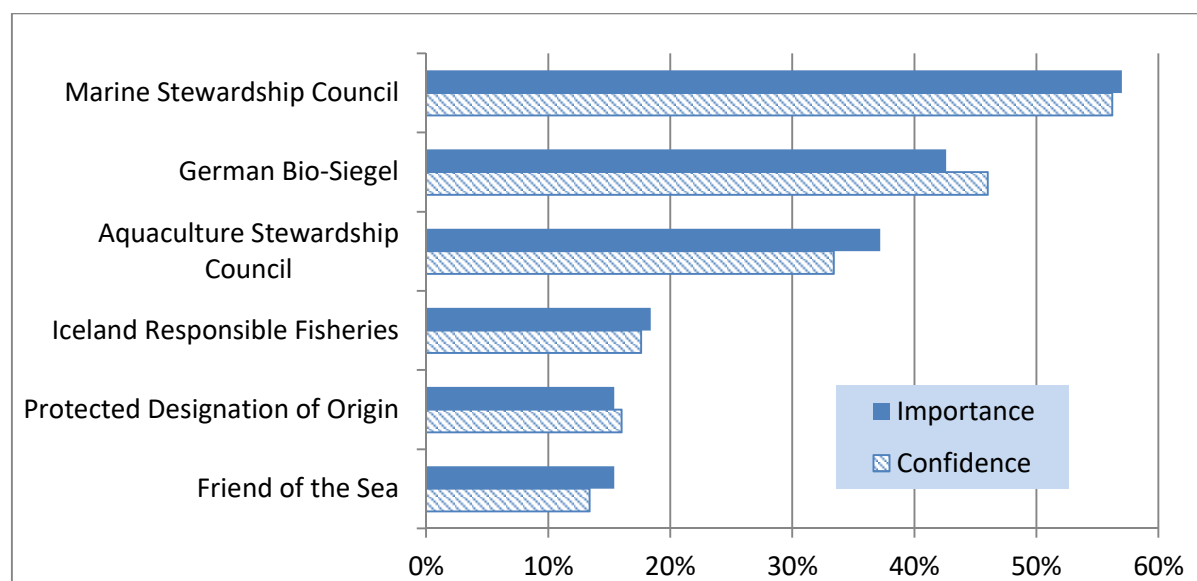
**Figure 31: German consumers’ awareness of different sustainability labels on seafood (% of participants)**



Question: Please imagine you are shopping for fish. Now have a look at the list presented. Have you seen any of these labels while you were shopping for fish?

Regarding the importance for their seafood choice, German consumers mentioned first the MSC label followed by the German Bio-Siegel (organic label) and the ASC (Aquaculture Stewardship Council) label (Figure 32). In line with the overall awareness, the FOS label was the least important one in the seafood choice. Confidence in the tested sustainability labels followed the same order as the importance in the seafood choice (Figure 32).

**Figure 32: Importance of and confidence in sustainability labels for seafood (% of German participants)**



Questions - Importance: For the labels you might or you have seen while shopping for fish: How important are these for your seafood choice... - Measured on a 5-point Likert scale ranging from 'Not at all important' to 'Very important'. Scores of 4 or 5 were merged and classified as important.

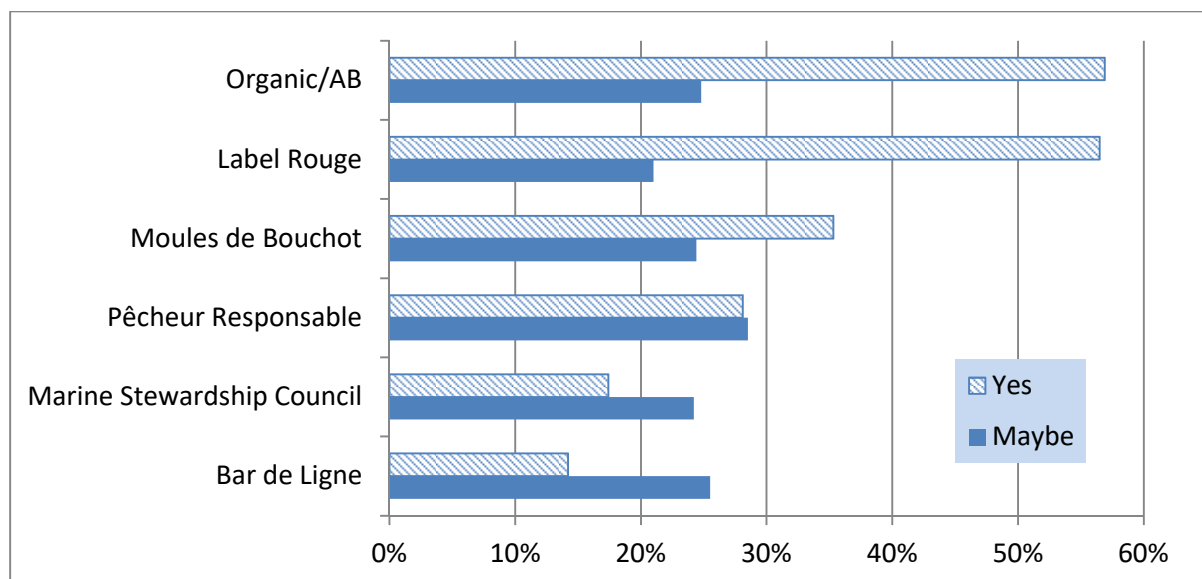
Question - Confidence: To what extent do you have confidence in the following label(s) when you are purchasing seafood? - Measured on a 5-point Likert scale ranging from 'I have no confidence at all' to 'I have total confidence'. Scores of 4 or 5 were merged and classified as having confidence.

### 3.2.7.2 FRENCH CONSUMERS' PERCEPTIONS OF SUSTAINABILITY LABELS

In France, the organic (AB/Agriculture Biologique), the Marine Stewardship Council (MSC) label, the Pêcheur Responsable (PR), the Label Rouge (LR), the Moules de Bouchot (MB) label and the Bar de Ligne (BL) were tested. As explained above 'Label rouge' and the 'Moules de Bouchot' label were included although they are no sustainability labels in the strict sense.

French consumers were the most aware of the domestic organic AB label followed by the Label Rouge and the Moules de Bouchot label. The label Bar de Ligne was the least known (Figure 33).

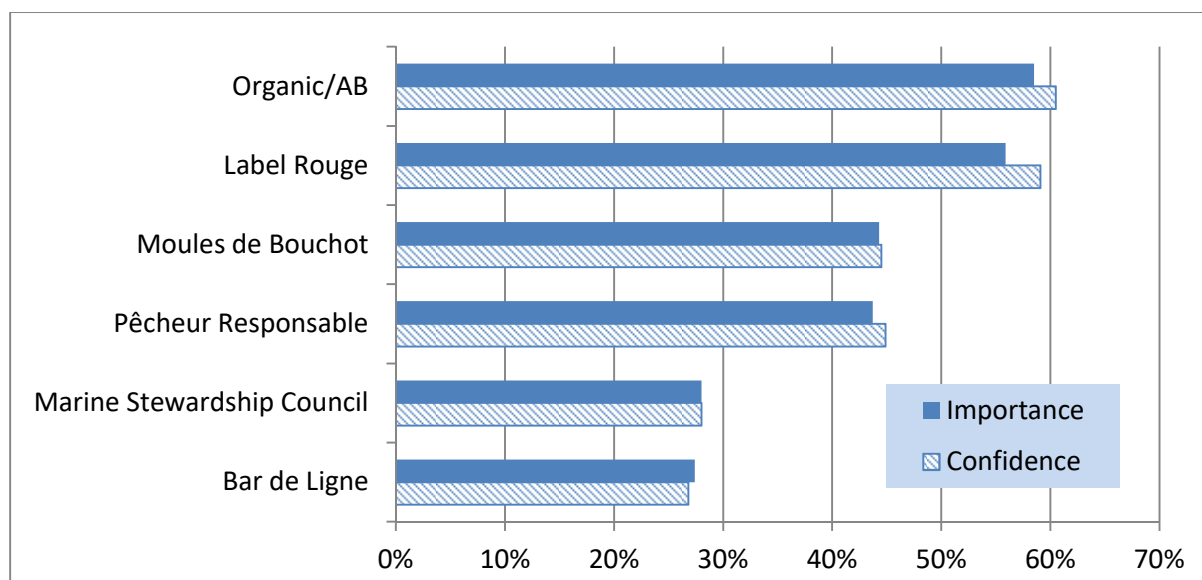
**Figure 33: French consumers' awareness of different sustainability labels on seafood (% of participants)**



Question: Please imagine you are shopping for fish. Now have a look at the list presented. Have you seen any of these labels while you were shopping for fish?

The organic AB label and the Label Rouge were important for almost 60% of French participants in their choice for seafood. The Moules de Bouchot label and the Pecheur Responsable label were important for about 45% of the participants. Similar numbers applied for participants' confidence (Figure 34).

**Figure 34: Importance of and confidence in sustainability labels for seafood (% of French participants)**



Question - Importance: For the labels you might or you have seen while shopping for fish: How important are these for your seafood choice... - Measured on a 5-point Likert scale ranging from 'Not at all important' to 'Very important'. Scores of 4 or 5 were merged and classified as important.

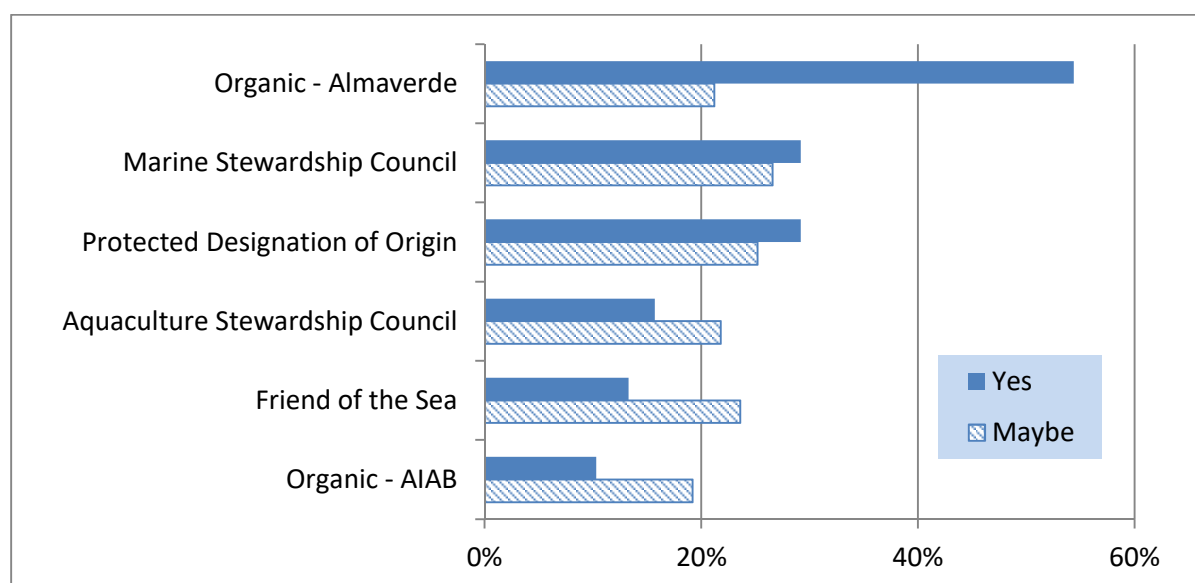
Question - Confidence: To what extent do you have confidence in the following label(s) when you are purchasing seafood? - Measured on a 5-point Likert scale ranging from 'I have no confidence at all' to 'I have total confidence'. Scores of 4 or 5 were merged and classified as having confidence.

### 3.2.7.3 ITALIAN CONSUMERS' PERCEPTIONS OF SUSTAINABILITY LABELS

In Italy, two organic labels (Almaverde and AIAB), the Marine Stewardship Council (MSC) label, the Protected Designation of Origin (PDO), the Aquaculture Stewardship Council (ASC) label and the Friend off the Sea (FOS) label were tested.

Participants were by far the most aware of the Almaverde organic label followed by the MSC label and the PDO label. The AIAB organic label was the least known in the context of the purchase of fish (Figure 35).

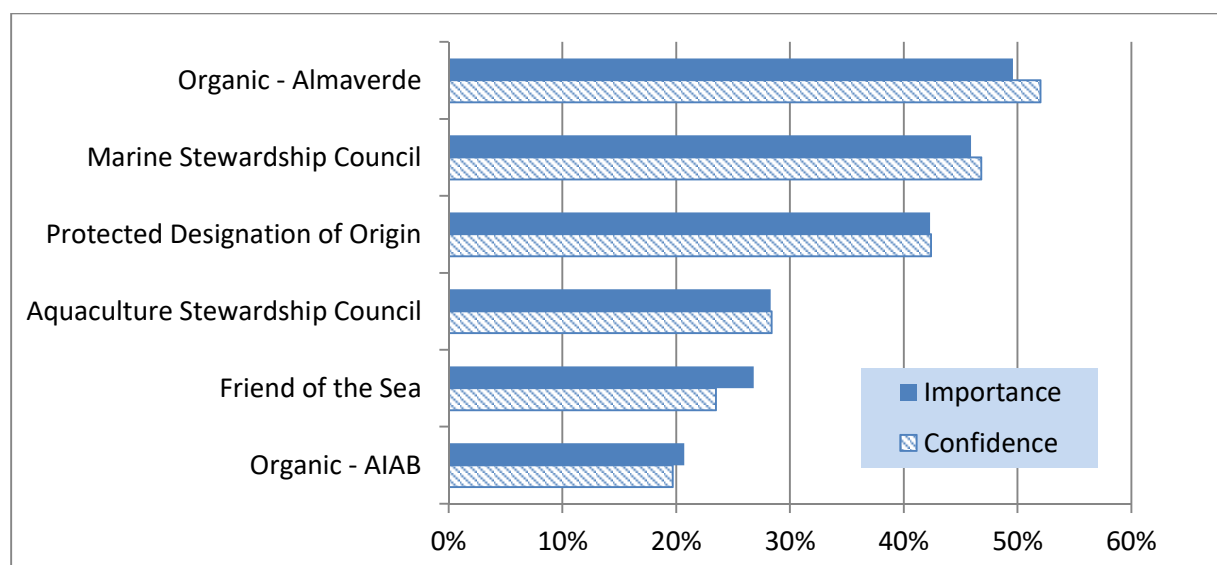
**Figure 35: Italian consumers' awareness of different sustainability labels on seafood (% of participants)**



Question: Please imagine you are shopping for fish. Now have a look at the list presented.  
Have you seen any of these labels while you were shopping for fish?

In line with the awareness, Italian consumers attached the most importance and had the most confidence to the Almaverde label followed by the MSC label and the PDO label. The AIAB label was the least important and the least trusted one (Figure 36).

**Figure 36: Importance and confidence in sustainability labels for seafood (% of Italian participants)**



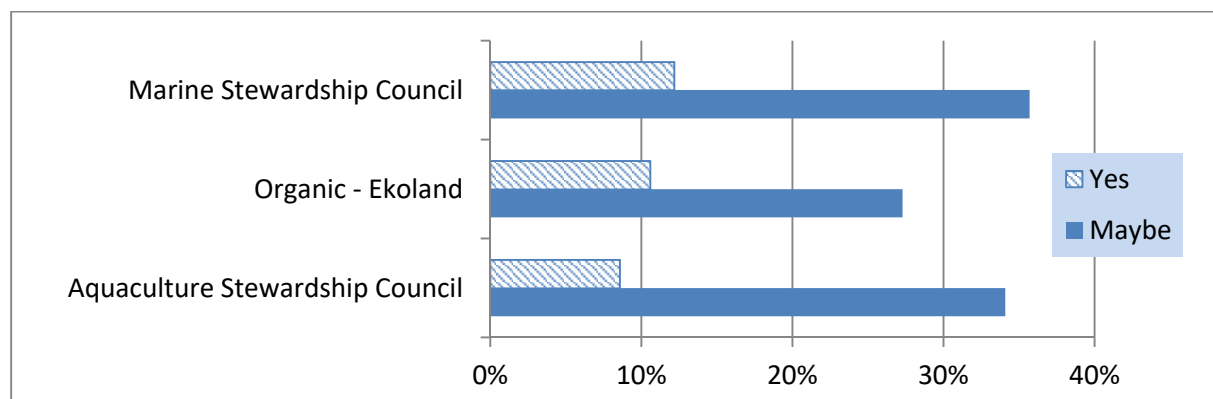
Question - Importance: For the labels you might or you have seen while shopping for fish: How important are these for your seafood choice... - Measured on a 5-point Likert scale ranging from 'Not at all important' to 'Very important'. Scores of 4 or 5 were merged and classified as important.

Question - Confidence: To what extent do you have confidence in the following label(s) when you are purchasing seafood? - Measured on a 5-point Likert scale ranging from 'I have no confidence at all' to 'I have total confidence'. Scores of 4 or 5 were merged and classified as having confidence.

### 3.2.7.4 POLISH CONSUMERS' PERCEPTIONS OF SUSTAINABILITY LABELS

In Poland only three labels (an organic label (Ekoland), the Marine Stewardship Council (MSC) label and the Aquaculture Stewardship Council (ASC) label), were included in the survey, since only these three labels were perceived to have some relevance in the market by Polish project partners. The awareness of the tested labels was – compared to the other study countries – rather low. About 12% of the participants were clearly aware of the MSC label and 36% indicated to have maybe seen the label. The awareness of the Ekoland organic label and the ASC label was even lower (Figure 37).

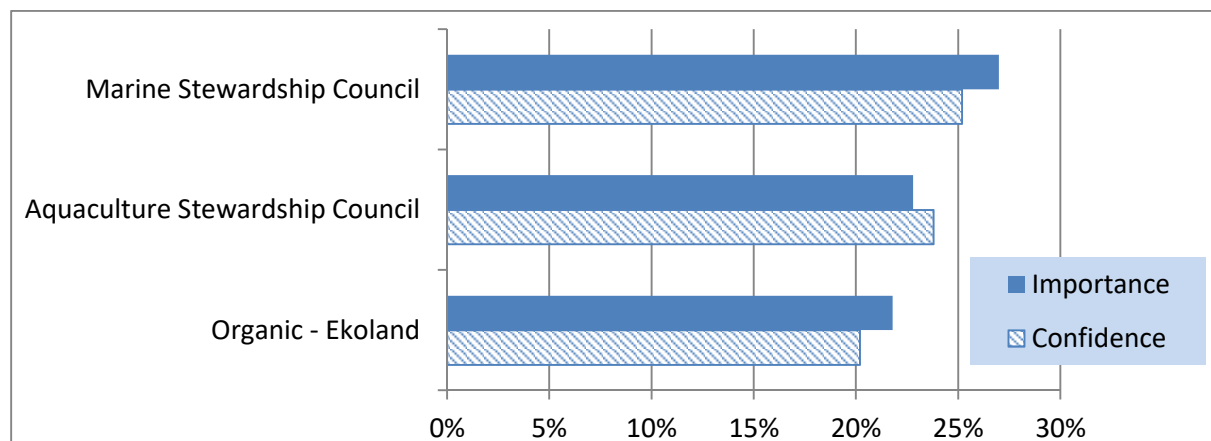
**Figure 37: Polish consumers' awareness of different sustainability labels on seafood (% of participants)**



Question: Please imagine you are shopping for fish. Now have a look at the list presented. Have you seen any of these labels while you were shopping for fish?

The low awareness of the labels was in line with the low importance for their seafood choice and the confidence consumers attached to it. The highest importance and confidence had the MSC label followed by the ASC label and the label of Ekoland (Figure 38).

**Figure 38: Importance of and confidence in sustainability labels for seafood (% of Polish participants)**



Questions - Importance: For the labels you might or you have seen while shopping for fish: How important are these for your seafood choice... - Measured on a 5-point Likert scale ranging from 'Not at all important' to 'Very important'. Scores of 4 or 5 were merged and classified as important.

Question - Confidence: To what extent do you have confidence in the following label(s) when you are purchasing seafood? - Measured on a 5-point Likert scale ranging from 'I have no confidence at all' to 'I have total confidence'. Scores of 4 or 5 were merged and classified as having confidence.

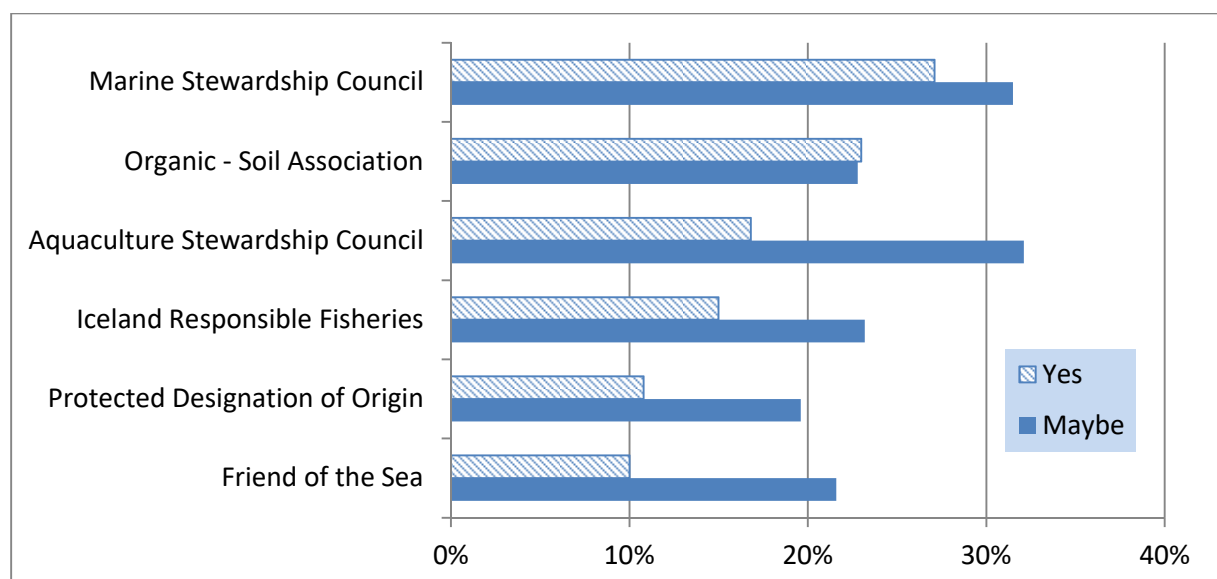
### 3.2.7.5 UK CONSUMERS' PERCEPTIONS OF SUSTAINABILITY LABELS

In the UK, also an organic label (Soil Association), the Marine Stewardship Council (MSC), the Aquaculture Stewardship Council (ASC) label, the Iceland Responsible Fisheries (IRF), Protected Designation of Origin (PDO) label and the Friend of the Sea (FOS) were considered.

UK consumers were the most aware of the MSC label. The organic Soil Association label and the ASC label were nearly equally familiar to the participants. The FOS label was again the least known label (Figure 39).



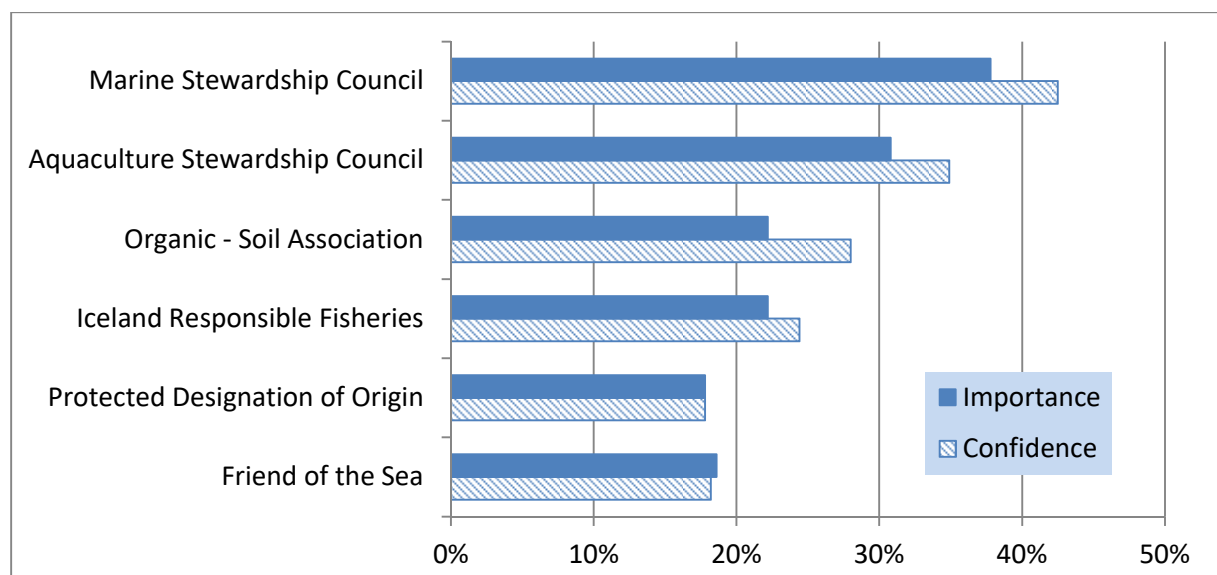
**Figure 39: UK consumers' awareness of different sustainability labels on seafood (% of participants)**



Question: Please imagine you are shopping for fish. Now have a look at the list presented. Have you seen any of these labels while you were shopping for fish?

In the same way, participants in the UK attached the highest importance to the MSC label followed by the ASC label and the organic label of the Soil Association (Figure 40). Similar to the other countries, confidence and importance were very closely related to each other. Importance of and confidence in the PDO and the FOS label were equally low.

**Figure 40: Importance of and confidence in sustainability labels for seafood (% of UK participants)**



Question - Importance: For the labels you might or you have seen while shopping for fish: How important are these for your seafood choice... - Measured on a 5-point Likert scale ranging from 'Not at all important' to 'Very important'. Scores of 4 or 5 were merged and classified as important.

Question - Confidence: To what extent do you have confidence in the following label(s) when you are purchasing seafood? - Measured on a 5-point Likert scale ranging from 'I have no confidence at all' to 'I have total confidence'. Scores of 4 or 5 were merged and classified as having confidence.

### 3.2.7.6 DISCUSSION OF THE SURVEY RESULTS ON LABELLING IN LIGHT OF THE FOCUS GROUP FINDINGS

The survey results confirm that in all study countries a share of about 30% - in some countries more - were aware of at least some of the existing sustainability labels. In Germany, France and Italy more than half of the participants were familiar with at minimum one of the tested sustainability labels. This holds true to a somewhat lesser extent in Poland and in the UK.

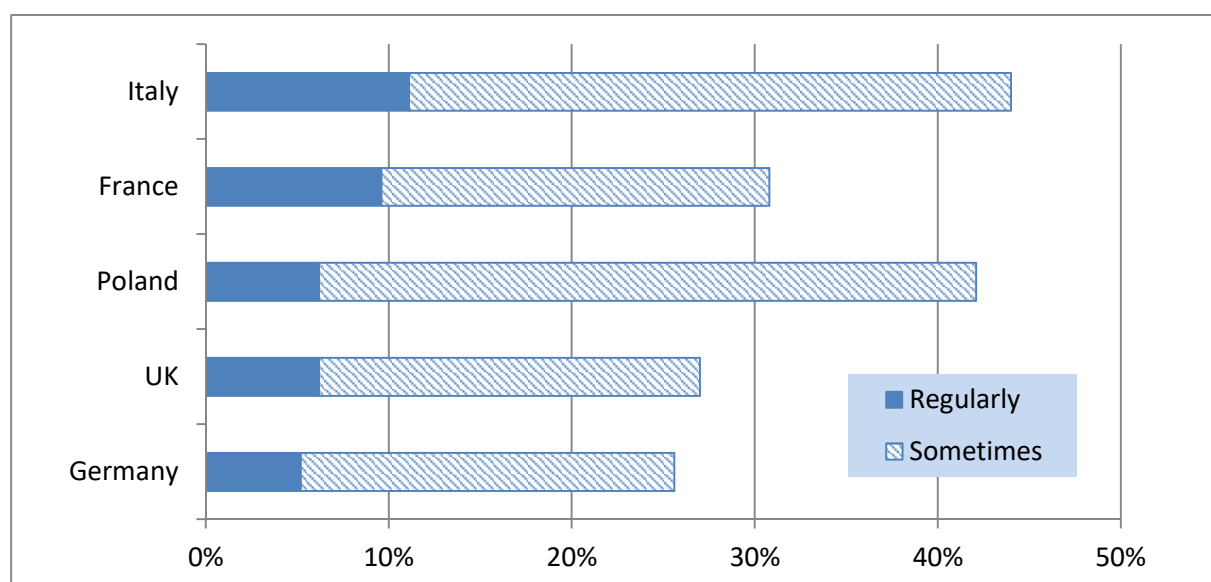
40 to 50% of the participants had confidence in some of the labels and stated that they were relevant in their purchase decisions. In Germany, Poland and the UK participants attached the highest importance to the MSC label in the shopping situation, whereas the French and the Italians perceived the respective domestic organic label as the most important one in their purchase decision.

### 3.2.8 USE OF SMARTPHONES AND WILLINGNESS TO PURCHASE SEAFOOD ONLINE

Since some consumers in the focus groups expressed a need for more information about seafood and the focus group findings highlighted that information should be offered through multiple channels, we investigated the actual use of smartphones as one option of information retrieval about seafood in the shopping situation.

The survey results revealed that in most study countries less than 10% of the participants regularly used a smartphone for getting information about seafood products while shopping (Figure 41). The highest shares of participants who regularly used a smartphone in the shopping situation were found in Italy and France. In Italy and in Poland the shares of participants using the smartphone at least sometimes were rather high, and more than 40% used their smartphones at least sometimes for retrieving information about seafood while shopping.

**Figure 41: Use of smartphones for retrieving information about seafood products while shopping (% of participants by country)**

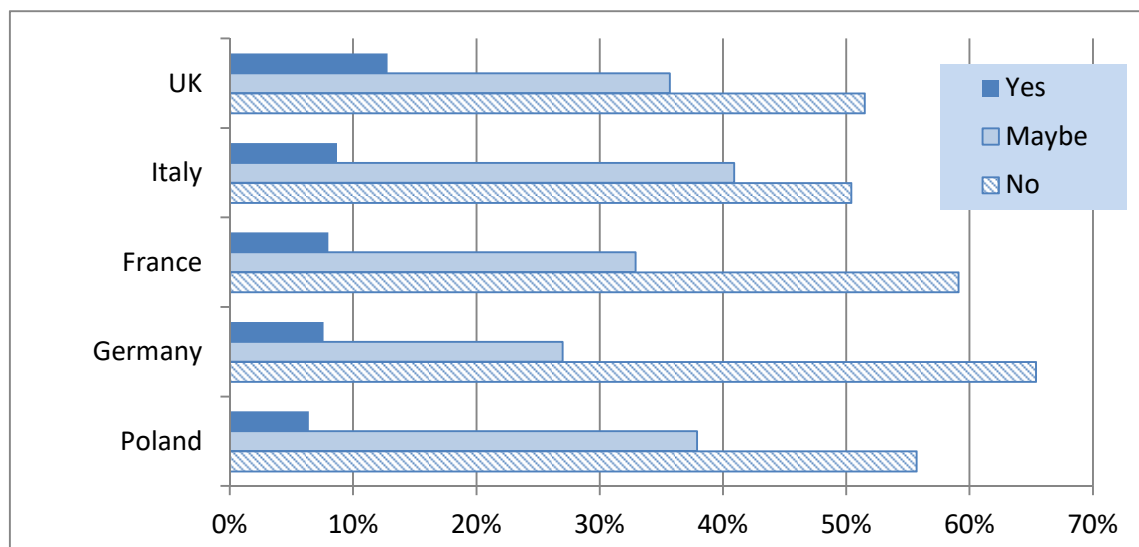


Question: How often do you use your smartphone for getting information about seafood products while you are shopping?

In light of the increasing importance of e-commerce platforms in various product categories we asked participants for their willingness to purchase seafood online. The results showed that in all study countries some consumers were willing or might be willing to purchase seafood online. The share of participants who were or might be willing to do so varied between 35% in Germany and 49%

in the UK. However, the vast majorities of seafood purchases took place without smartphone support (Figure 42).

**Figure 42: Willingness to purchase seafood online (% of participants per country)**



Question: Would you be prepared to purchase seafood online?

## 4 SUMMARY AND CONCLUSIONS

The presented research highlights market potentials for the seafood species under investigation as well as for seafood from coastal fisheries. Consumers' preferences and perceptions of the analysed species and of coastal fisheries show some similarities but also significant differences. Therefore, any promotion strategy has to consider the country specific differences with respect to seafood consumption in the EU in order to be successful.

Having this in mind, the analysis for **carp** revealed that a potential for “new” carp products does exist in Germany and in Poland. In particular, the bonecut carp filet appears as a promising “new” product. The wider introduction of a bonecut filet to the market, a better availability of carp products and the avoidance of off-flavors are important prerequisites for an increased economic success of carp. In order to decrease the knowledge gap about carp and to enhance interest in it, the provision of recipes, in particular non-traditional ones, might help. An increased offering of carp dishes in the out of home food sector with particular focus on non-traditional recipes may support an increase in carp consumption.

In the case of **plaice** differences between Germany and the UK became obvious. Even though plaice was viewed as a tasty and easy to prepare fish in both countries, the UK consumers rather perceive plaice as a special and seasonal fish and indicated the high price of plaice to be a major barrier for consumption. In contrast, in Germany plaice was more often perceived as a common food fish and the inconvenience in preparation presented the most important barrier. Consumers in both countries agreed that low availability was another main barrier for plaice consumption. They also attached more importance to the catching of plaice in line with sustainability considerations than to the origin of the North Sea. Promising ways to promote plaice consumption are on the one hand the offering of preparation advice and recipes and on the other hand the highlighting of the origin of plaice from local waters in a concise manner in combination with a sustainability indication.

As for **salmonids**, trout was less known than salmon: in all study countries the consumption of fresh and smoked salmon was higher than the consumption of fresh and smoked trout. Of interest for the project, the question on substitutability of trout and salmon is not yet finally concluded: the focus groups and the online survey provided no evidence of substitutability between trout and salmon. Some consumers stressed similarities in taste especially for smoked product. As a consequence, trout promotion should be based on its own qualities and not as a substitute for salmon. Since domestic origin of the production is an important purchase attribute of trout, its local origin as well as eco-friendly aspects of trout farming might support its consumption.

Arctic char originating from Iceland is a quite innovative product on the market for salmonids. The results of the online survey confirm that most of the consumers were either unfamiliar with it or had not tried it. The share of the respondents consuming arctic char at least once a year or more ranged from 33% in Germany to 12% in the UK.

Mostly, consumers in the studied countries had a positive attitude towards **coastal fisheries**. Coastal fisheries were associated with freshness, importance for coastal communities, eco-friendly fishing, healthiness and high quality seafood as well as a great variety of seafood. French consumers took special interest in artisanal fishing practices which might indicate some confusion among consumers regarding coastal and artisanal fisheries.

The majority of participants in each country perceived a coastal fisheries label as useful. However, country differences exist so that a label for communicating the origin from coastal fisheries appears to be particularly promising for France and Italy. A prerequisite for the success of a labelling approach is that the included seafood products hold up to the expectations of consumers. Products certified by such a label, should be fished in an eco-friendly manner and should be of a very high quality. In particular, Italian consumers expected a freshness guaranty, whereas UK consumers

particularly associated the support of local, coastal communities. Pointing at the origin from a particular domestic area appears promising, too.

For the promotion of clams/scallops, the survey revealed that the communication of sustainable fishing practices is promising in all study countries. The use of sustainability labels such as the MSC (or the Label Rouge for high quality including animal welfare) presents an opportunity. It was shown that particularly fresh scallops/clams can profit from the emphasis of European/domestic origin. This is particularly the case for France and Italy. Also, some scepticism about such a label was expressed as well as the perception of having already enough labels on seafood.

The presented research reveals that a promotion of European seafood based on its domestic/local origin, its sustainable production and its big variety is a promising promotion approach. As shown in D2.2, sustainable European production is not an issue for all consumers but for a significant share and in all study countries a part of the consumers was interested in these attributes and attached importance to them in their purchase decision.

The communication of sustainability through labels presents one approach in this context. In this line it should be considered that consumers are also sceptical about labels and many of them are overwhelmed by the amount of labels already present on the market. Therefore, the choice of labels for communicating the sustainability of a particular seafood product should be carefully considered. Cultural preferences for specific sustainability labels need to be taken into account.

## REFERENCES

- ALFNES, F. (2017). SELLING ONLY SUSTAINABLE SEAFOOD: ATTITUDES TOWARD PUBLIC REGULATION AND RETAILER POLICIES. *MARINE POLICY*, 78: 74-79.
- BÄTZING, W. (2014). NUTZUNGSKONFLIKTE ZWISCHEN TEICHWIRTSCHAFT, NATURSCHUTZ UND FREIZEITINTERESSEN IM AISCHGRUND. *MITTEILUNGEN DER FRÄNKISCHEN GEOGRAPHISCHEN GESELLSCHAFT*, 59: 81-100.
- BRÉCARD, D., HLAIMI, B., LUCAS, S., PERRAUDEAU, Y., SALLADARRÉ, F., (2009). DETERMINANTS OF DEMAND FOR GREEN PRODUCTS: AN APPLICATION TO ECO-LABEL DEMAND FOR FISH IN EUROPE. *ECOLOGICAL ECONOMICS*, VOLUME 69, ISSUE 1, p. 115-125.
- CLARET, A., GUERRERO, L., AGUIRRE, E., RINCÓN, L., HERNÁNDEZ, M. D., MARTÍNEZ, I. ET AL. (2012). CONSUMER PREFERENCES FOR SEA FISH USING CONJOINT ANALYSIS: EXPLORATORY STUDY OF THE IMPORTANCE OF COUNTRY OF ORIGIN, OBTAINING METHOD, STORAGE CONDITIONS AND PURCHASING PRICE. *FOOD QUALITY AND PREFERENCE*, 26(2): 259-266.
- DG MARE (2008). ENQUÊTE D'IMAGE SUR LA PERCEPTION DES PRODUITS DE LA PÊCHE ET DE L'AQUACULTURE - ÉTUDE 1 DANS LE CADRE DU CONTRAT CADRE LOT 3 – ÉTUDES RELATIVES À LA MISE EN OEUVRE DU FEP - RAPPORT FINAL. ONLINE AT: [HTTP://EC.EUROPA.EU/FISHERIES/DOCUMENTATION/STUDIES/STUDY\\_MARKET/FAP\\_EXEC\\_SUMMARY\\_EN.PDF](http://ec.europa.eu/fisheries/documentation/studies/study_market/fap_exec_summary_en.pdf). (ACCESSED: 25.4.2015)
- EUMOFA (2015). MONTHLY HIGHLIGHTS. NO. 6. ONLINE AT: [HTTP://WWW.EUMOFA.EU/MONTHLY-HIGHLIGHTS](http://www.eumofa.eu/monthly-highlights) (ACCESSED: 20.6.2017)
- FEUCHT, Y., ZANDER, K., AVDELAS, L., GALINOU-MITSOUDI, S., LE GALLIC, B., NOURRY, M., MASSON, E., PIRRONE, C. (2017). DELIVERABLE: D2.2 RESULTS ON CONSUMER PREFERENCES FOR SUSTAINABLE SEAFOOD PRODUCTS FROM EUROPE. THUENEN-INSTITUTE. BRAUNSCHWEIG. ONLINE AT: [HTTPS://WWW.THUENEN.DE/DE/INSTITUTSUEBERGREIFENDE-PROJEKTE/FISCH-AUS-EUROPA-NACHHALTIG-PRODUZIERT-WAS-WOLLEN-VERBRAUCHER](https://www.thuenen.de/de/institutsuebergreifende-projekte/fisch-aus-europa-nachhaltig-produziert-was-wollen-verbraucher). ACCESSED 10.01.2018.
- FEUCHT, Y. AND ZANDER, K. (2017). DELIVERABLE: D2.3 REPORT ON POSSIBILITIES FOR THE IMPROVEMENT OF THE INTERNET COMMUNICATION ON SEAFOOD PRODUCTS. BRAUNSCHWEIG: THÜNEN-INSTITUT. AVAILABLE FROM: [HTTPS://WWW.THUENEN.DE/DE/INSTITUTSUEBERGREIFENDE-PROJEKTE/FISCH-AUS-EUROPA-NACHHALTIG-PRODUZIERT-WAS-WOLLEN-VERBRAUCHER/](https://www.thuenen.de/de/institutsuebergreifende-projekte/fisch-aus-europa-nachhaltig-produziert-was-wollen-verbraucher/).
- GUERRERO, L., GUÀRDIA, M. D., XICOLA, J., VERBEKE, W., VANHONACKER, F., ZAKOWSKA-BIEMANS, S., ET AL. (2009). CONSUMER-DRIVEN DEFINITION OF TRADITIONAL FOOD PRODUCTS AND INNOVATION IN TRADITIONAL FOODS. A QUALITATIVE CROSS-CULTURAL STUDY. *APPETITE*, 52(2): 345-354.
- HICKS, D., PIVARNIK, L., McDERMOTT, R. (2008): CONSUMER PERCEPTIONS ABOUT SEAFOOD - AN INTERNET SURVEY. *JOURNAL OF FOODSERVICE*, 9: 213-226.
- McCLENACHAN, L., DISSANAYAKE, S. T. M., CHEN, X. (2016). FAIR TRADE FISH: CONSUMER SUPPORT FOR BROADER SEAFOOD SUSTAINABILITY. *FISH AND FISHERIES*, 17(3): 825-838.
- MYRLAND, O., TRONDSSEN, T., JOHNSTON, R.S., LUND, E. (2000): DETERMINANTS OF SEAFOOD CONSUMPTION IN NORWAY: LIFESTYLE, REVEALED PREFERENCES, AND BARRIERS TO CONSUMPTION. *FOOD QUALITY AND PREFERENCE*, 11: 169-188.
- ÓLAFSDÓTTIR, G., JÓNSDÓTTIR, G.A., ÓMARSÓTTIR, I.L., TRYGGVADÓTTIR, G.B., FREDRIKSEN, M., KRIKEGAARD, H.P., BARON, C., LEKANG, O.I., RUSTAD, T., KIESSLING, A., BOGASON, S.G. (2014). INTERACT - INDUSTRY - ACADEMIA INTERACTION IN THE MARINE SECTOR. ONLINE AT: [HTTP://NORDICINNOVATION.ORG/GLOBAL/ PUBLICATIONS/REPORTS/2014/P11073\\_NORDIC%20INNOVATION\\_INTERACT\\_032015\\_FIN.PDF](http://nordicinnovation.org/global/publications/reports/2014/P11073_Nordic%20Innovation_Interact_032015_Fin.pdf). ACCESSED: 20.6.2015.

- PIENIAK, Z., KOŁODZIECZYK, M., KOWRYGO, B., VERBEKE, W. (2011). CONSUMPTION PATTERNS AND LABELLING OF FISH AND FISHERY PRODUCTS IN POLAND AFTER THE EU ACCESSION. *FOOD CONTROL*, 22(6): 843-850.
- PIENIAK, Z., VERBEKE, W., BRUNØ, K., SCHOLDERER, J., OLSEN, S. (2009): COMPARISON BETWEEN POLISH AND WESTERN EUROPEAN FISH CONSUMERS IN THEIR ATTITUDINAL AND BEHAVIOURAL PATTERNS. *ACTA ALIMENTARIA*, 38: 179-192.
- VANHONACKER, F., PIENIAK, Z., VERBEKE, W. (2013): EUROPEAN CONSUMER IMAGE OF FARMED FISH, WILD FISH, SEABASS AND SEABREAM. *AQUACULTURE INTERNATIONAL*, 21: 1017-1033.
- VARBLE, S., SECCHI, S. (2013). HUMAN CONSUMPTION AS AN INVASIVE SPECIES MANAGEMENT STRATEGY. A PRELIMINARY ASSESSMENT OF THE MARKETING POTENTIAL OF INVASIVE ASIAN CARP IN THE US. *APPETITE*, 65: 58-67.
- ZANDER, K., HAMM, U. (2010). CONSUMER PREFERENCES FOR ADDITIONAL ETHICAL ATTRIBUTES OF ORGANIC FOOD. IN: *FOOD QUALITY AND PREFERENCE* 21(5): 495-503.



## **APPENDIX A – ONLINE QUESTIONNAIRE**

Dear participant,

you are participating in a scientific survey. This survey is part of an EU research project.

The results will be analyzed by the Thünen Institute of Market Analysis. This organization is an independent research institute mandated by the German Federal Ministry of Food and Agriculture.

All your statements will be treated confidentially. Only summarized data will be published, so no connection can be made to your personal answers.



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-----Selection criteria-----

1. In which of the following industries or professional areas are you and members of your household employed? Multiple responses are possible.
  - Marketing/market research → No participation
  - Food industry → No participation
  - Fisheries sector → No participation
  - Media
  - Public administration
  - Education
  - Health services
  - Other
2. Please indicate your gender.
  - Female
  - Male
3. In which year were you born? Please indicate your year of birth.  
Year 19\_\_\_\_\_
4. In which area do you live?
5. Which person in your household is usually responsible for doing the grocery shopping?
  - Me alone
  - Me together with other members of my household
  - Another person → No participation
6. How often do you consume fish?
  - Never → No participation
  - Less than once a month
  - Once a month
  - 2 to 3 times a month
  - Once a week
  - More than once a week

-----Start of main survey-----

7. Please describe your consumption habits with respect to the following seafood: → The included list depended on the study country.

- Carp in DE and PL
- Clams only in IT
- Plaice in DE and UK
- Scallops only in FR and UK
- Salmon and Trout in PL, FR, IT

	I do not know this species	I have not tried it	I have tried it once or twice	I eat it every few years	I eat it once a year	I eat it more than once a year	I eat it nearly every month	I eat it at least once a month
Arctic char								
Carp								
Clams in general								
Fresh salmon								
Fresh trout								
Plaice								
Smoked salmon								
Smoked trout								
Scallops								

-----Associations with different seafood species and coastal fisheries-----

----- Carp – DE-PL-----

8. What do you associate with carp? Please choose a point on the scale accordingly.

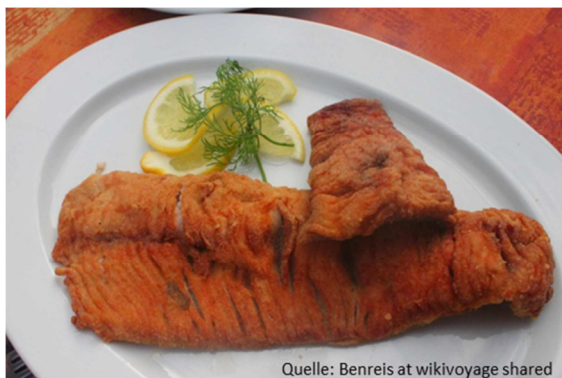
	1	2	3	4	5	
Fish for Christmas/New Year's Eve						A fish for all year around
Good taste						Bad taste
Easy to prepare						Hard to prepare
Free of bones						Full of bones
Convenient portion sizes						Inconvenient portion sizes
Easy to obtain						Hard to obtain
Fish I would prepare for friends and family						Fish I would not prepare for friends and family
Good image						Bad image
Fish of consistent taste						Fish of inconsistent taste
Eco-friendly farmed						Farmed in a manner harmful to the environment
Traditional						Modern
Healthy						Unhealthy
Low-priced						High-priced

9. What mainly hinders you to consume (more) carp? Please indicate up to three reasons. → randomized order, at least one answer has to be indicated

- Too many bones
- Moldy taste
- Low availability
- Hard to prepare
- Fish from old-fashioned cooking traditions
- Portion size too big for one person
- I do not know enough about carp
- Health reasons
- Other reasons: \_\_\_\_\_

In the following we will show you pictures of carp products. Please assess them according to the offered statements.

10. Imagine you see this product while you are shopping for fish. What would be your associations with this product?



Boneless filet

	I do not agree at all	I do not agree	Neither nor	I agree	I totally agree
I might like the taste					
Could be healthy for me					
I might easily prepare this					
Is familiar to me					
Is something I would like to taste					
Is something I would purchase					

11. Imagine you see this product while you are shopping for fish. What would be your associations with this product?



Carp sausage

	I do not agree at all	I do not agree	Neither nor	I agree	I totally agree
I might like the taste					
Could be healthy for me					
I might easily prepare this					
Is familiar to me					
Is something I would like to taste					
Is something I would purchase					

12. Imagine you see this product while you are shopping for fish. What would be your associations with this product? → randomized order



Carp crisps

	I do not agree at all	I do not agree	Neither nor	I agree	I totally agree
I might like the taste					
Could be healthy for me					
I might easily prepare this					
Is familiar to me					
Is something I would like to taste					
Is something I would purchase					



13. Imagine you see this product while you are shopping for fish. What would be your associations with this product?



Carp burger

	I do not agree at all	I do not agree	Neither nor	I agree	I totally agree
I might like the taste					
Could be healthy for me					
I might easily prepare this					
Is familiar to me					
Is something I would like to taste					
Is something I would purchase					

-----Plaice – DE, UK -----

14. What do you associate with plaice? Please choose a point on the scale accordingly.

	1	2	3	4	5	
Special food fish						Common food fish
Good taste						Bad taste
Easy to prepare						Hard to prepare
Free of bones						Full of bones
A seasonal fish						A fish for all year around
Easy to obtain						Hard to obtain
Low-priced fish						High-priced fish
Good image						Bad image
Healthy fish						Unhealthy fish
Fish mostly prepared at home						Fish mostly consumed out of home (e.g., in Restaurants)
Fish from the North Sea						Fish from other ocean regions

15. What mainly hinders you to consume (more) plaice? Please indicate up to three reasons.

- Too many bones
- Undistinguished taste
- Low availability
- Expensive
- Hard to prepare
- Portion size too big for one person
- I do not know enough about plaice
- Health reasons
- Other reasons: \_\_\_\_\_

16. How important is it to you that the plaice you eat.... → This question was only asked if participants indicated to have at least tried plaice once or twice.

	Not important at all	Not important	Neither nor	Important	Very important
is caught in the North Sea?					
is caught in line with sustainability considerations?					

-----Trout – Salmon: FR, IT, PL -----

17. What do you associate with trout in general? Please choose a point on the scale accordingly.

	1	2	3	4	5	
Locally produced fish						Imported fish
A seasonal fish						A fish for all year around
Good image						Bad image
Can be used for the preparation of a variety of dishes						Can be used for the preparation of a low number of dishes
Eco-friendly farmed						Farmed in a manner which is harmful to the environment
Convenient portion sizes						Inconvenient portion sizes
Traditional fish						Modern fish

18. What do you associate with fresh trout? Please choose a point on the scale accordingly.

	1	2	3	4	5	
Distinctive taste compared to fresh salmon						Similar taste to fresh salmon
Fresh trout is easy to prepare						Fresh trout is hard to prepare
Fresh trout is easy to obtain						Fresh trout is hard to obtain
Fresh trout has a reasonable price						Fresh trout is expensive
Mainly prepared at home						Mainly consumed out of home

19. What do you associate with smoked trout? Please choose a point on the scale accordingly.

	1	2	3	4	5	
Distinctive taste compared to smoked salmon						Similar taste compared to smoked salmon
Smoked trout is easy to obtain						Smoked trout is hard to obtain
Smoked trout is easy to prepare						Smoked trout is hard to prepare
Smoked trout has a reasonable price						Smoked trout is expensive
Mainly prepared at home						Mainly consumed out of home

20. What do you associate with salmon? Please choose a point on the scale accordingly.

	1	2	3	4	5	
Easy to prepare						Hard to prepare
Locally produced fish						Imported fish
A seasonal fish						A fish for all year around
Fresh salmon is easy to obtain						Fresh salmon is hard to obtain
Smoked salmon is easy to obtain						Smoked salmon is hard to obtain
Fresh salmon has a reasonable price						Fresh salmon is expensive
Smoked salmon has a reasonable price						Smoked salmon is expensive
Good image						Bad image
Can be used for the preparation of a variety of dishes						Can be used for the preparation of a low number of dishes
Eco-friendly farmed						Farmed in a manner which is harmful to the environment
Convenient portion sizes						Inconvenient portion sizes
Mainly consumed out of home if fresh						Mainly consumed at home if fresh
Mainly consumed out of home if smoked						Mainly consumed out of home if fresh
Traditional fish						Modern fish

21. Which of the following attributes are most important for you in your purchase of salmon? Please indicate up to three attributes. → This question was only shown to the participants if they indicated to have at least tried salmon once or twice.

- Low price
- Versatile preparation alternatives
- Easy preparation
- Good taste
- High product diversity
- Healthiness
- I am used to buying salmon
- Eco-friendly production
- Attractive colour

22. And which of the following attributes are most important for you in your purchase of trout?  
Please indicate up to three attributes. → This question was only shown to the participants if they indicated to have at least tried trout once or twice.

- Low price
- Versatile preparation alternatives
- Easy preparation
- Good taste
- High product diversity
- Healthiness
- I am used to buying trout
- Domestic production
- Eco-friendly production
- Attractive colour

-----Coastal fisheries – FR, IT, UK -----




23. What do you associate with coastal fisheries? Please choose a point on the scale accordingly.

	1	2	3	4	5	
High freshness						Low freshness
Artisanal fishing						Industrial fishing
Important for coastal communities						Unimportant for coastal communities
Seafood from coastal fisheries is easy to obtain						Seafood from coastal fisheries is difficult to obtain
Eco-friendly fishing						Fishing which is harmful to the environment
Low-priced seafood						High-priced seafood
High convenience						Low convenience
Eco-friendly catching methods						Catching methods which are harmful to the environment
Healthy seafood						Unhealthy seafood
High quality seafood						Low quality seafood
High variety of seafood						Low variety of seafood

24. You indicated to eat scallops. From where do the scallop products you consume mostly originate? Please indicate only one answer. → This question was only given to participants in France and the UK and only if they had indicated to have tried scallops at least once or twice.

- Local origin (< 50 km)
- Domestic origin
- Other European countries: \_\_\_\_\_
- Non-European countries: \_\_\_\_\_
- I do not know

25. What kind of scallop products do you mostly purchase? Please indicate up to two products. →  
This question was only given to participants in France and the UK and only if they had indicated to have tried scallops at least once or twice.

	Frozen nuts	 Source: TI/Y.Feucht
	Whole fresh scallops	 Source: Fishor consulting LTD/S. Mardle
	Fresh scallops with roe	 Source: Fishor consulting LTD/S. Mardle
	Other prepared/preserved products with scallops	For example soup

26. How important is it to you that.... → This question was only presented to participants who indicated to had at least tried scallops/clams once or twice. Only French participants were asked about the label rouge. In Italy the word 'scallops' was substituted with the word 'clams'.

	Not important at all	Not important	Neither nor	Important	Very important
	1	2	3	4	5
the fresh scallops you eat originate from European fishing areas?					
the scallops you eat are fished in line with sustainability considerations?					
the preserved scallops (e.g., frozen nuts) you eat originate from European fishing areas?					
the scallops you eat are certified by label rouge?					
the scallops you eat are certified by MSC (Marine Stewardship Council) or other sustainability labels?					



27. What is your view on a coastal fisheries label?

	I do not agree at all	I do not agree	Neither nor	I agree	I totally agree
I would use such a label in my purchase decision					
I think such a label would be useful					
I think that a coastal fisheries label is of particular interest for products found in supermarkets					
I am skeptical about a coastal fisheries label					
I think that already enough labels for seafood exist					

28. Imagine the introduction of a label indicating that the respective seafood does originate from coastal fisheries. What would you expect from such a label? Please indicate up to three expectations.

- Artisanal fishing practices
- Eco-friendly fishing practices
- The support of local, coastal communities
- A guaranty of higher freshness compared to other seafood products
- A very high quality product
- That the label can only be found on seafood originating from domestic coastal zones

-----Measurement of subjective knowledge, involvement and domain-specific innovativeness-----

29. How far do you agree with the following statements? → This question measured subjective knowledge.

	Do not agree	Do rather not agree	Neither/nor	Do rather agree	Agree
Compared to an average person I know a lot about seafood					
I have a lot of knowledge about how to evaluate the quality of seafood					
People who know me consider me as an expert in the field of seafood					

30. How far do you agree with the following statements? → This question measured involvement.

	Do not agree	Do rather not agree	Neither/nor	Do rather agree	Agree
I am interested in where the seafood I eat comes from					
I enjoy cooking seafood for others and myself					
Making the right choice of seafood is important to me					
Seafood is an important part of my diet					

31. How far do you agree with the following statements? → This question measured domain-specific innovativeness.

	Do not agree	Do rather not agree	Neither/nor	Do rather agree	Agree
In general, I am among the first in my circle to purchase new seafood products					
In general, I would consider buying new seafood products					
In general, I am among the first in my circle to know the latest seafood product trends					

---Perception of sustainability communication about seafood, use of smartphones in the seafood purchase and interest in seafood ecommerce portals-----

32. When considering origin, ingredients and production of seafood, how much do you trust information issued by...







	Do not trust	Do rather not trust	Neither/nor	Do rather trust	Do trust
NGOs (e.g., WWF, aquariums)					
state institutions					
producers					
retailers/stores					

33. Imagine that a retailer/store would decide to sell only sustainable seafood. What are your views on the following statements?

	Do not agree	Do rather not agree	Neither/nor	Do rather agree	Agree
This is a good idea					
I suspect that the seafood would be more expensive					
I suspect a loss in seafood variety					
It would be comfortable to rely on the retail to provide only sustainable seafood					
I am skeptical that a retailer can ensure the sustainability					
I perceive such a decision as patronizing					
The retail should take up more responsibility for sustainability in seafood					
Such a commitment is important to conserve global fish populations					
I do not care about sustainability in seafood					

34. Please imagine you are shopping for fish. Now have a look at the list presented. Have you seen any of these labels while you were shopping for fish? → The included labels change per country for questions 34 to 36.







----- DE – included labels -----

	No	Maybe	Yes
			
			
			
			
			
			




-----FR – included labels-----

	No	Maybe	Yes
			
			
			
			
			
			







-----IT – included labels -----

	No	Maybe	Yes
			
			
			
			
			
			

-----PL – included labels-----







	No	Maybe	Yes
			
			
			

-----UK – included labels-----







	No	Maybe	Yes
			
			
			
			
			
 <p>Seafood from Iceland for the benefit of future generations <a href="http://www.ResponsibleFisheries.is">www.ResponsibleFisheries.is</a></p>			



36. For the labels you might or you have seen while shopping for fish: How important are these/this for your seafood choice... → Participants saw only the labels for which they answered 'Maybe' or 'Yes' in the question number 35.

	not at all important	not important	Neither nor	important	very important
					
					
					
					
					
 <p>Seafood from Iceland for the benefit of future generations <a href="http://www.ResponsibleFisheries.is">www.ResponsibleFisheries.is</a></p>					

37. To what extent do you have confidence in the following label(s) when you are purchasing seafood? → Participants saw only the labels for which they answered 'Maybe' or 'Yes' in the question number 36.

	I have no confidence at all	I have no confidence	Neither nor	I have confidence	I have total confidence
					
					
					
					
					
 Seafood from Iceland for the benefit of future generations <a href="http://www.ResponsibleFisheries.is">www.ResponsibleFisheries.is</a>					

38. How often do you use your smartphone for getting information about seafood products while you are shopping?

- Never
- Sometimes
- Regularly
- I do not possess a smartphone

39. Would you be prepared to purchase seafood online?

- No
- Maybe
- Yes

---

40. What level of education have you achieved? Please indicate the highest level you obtained.

- No formal qualification
- Secondary (GCSE or O'Level)
- Sixth form/College (A'Level)
- University degree

41. How many people, you included, live permanently in your household?

---

42. What is your household's monthly net income? (this is the available sum to all members of the household for a month)

- Less than £430
- £430 up to below £850
- £850 up to below £1,300
- £1,300 up to below £1,750
- £1,750 up to below £2,150
- £2,150 up to below £2,600
- £2,600 up to below £3,000
- £3,000 up to below £3,500
- above £3,500
- No comment

43. Do you have any further comments?

---

Thank you very much for your participation. If you like to know more about the scientific research project you took part in, have a look at the website of the project:

<http://www.success2020.eu/>



## **APPENDIX B – INNOVATIVE MUSSEL PRODUCTS IN GREECE**

### **AUTHORS**

**Avdelas Lamprakis & Petridis Dimitris**

### **EXECUTIVE SUMMARY**

Currently in Greece, a traditional mussel product without shells, so called ‘unvalved’, is frequently encountered in the public markets and supermarkets as an alternative preparation to fresh mussels. However, this product suffers from short shelf-life, colour and taste deterioration. To overcome the defects of the product, the introduction of a new preservation technique based on natural preservatives (brine and vinegar) was attempted. In terms of microbiological quality the new technique resulted in almost doubling the shelf-life of the product but did not affect the colour. The preservation technique was then combined with an alternative mussel recovery process. The microbiological quality results then revealed a significant extension (17-32 days) of the shelf-life depending on the preservative, and the appearance of all products was significantly improved during storage, irrespective of shelf-life. Throughout the experimental period, sensory tests were employed in order to access the acceptability of the new products by the consumers. The use of the innovative products was promoted during two workshops targeting the HORECA sector in Greece. An online survey was also employed to access consumer preferences and willingness to pay for sustainable mussel products. Based on the aforementioned results, the innovative products are expected to significantly affect the mussel value chain in Greece when commercially introduced in the market.

### **GOALS**

The goal of this research is to improve the shelf-life of a mussel product so called ‘unvalved’ which is produced and distributed in Greece. At the same time, consumer preferences and willingness to pay for sustainable mussel products in Greece are also assessed.

This appendix summarizes the findings of various research teams appointed by ATEITH under the SUCCESS project.

## KEY HIGHLIGHTS / OUTCOMES

- Using natural preservatives (brine and vinegar) the shelf-life of the unvalved mussel product is nearly doubled.
- When natural preservatives are combined with an alternative mussel recovery process, the shelf-life of the products is further extended and the appearance of all products is significantly improved
- Unvalved mussel producers, using only natural preservatives, may present new products in the market without the need of any investment
- A rather small investment is needed in the case of the alternative mussel recovery process which further extends the shelf-life and improves the appearance of the products making it more suitable for use in the HORECA sector
- The use of natural preservatives (brine and vinegar) is acceptable by the Greek consumers at low concentrations
- The new products are acceptable by the HORECA sector in Greece
- The new products may substitute for the imported frozen mussels in the HORECA sector
- Only few (18%-26%) consumers in Greece are aware of the most common sustainability labels for seafood and even fewer consumers (6.5%-14%) are aware of the meaning of these sustainability labels
- The average consumer in Greece is indifferent to sustainability certification except in the case of the retailer sustainability certification for mussels at Thessaloniki where the average consumer seems to dislike such certification
- There exists a part (>30%) of Greek consumers who are willing to buy and pay price premiums for mussels certified for sustainability

## 1 INTRODUCTION

Currently in Greece, a traditional mussel product without shells, so called ‘unvalved’, is frequently encountered in the public markets and supermarkets as an alternative preparation to fresh mussels. However, this product, weighed 500g and sealed in plastic bags with equal amount of tap water, suffers from three drawbacks:

1. The shelf-life terminates after 5 to 6 days preservation in the fridge.
2. Juice from the mussel bodies diffuses into the water and turns the medium brownish.
3. The taste deteriorates by time and the appearance of brown colour renders the product unattractive.

To overcome those defects, a new preservation and a new process technique based on cheap and natural preservatives, that is salt and white vinegar, was attempted aiming to improve the quality of the unvalved mussel product in terms of shelf-life, taste and appearance.

The acceptability of the products during the product development phase was continuously monitored using sensory tests. The products considered acceptable by the consumers during the sensory tests were then promoted to the HORECA sector in Greece.

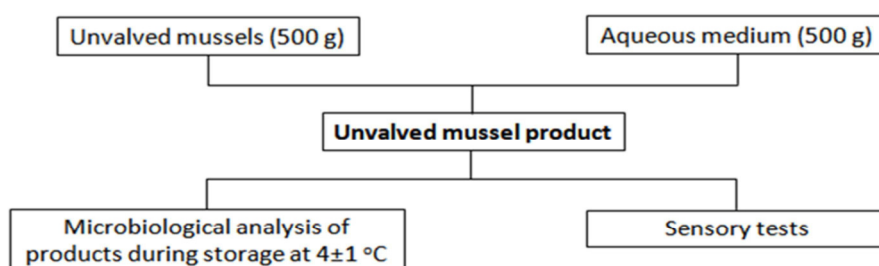
At the same time, an online survey was conducted in the two major cities in Greece, Athens and Thessaloniki, in order to access consumer preferences for, among others, unvalved mussels certified for sustainability.

## 2 METHODOLOGICAL APPROACH

In this chapter we describe shortly the methodological approaches applied.

### 2.1 PRODUCT DEVELOPMENT

Various media were used for the preparation of unvalved mussel products: brines (1, 2, 3, 3.5, 10, 15, 20 and 25%) and aqueous white vinegar solutions (10, 15, 20 and 25%) according to the following process:



The products were monitored regularly (every 5 days) for microbiological quality, testing for the presence of:

- E. Coli  $\beta$ -glucuronidase positive (ISO 16649-3:2005)
- Salmonella spp. (ISO 6579:2002)
- Total viable count (ISO 4883-2:2013)

and complying with known food safety criteria:

- E. coli  $\beta$ -glucuronidase positive (<230 MPN/100 g sample)
- Salmonella spp. (absence in 25 g sample)
- Colony count (<5×10<sup>5</sup> cfu/g)

Regarding the sensory tests, the products were assessed in terms of their taste acceptability using an unstructured line scale 0-15 cm (the left end corresponds to as not all acceptable and the right end as very acceptable product). The scale can further be divided in 5 equal intervals denoting: not at all 0-3cm, low 3-6cm, moderate 6-9cm, adequate 9-12cm, very acceptable 12-15cm. The products were evaluated by the academic staff of the Department of Food Technology or mussel farmers. Plastic bags were also inspected for streaks of brown colour.

For a comprehensive discussion of the methodology, please refer to the task deliverable and Karayannakidis et al. (2017).

## 2.2 ONLINE SURVEY

The online survey was conducted with 504 consumers in two cities (Athens and Thessaloniki). A questionnaire was designed which includes an introduction and distinct parts.

In the introduction, the consumer was informed about the survey and asked to agree and participate. Then 5 exclusion questions were asked regarding the age, the place of residence, the consumption of seafood, the gender and the person of the family that usually buys seafood.

In the first part of the questionnaire, nine choice cards (Figure 1) are included while the terms used in these questions (such as sustainable fisheries, sustainable aquaculture) were explained to the consumer. Five species are included as alternatives in the choice experiment, mussels being one of them. The levels of the certification attribute are selected based on the project aims for the Task 2.3., i.e. sustainability. The base level refers to the current situation of uncertified products. The “label” is considered as an integrated part of the certification attribute. When the product is not certified, no label is presented while label is presented in the case of certified products. In order to capture certification and branding preferences in the analysis, two levels of sustainability are included, certification by the producer based on international sustainability standards and certification by the retailer based on private sustainability standards. The origin attribute of the seafood products, while known to be a dominant attribute for Greek origin, is inserted in the analysis in three levels; Greek origin as base level, imported from EU countries and Imported from Non-EU countries in order to capture changes in preferences for products of EU origin and, as a known attribute for verification. The price attribute includes three levels (low, mean, high), specific to the species alternative. For each species, the current mean price in the market is used as base level. Low and high levels are specified as -20% and +50% of the mean price.



The second part of the questionnaire involved mainly socio-demographic questions and questions regarding the frequency of seafood consumption (Table 1).

In the third part, consumers were presented with four labels (Figure 2) and were asked if they had seen these labels in the past, while if the answer was positive, consumers were asked if they know the meaning of the label using 5 multiple choice answers one of which was open ended.

A market research agency was appointed in order to deliver the questionnaire of the survey online to a predefined consumer panel in Athens and Thessaloniki and gather the responses. Based on the 5 exclusion questions in the introduction of the questionnaire, quota's for gender and place of residence were applied. The sample included only seafood consumers who usually buy seafood for the household.

The online delivery of the questionnaire started on January 2017 and lasted for approximately two weeks. The socio-demographics of the sample are presented in the table below.

For a comprehensive discussion of the methodology, please refer to the task report and Abdelas & Petridis (2017).

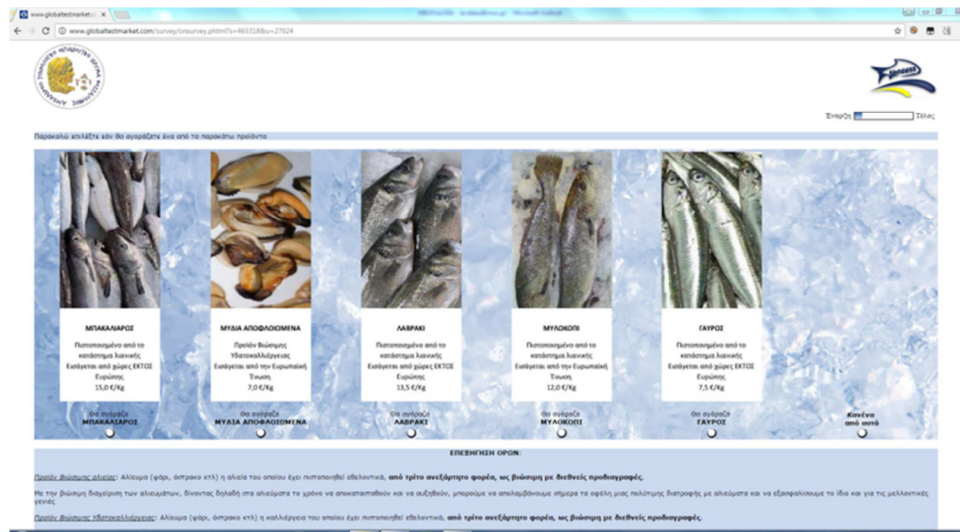
**Table 1: Sample socio-demographics**

Age		Place of residence	
Min	25	Athens	252
Max	63	Thessaloniki	252
Average	40,8		
<b>Household members</b>		<b>Gender</b>	
<31 years	83 16,5%	Male	160 31,7%
31 -40 years	181 35,9%	Female	344 68,3%
40 -50 years	145 28,8%		
>50 years	95 18,8%		
<b>Annual income</b>		<b>Educational level</b>	
1	39 7,7%	Primary level	7 1,4%
2-3	283 56,2%	Secondary level	106 21,0%
4 or more	182 36,1%	University level	391 77,6%
<b>Seafood consumption</b>			
<12000 €	217 43,1%	Less than once a week	113 22,4%
12000 to 30000 €	261 51,8%	Once a week	306 60,7%
> 30000 €	26 5,2%	Twice or more a week	85 16,9%

**Figure 1: Labels presented to the consumers**



**Figure 2: Choice card example**



### 3 RESULTS AND DISCUSSION

In this chapter we first shortly describe and discuss the results of the product development, followed by the results of the promotion events and the results of the online survey.

#### 3.1 PRODUCT DEVELOPMENT

In the following, the key results of the product development are presented.

##### 3.1.1 1st cycle of experimental trials

The examination of microbiological quality revealed the following changes:

- Mussel products placed in brine at concentrations up to 10% exhibited significantly better shelf-life (up to 11 days at  $4 \pm 1$  °C) than the commercially available product (5 days).
- Mussel products placed in white vinegar solutions up to 15% showed significantly better shelf-life (up to 11 days) than the control.

The sensory assessment of taste showed that:

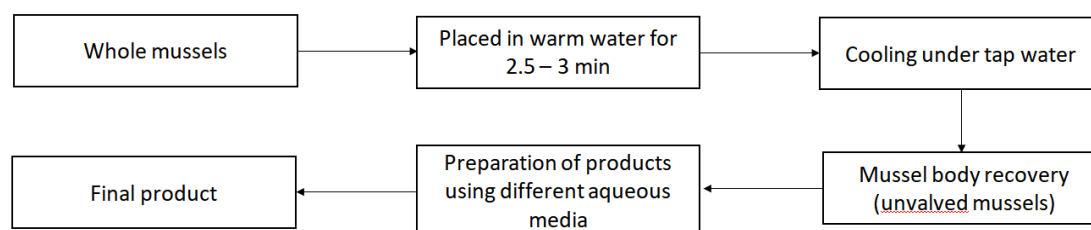
- Unvalved mussel products placed in brine at concentrations 15, 20 and 25% were unacceptable by the panelists (data not shown).
- Unvalved mussel products placed in aqueous white vinegar solution at concentrations 20 and 25% were also unacceptable by the panelists.
- The rest of the products exhibited significantly better taste than the control.
- Overall, unvalved mussels placed in 4 and 10% brine and 10 and 15% aqueous white vinegar solution were more preferable by the panelists.

In terms of general appearance, all products exhibited a brown color in the plastic bags.

To synopsise, in that cycle of experimental lab trials, the use of brine and vinegar, as preservatives at specified medium concentrations, helped the unvalved mussels to double their shelf life (up to 11 days), but still kept them brownish in color.

### 3.1.2 2nd cycle of experimental trials

To overcome the color drawback and also to potentially increase the shelf-life of unvalved mussels an alternative mussel recovery process was employed (see flow chart below) starting with intact fresh mussels.



Four products were prepared, mussels placed in 4 and 10% brine and 10 and 15% aqueous white vinegar solution. All products were stored at  $4 \pm 1$  °C and assessed in terms of their microbiological quality, taste and appearance in relation to storage time, in a manner as previously described. The microbiological monitoring (Table 2) of the products revealed a significant extension of shelf-life depending on the preservative used:

- Unvalved mussels placed in 4% brine exhibited a shelf-life of 17 days, while those placed in 10% brine, 27 days.
- Unvalved mussels placed in aqueous white vinegar solution 10% and 15% exhibited a shelf-life of at least 32 days.

The taste of products was assessed every 5 days in concordance with the microbiological tests. Results showed the following (Fig. 3):

- Products placed in 4% brine and 10 and 15% white vinegar solution were the most preferable by the panelists who judged them as adequately acceptable.
- Mussels placed in 10% brine were found to be very salty. A washing step is necessary to improve the taste of the unvalved mussels placed in 10% brine (placing drained mussel bodies in water for 180 min prior cooking is proposed).

The appearance of all products was significantly improved throughout storage, irrespective of shelf-life as Figure 4 clearly depicts, with some remarks:

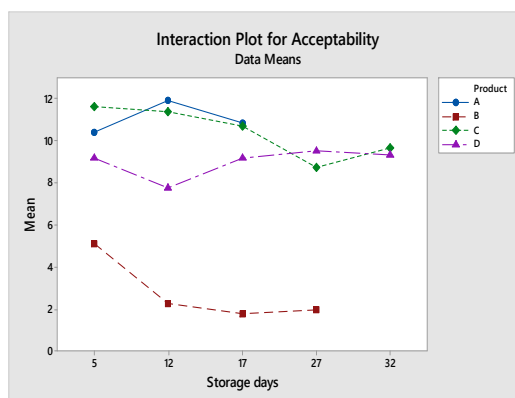
- Mussels preserved in brine concentration keep most of the time the natural color of freshly unvalved mussels.
- Mussels preserved in white vinegar attenuate gradually in color showing finally a whitish color due to vinegar's effect.

**Table 2: Changes in MPN, *Salmonella* spp. and TVC (cfu/g)**

Storage time (days)	Product	MPN	<i>Salmonella</i> spp.	TVC
20(17)	4% brine	<18	Absence	<b>810000</b>
	10% brine	<18	Absence	210000
	10% vinegar	<18	Absence	42000
	15% vinegar	<18	Absence	39500
25				
	10% brine	<18	-	410000
	10% vinegar	<18	-	150000
	15% vinegar	<18	-	165000
30(27)				
	10% brine	<18	-	<b>600000</b>
	10% vinegar	<18	-	320000
	15% vinegar	<18	-	305000

Numbers in bold indicate failure to comply with the specific criteria (TVC>500.000)

**Figure 3: Mean taste acceptability of the various products throughout storage at 4±1 °C**



A: brine 4%, B: brine 10%, C: vinegar 10%, D: vinegar 15%

**Figure 4: Storage for 14 days in plastic bags according to the series of medium concentrations**



Control (no preservatives and 3 days old), brine 4% and 10%, white vinegar 10% and 15%.

### 3.1.3 Promotion Events

Two promotion events, addressed to chefs, were conducted, the first in Heraklion (Crete) a high touristic destination, the second in Thessaloniki (Central Macedonia) near by the main mussel production area in Greece. A promotion agency was appointed and a known chef prepared twelve different recipes (treatments). The recipes differed in the amount of salt (4% or 10%) and vinegar 10% plus one without any treatment (traditional unvalved mussels) and were equally divided into four appetizers, salads and main courses. A simple questionnaire which included demographic questions and attitudes was provided to the chefs asking them to rate the recipes preference. MaxDiff (maximum difference scaling) was chosen as an alternative to standard preference scales to determine the relative importance of recipes being rated.

The participants for both events were numbered 97, but 38 questionnaires out of 47 were valid in Crete and 41 out of 50 in Thessaloniki. Product quality, taste and food supply are the key factors common for both events that could possibly trigger the chefs to cook mussels regularly. Price is of high priority to Cretan chefs (32.1%), freshness and long self-life (10%) for the northern chefs. The latter sounds quite interesting since there is an immediate availability of fresh mussels around Thessaloniki region and probably the main cause is the flexibility of the frozen products used which serve for a longer usage time.
































Cretan chefs use imported mussels (77.7%) instead of Greek mussels (6.7%) or both at about 16.7%, due presumably to scarcity of the domestic ones in the market. An inverse situation is obvious for chefs from the north, where domestic mussels are mostly used (76.9%) and only 15.4% are imported. Cretan chefs tend to use frozen mussels (58.8%), most of which are imported and few are transported from Thessaloniki region. A portion 14.7% of Cretans, try to procure only fresh mussels whenever available in the market. Chefs from Central Macedonia prefer to cook fresh mussels (60.7%), while another 25% uses also frozen mussels as an alternative at times of low supply, connected often with adverse weather conditions or due to longer time of handling. Three to four chefs in both events tend to use generally mussels on a regular basis (roughly 75%).

The innovative unvalved mussel products developed during the SUCCESS project, were preserved for 14 days and the traditional one for 3 days before use, and were presented to chefs in various recipes for taste rating. Most of the recipes were admittedly very tasteful (comments were recorded) and the results are shown in Table 3.

Cretan chefs ranked two recipes with vinegar 10% as the most acceptable for salads (preference 45.2%) and main courses (74.1%). Appetizers were nearly equally rated by the chefs thus no particular preference was manifested ( $p=0.372$ ).



**Table 3: Statistical analysis of chefs' taste preferences on twelve recipes presented**

Heraklion-Crete MaxDiff Results			
Marginal Utility	Marginal Probability		Appetizer
0.1978	0.2992		2
0.1486	0.2848		3
-0.051	0.2334		4
-0.296	0.1826		1
p=0.372 Comparisons: 2=3=4=1			
Marginal Utility	Marginal Probability		Salad
0.6874	0.4520		8
-0.042	0.2179		5
-0.248	0.1773		7
-0.397	0.1529		6
p=0.003 Comparisons: 8>5=7=6 (vinegar 10%)			
Marginal Utility	Marginal Probability		Main course
.6590	0.7410		11
-0.105	0.1269		12
-0.588	0.0783		10
-0.965	0.0537		9
p<0.0001 Comparisons: 11>12 =10= 9 (vinegar 10%)			
 <p>•8• Mussels with pickled vegetables Preservation: vinegar 10%</p>			
 <p>•11• Mussels stew Preservation: vinegar 10%</p>			
Thessaloniki-Central Macedonia MaxDiff Results			
Marginal Utility	Marginal Probability		Appetizer
0.5171	0.3789		4
0.3072	0.3072		2
-0.100	0.2044		3
-0.724	0.1095		1
p=0.002 Comparisons: 4=2=3>1 (salt 4%)			
Marginal Utility	Marginal Probability		Salad
0.4274	0.3646		5
0.1760	0.2836		6
-0.302	0.1759		7
-0.302	0.1759		8
p=0.027 Comparisons: 5=6>7=8 (salt 10%)			
Marginal Utility	Marginal Probability		Main course
0.3920	0.3545		11
0.0886	0.2617		12
-0.046	0.2288		9
-0.435	0.1550		10
p=0.043 Comparisons: 11 12 9 10 (vinegar 10%)			
 <p>•4• Marinated mussels tart Preservation: salt 4%</p>			
 <p>•2• Mussels saganaki Preservation: salt 4%</p>			
 <p>•5• Mussels salad with dried beans Preservation: salt 10%</p>			
 <p>•6• Athenian tuna salad with mussels Preservation: fresh</p>			
 <p>•11• Mussels stew Preservation: vinegar 10%</p>			

A different approach on taste rating was found for chefs from Thessaloniki. An appetizer with 4% salt preservative was the most acceptable (37.9%) although did not differ statistically from two other recipes. Two salads, one with 10% salt preservative (36.5%) and another without treatment (28.4%), were highly rated. Finally, the same recipe (vinegar 10%) from the main courses was preferred by chefs from both events (35.5%).

To summarize, recipes from all the treated unvalved mussels with salt and vinegar solutions were warmly welcomed by the chefs who, in the majority, stated that they intend to use the product as soon as that would be commercially available. We expect that the very promising attitude of the chefs regarding the new products may initiate the mussel farmers to engage with the production of the innovative unvalved mussels in a commercial scale.

### 3.2 ONLINE SURVEY

With regard to consumer awareness for sustainability and organic certification labels, of the full sample, 26% & 18% of the consumers answered that they have seen before the MSC & FRIENDS OF THE SEA labels respectively. For the European organic label, 21% of the consumers answered that they have seen the label before while 74% of the consumers had seen the placeholder “label” in the past. Nevertheless, when the consumers were asked about the meaning of these labels, only 14%, 6.5% and 9.7%, were aware the meaning of the MSC, FRIENDS OF THE SEA and the organic label respectively. For the placeholder “label”, 31% of the consumers replied that this label means organic food.

**Table 4: The multinomial logit models for the two cities (coefficients for mussels only)**

Frequencies of alternatives:											
None	Anchovy	Hake	Meagre	Mussels	Seabass	None	Anchovy	Hake	Meagre	Mussels	Seabass
0.099647	0.292769	0.228395	0.082011	0.120370	0.176808	0.111552	0.254850	0.221781	0.085097	0.134480	0.192240
Coefficients: <b>Athens</b>						Coefficients: <b>Thessaloniki</b>					
	Estimate	Std. Error	t-value	Pr(> t )		Estimate	Std. Error	t-value	Pr(> t )		
Mussels:(intercept)	1.665646	0.308840	5.3932	6,92E-05 ***		2.2095399	0.3118982	7.0842	1,399E-09 ***		
Mussels Producer Certification	-0.033051	0.166914	-0.1980	0.843036		-0.2082326	0.1606186	-1.2964	0.194823		
Mussels Retailer Certification	0.133572	0.164589	0.8116	0.417048		<b>-0.3740354</b>	<b>0.1693235</b>	<b>-2.2090</b>	<b>0.027175 *</b>		
Mussels EU	-0.739322	0.154260	-4.7927	0,001645 ***		-1.4926600	0.1590314	-9.3859	<2.2e-16 ***		
Mussels NonEU	-1.294595	0.176752	-7.3243	2,4E-10 ***		-2.3293346	0.2039777	-11.4196	<2.2e-16 ***		
Mussels Price	-0.123942	0.034978	-3.5434	0.000395 ***		-0.1147310	0.0350446	-3.2739	0.001061 **		
Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.											

In Table 4, the coefficients for mussels of two conditional logit models for Athens and for Thessaloniki are presented. The price coefficients are negative and significant suggesting that the higher the price the smaller the probability of the product to be chosen. The coefficients for the control attribute (origin) are all negative and highly significant suggesting, as expected, that the average consumer prefers domestically produced seafood products. The sustainability certification coefficients (either producer or retailer) are not significant suggesting that the average consumer is indifferent to sustainability certification with the exception of the retailer sustainability certification for mussels for Thessaloniki where the average consumer seems to dislike such certification.



Nevertheless, as in the case of organic seafood, currently a niche market in Greece, there exists a part (>30%) of Greek consumers who are willing to buy and pay price premiums for seafood products certified for sustainability (Avdelas & Petridis, 2017).

## CONCLUSIONS

Using natural preservatives (brine and vinegar) the shelf-life of the unvalved mussel product is nearly doubled. When natural preservatives are combined with an alternative mussel recovery process, the shelf-life of the products is further extended and the appearance of all products is significantly improved. Producers, using only natural preservatives, may present new products in the market without the need of any investment. A rather small investment is needed in the case of the alternative mussel recovery process which further extends the shelf-life and improves the appearance of the products making it more suitable for use in the HORECA sector. The use of natural preservatives (brine and vinegar) is acceptable by the Greek consumers at low concentrations. The new products are acceptable by the HORECA sector in Greece. The new products may substitute for imported frozen mussels in the HORECA sector.

Only few (18%-26%) consumers in Greece are aware of the most common sustainability labels for seafood and even fewer consumers (6.5%-14%) are aware of the meaning of these sustainability labels. The average consumer in Greece is indifferent to sustainability certification except in the case of the retailer sustainability certification for mussels at Thessaloniki where the average consumer seems to dislike such certification. There exists a part (>30%) of Greek consumers who are willing to buy and pay price premiums for mussels certified for sustainability.

Based on the aforementioned results, the innovative products developed during the SUCCESS project are expected to significantly affect the mussel value chain in Greece when commercially introduced in the market.

## REFERENCES

Avdelas Lamprakis and Petridis Dimitris (2017). Consumer preferences for certified seafood in Greece. Presented at the XXIII EAFE Conference, Dublin Castle, 25-27 April 2017.

Karayannakidis D. Panayotis, Petridis Dimitris, Galinou-Mitsoudi Sofia, Avdelas Lamprakis, Papaharisis Leonidas and Tsiaras Spyridon (2017). Approaches to extend the shelf-life and improve the quality of unvalved mussel products stored at  $4\pm 1$  °C. Presented at 6th International Congress in Food Technology, DOI10.13140/RG.2.2.18024.67846