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Results on consumer preferences for sustainable seafood products from Europe

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ORGANIZATION OF THE REPORT

This report is separated in three sections. The first section consists of the report for deliverable D2.2 and is based on research performed by Yvonne Feucht and Katrin Zander from the Thuenen-Institute. The second section shows the results of the research conducted by UBO in the subtask 2.2c and was written by Bertrand Le Gallic, Myriam Nourry, Estelle Masson and Claudio Pirrone. The third section of this report displays some results of task 2.2b and was directed by Lamprakis Avdelas and Sofia Galinou-Mitsoudi from ATEITH.

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REPORT FOR DELIVERABLE D2.2 - RESULTS ON CONSUMER PREFERENCES FOR SUSTAINABLE SEAFOOD PRODUCTS FROM EUROPE (TI)

Yvonne Feucht and Katrin Zander

OVERVIEW / EXECUTIVE SUMMARY

GOALS

Form other food products we know that consumers are willing to pay higher prices for attributes such as sustainably/organic/equitably/locally produced. Therefore, the deliverable D2.2 aims to explore consumers' awareness and preferences for seafood from European production with the additional attributes of ecological and/or social sustainability. This objective was achieved through the conduction and analysis of an online survey which included a contingent valuation exercise.

EXECUTIVE SUMMARY

This report starts with a literature review of recent research focusing on consumers' interest in and preferences for sustainability related attributes (e.g., organic production) and geographic origin (local, domestic and European) as well as production methods (wild or farmed). Consumers' knowledge about fish and seafood is addressed. The literature review shows that consumers have preferences for different sustainability attributes and geographic origins. Thus, the present study explores if sustainably produced seafood from European production might be a promising market segment and a way to improve the market position of the European seafood sector.

In order to reach this aim, the present research consists of an online survey conducted with 4103 consumers in eight European countries (Finland, France, Germany, Ireland, Italy, Poland, Spain and United Kingdom). The survey includes a questionnaire and a contingent valuation exercise. The questionnaire elicits consumers' perception of European and local production, perception of sustainable fisheries and fish farming and associations with aquaculture. The contingent valuation exercise explores consumers' preferences and willingness to pay for seafood for different sustainability aspects (e.g., higher animal welfare standards, no discards) and varying geographic origins (e.g., local, European).

The chapter 4 of the report describes the results of the present research. It starts with the results of the questionnaire and displays afterwards the findings of the contingent valuation exercise. The results of the questionnaire on general preferences for fish consumption show that fresh fillets are the most favoured preparation form and that salmon is the most bought/consumed one. Participants generally have a positive perception of fish. Fish is perceived as healthy, nutritious and easy to prepare. With respect to the importance of local and European origin of fish participants find domestic origin important followed by local and European origin. Greater freshness is the most important reason for preferring local and European origin. Simultaneously, the support of the local economy was a stronger motive for

the importance of local origin than it was the case for European origin. European origin was in particular associated with guaranteeing food safety and an ethical responsible production.

The results on consumers' attitudes towards aquaculture reveal that the participants of the study have a rather positive view of aquaculture. Aquaculture is foremost associated with the provision of jobs and perceived as being of importance to cover global fish demand. With respect to taste wild fish is however preferred over farmed fish. Sustainable fisheries and sustainable aquaculture are predominantly associated with environmental sustainability and to a lesser degree with economic and social sustainability. In addition, healthiness including human as well as animal wellbeing is another very important aspect of sustainable aquaculture.

The findings of the contingent valuation exercise show that the additional willingness to pay is highest for organic production followed by sustainable production and higher animal welfare standards. For marketing and communication issues, the share of participants with a (high) additional WTP is of particular interest. Thus, chapter 4.2.2 identifies three consumer segments: 'No additional willingness to pay' (+2%), 'Low additional willingness to pay' (+17%) and 'high additional willingness to pay' (+43%). In the segments with low and high additional willingness to pay organic production, sustainable production and higher animal welfare standards are particularly valued.

The present report shows that there is a small consumer segment with a higher WTP for fish (and seafood) produced according to sustainable production methods and from European origin. About 10% of the consumers belong to this segment their WTP is at almost 50%.

KEY HIGHLIGHTS / OUTCOMES

1   The majority of the participants found domestic production important followed by local and European production:
  - Local origin was foremost associated with 'greater freshness', 'support of the economy' and 'shorter transport distances'.
  - European origin was in particular important to participants due to quality, safety and sustainability reasons.
  - The 'European' origin indication has the potential to serve as a guarantee for food safety and ethical responsible production with respect to environmental and animal welfare issues.

2   Participants revealed a rather positive attitude towards aquaculture but had some concerns about the use of drugs in aquaculture and potential negative ecological impacts:
  - Aquaculture was mainly associated with the provision of jobs and as an important contribution to cover global fish demand.
  - The majority of the participants agreed that the consumption of farmed fish preserves natural resources.
  - More than half of the participants perceived aquaculture as a highly technical activity.

3   Sustainable fisheries and aquaculture were predominantly associated with the environmental dimension of sustainability.

- Participants associated predominantly a reduced impact on the marine environment and the protection of the aquatic biodiversity with sustainable fisheries.

- Sustainable aquaculture was foremost associated with 'minimal use of hormones and drugs', 'helping to protect endangered species', 'no pollution of the environment' and 'respect of fish welfare'.

4   On average higher Willingness to Pay (WTP) for fish (and seafood) produced according to sustainable production methods and from European origin exists. WTP differs largely between participants.

- Almost 50% are not willing to pay higher prices for sustainable fish, about 40% are disposed to pay 15 to 20% more and a small segment of just under 10% has an additional WTP of 50%.

- By emphasizing animal welfare, organic and/ or sustainable production, the small consumer segment with high WTP can be successfully addressed.

- The indication of European origin can strengthen the positive perception of a fish produce since consumers perceive the European Union as a credible controlling agent.

1. INTRODUCTION

This deliverable contains the results of the task 2.3 'Exploring awareness, preferences and willingness to pay of consumers for European seafood products (responsible TI; partners: UBO).

In the European market for seafood European producers compete with international imports which often can be produced at lower costs. That is why imports of seafood are gaining market shares and an economically sustainable production of seafood in Europe is frequently questioned.

When aiming at increasing European production, consumers play an important role. Do they ask for the cheapest product or do they also consider origin and specific production methods when purchasing seafood? Since future European seafood products will have to be located in higher priced market segments consumers need to be convinced that European products are worth higher prices.

A first literature review revealed that focusing only on the communication of European origin is not a promising approach for market differentiation. Simultaneously, we know from other food products that consumers are willing to pay higher prices for attributes such as sustainably/organically/equitably/locally produced. Some similar results have been published also for fish. Sustainability considerations represent also an integral part of the Common Organization of the Markets in Fishery and Aquaculture Products Regulation (COM) issued by the EU (D'Amico et al. 2016). That is why strengthening the communication of sustainability which exists anyway in European fisheries and aquaculture in combination with European origin seems to be a promising approach. In this context, the present research will aim to reveal European consumers' preferences for sustainably produced European fish.

The research combines an online survey with a contingent valuation experiment and was conducted in eight European countries (Germany, Finland, France, Ireland, Italy, Poland and Spain). By means of the contingent valuation consumers' preferences and willingness to pay for these products was analyzed. The questionnaire rendered additional information on socio- and psychographic variables of the participants and explored participants' perception of sustainable fisheries and sustainable aquaculture as well as of aquaculture over all.

A market research agency was contracted to organize the conduction of the survey in all study countries. This guaranteed a similar approach in the study countries. Questionnaire development and data analysis was done by researchers from the Thuenen-Institute. UBO and LUKE contributed to the development of the questionnaire. UBO, LUKE, NISEA, NMFRI, FISHOR Consulting and Universidad de Cantabria checked the translation of the questionnaire in the respective languages.

2. LITERATURE REVIEW

During the last decade sustainability has become an important issue for the seafood sector since public concerns about the social and environmental impact have been increasing (Ankamah-Yeboah et al. 2016; Brunsø et al. 2008; Bergleiter and Meisch 2015). For example Europeans attach a high priority to the regulation of overfishing (Gelcich et al. 2014). One way of addressing these concerns is to increase sustainability in fishing and production and to improve the communication of these aspects to consumers (e.g., Ankamah-Yeboah et al. 2016).

An extensive literature review was conducted taking into account results from studies undertaken in Europe as well as abroad (particularly Canada, USA and Australia). The review reveals that consumers are interested in additional product attributes such as sustainability, fish welfare, organic production and domestic/European origin in combination with seafood, given that general expectations with respect to price and quality are met (e.g., DG Mare 2008; Jaffry et al. 2004; McClenachan et al. 2015; Whitmarsh and Palmieri 2011). Thus, these additional product attributes are promising for market differentiation.

McClenachan et al. (2015) underline that consumers are willing to pay higher prices for locally sourced seafood than for sustainably produced seafood. Also consumers perceive a high degree of overlap between social sustainability and locally sourced seafood (McClenachan et al. 2015). Claret et al. (2012) find that seafood consumers use the indication of geographical origin as a quality key. Overall, domestic seafood products are preferred over foreign products due to ethnocentrism[1] and higher familiarity with local conditions (Brécard et al. 2009, Claret et al. 2012). Additionally, the indication of European origin enhances the positive image of seafood (Altintzoglou et al. 2010).

Gutierrez and Thornton (2014) show in a case study in the USA and UK that consumers are highly aware of sustainability labels and environmental claims related to seafood. Similarly, a recent study conducted by GlobeScan (2016) for the Marine Stewardship Council (MSC) highlights that awareness of the leading sustainability label for caught fish, the MSC, is increasing with now 37% of consumers in 21 countries indicating to have seen the MSC-label. Also Ankamah-Yeboah et al. (2016), Gutierrez and Thornton (2014) and Roheim et al. (2011) find that consumers are willing to pay a price premium for seafood with sustainability labels. In addition, Salladarré et al. (2010) point out that sustainability labels can induce an increase in fish consumption. However, some studies (e.g., Aarset et al. 2004; Feucht and Zander 2015; Zander et al. 2013) highlight that consumers were rather unaware of sustainability labels on seafood. Additionally, Grunert et al. (2014) stress that consumers in general show a low level of use of sustainability labels. The studies by Brécard et al. (2009), Wessells et al. (1999) and Uchida et al. (2014) point out that various factors influence the desire for sustainability labels on seafood. These are in particular conservation form, geographical origin and species as well as the production origin (wild or farmed).

The interest in sustainable seafood is also correlated with the frequency of visits to the seaside. The more time people spent on the coast the more they are in favor of a sustainability label (Brécard et al. 2009). However, empathy/closeness to the fisheries sector lowers the demand for a sustainability label (Salladaré et al. 2010). In general, basic awareness of potential problems resulting from fisheries is a precondition for the demand for a sustainability label (Gutierrez and Thornton 2014; Thøgersen et al. 2010).

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[1] Ethnocentrism refers here to a circumstance where people perceive their own culture/country as superior to others.

Therefore, consumers' knowledge about seafood has an important impact on consumers' interest in sustainable seafood. The review shows that consumers' knowledge with respect to seafood varied strongly according to the country of origin. Consumers from southern European countries are more knowledgeable than those in other European states (Pieniak et al. 2013). Interest in additional information about seafood differs with the degree of knowledge. Consumers with lower knowledge have often also little interest in additional information while more involved consumers demand frequently more information (Verbeke et al. 2008). In general, knowledge about seafood seems to be often limited even though a generic understanding about sustainability in seafood exists (Altintzoglou et al. 2011; Arvanitoyannis et al. 2004; Feucht and Zander 2015; Gutierrez and Thornton 2014; Schlag and Ystgaard 2013; Verbeke et al. 2007a). The lack of knowledge might result in the rejection of sustainable seafood products by consumers due to the underestimation of the consequences of their purchase decisions (Brécard et al. 2009). Gelcich et al. (2014) show that the level of awareness is correlated with the level of concern. In order to empower consumers to incentivize sustainable and European fisheries by their purchase behavior, targeted information is needed which is adjusted to the needs of different consumer groups (Gutierrez and Thornton 2014; Salladarré et al. 2010; Verbeke et al. 2008, Feucht and Zander 2016).

2.1.   PREFERENCES FOR CAPTURED FISH VS FARMED FISH

Previous studies show that consumers mostly ignored if the seafood they purchase originated from capture fisheries or aquaculture (DG Mare 2008). When comparing seafood from aquaculture with captured fish European consumers judged fish from aquaculture as being of a lower quality (Altintzoglou et al. 2010; DG Mare 2008). Consumers consider wild fish to be fresher, healthier, less processed and more natural (Claret et al. 2014). Consumers were concerned about potential traces of drugs or other additives in farmed fish (Aarset et al. 2004; Solgaard and Yang 2011). Aquaculture was also criticized for its effects on the environment like the destruction of natural habitats and the imposed threats on wild fish stocks by escapees and parasites (Behrens 2009; Kaiser and Stead 2002; Solgaard and Yang 2011). The use of fish meal and fish oil in fish feed was another concern with regard to the depletion of worlds' fish stocks (Behrens 2009; Kaiser and Stead 2002). Some consumers doubted fish welfare in aquaculture and thought of it as unnatural (Behrens 2009; Vanhonacker et al. 2011). Therefore a preference for wild caught fish was often stated among Europeans (Claret et al. 2016; DG Mare 2008; Kole et al. 2009; Polymeros et al. 2015).

But, besides these negative associations with aquaculture, some consumers also stated positive aspects. German consumers for example considered farmed fish to be more sustainable than captured fish (DG Mare 2008; Freeman et al. 2012). Some consumers also thought that aquaculture could guarantee higher food safety because of the controlled production conditions. Therefore, farmed fish was considered to be less affected by marine pollution, heavy metals and parasites. A part of the consumers was aware that farmed fish contributes substantially to the animal protein supply for human consumption and simultaneously reduces pressure on wild fish stocks (Claret et al. 2014; DG Mare 2008; Vanhonacker et al. 2011). Several consumers also appreciated aquaculture for contributing to the local economy (DG Mare 2008, Claret et al. 2012). In studies by Claret et al. (2016) and Kole et al. (2009) consumers preferred farmed fish over wild fish in a blind tasting. Interestingly, their preferences changed as soon as information about the production method was provided.

In sum, a comparison of consumer attitudes towards farmed and wild fish indicates that consumers hold a generalized positive image towards wild fish while farmed fish has not a

negative image but compared to captured fish a less positive image (Claret et al. 2016; DG Mare 2008; Vanhonacker et al. 2011).

Although, some research on consumers' preferences for seafood does exist, the results are not always consistent. Preferences for the origin (domestic, vs European vs overseas) and sustainability attributes seem to be present. Against this background, the present study aimed to explore if sustainably produced seafood from European production might be a promising market segment and a way to improve the market position of the European seafood economy.

3. METHODOLOGY

The research in task 2.3 consisted in the conduction of an online survey to elicit consumers' preferences for seafood from European production with the additional attributes of ecological and/or social sustainability. The survey was conducted with 4103 consumers in eight European countries (Finland-FI, France-FR, Germany-DE, Ireland-IR, Italy-IT, Poland-PL, Spain-ES and United Kingdom-UK) in March 2016. 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 still more women than men are responsible for shopping (e.g., Vanhonacker et al. 2013). With regard to age and regional distribution representativeness was required. All participants had to be fish consumers.

3.1. SAMPLE DESCRIPTION

Over all countries people between the age of 55 to 70 were the most (25%) represented in the sample while the youngest age group (18 to 24 years) had with 12% the lowest share (Table 1). The participants in Poland were slightly younger than in the other countries. The Italian and German participants were somewhat older compared to the other countries. In comparison to census data, people with higher education (college or university degree – tertiary level) were overrepresented in our data for FR, IR, IT, ES, PL and UK. In contrast, in Finland and Germany participants with a low to medium education (no formal education and up to 10 years of school visit) had a higher presence in the sample compared to the census. The dominance of higher educated people in the majority of the studied countries might be due to 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 Spain followed by Italy and UK. Finnish, German and Polish participants consumed the least often fish. The 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 1:   Summary statistics for variables on socio-demographic criteria (%)

Variable / Description	All	DE	ES	FI	FR	IR	IT	PL	UK
				Country					
Number of observations	4103	530	534	500	517	500	513	502	507
Age of test persons									
18 to 24 years	11.7	11.1	9.9	12.2	11.6	12.2	9.6	13.9	12.8
25 to 34 years	20.9	18.3	24.3	18.0	19.7	26.0	17.3	23.9	19.9
35 to 44 years	21.8	24.0	23.4	21.2	20.7	22.0	23.8	18.1	21.3
45 to 54 years	20.7	20.4	19.1	23.2	21.7	19.2	22.8	18.7	20.3
55 to 70 years	24.9	26.2	23.2	25.4	26.3	20.6	26.5	25.3	25.6
Gender									
Female	65.3	65.7	64.6	65.2	66.7	64.2	65.3	64.7	66.1
Male	34.7	34.3	35.4	35.8	33.3	35.8	34.7	35.3	33.9
Education (years of school visit)									
No formal qualification	2.5	0.4	0.6	11.0	2.7	0.6	0.0	1.2	3.6
About 10 years of school visit	22.5	48.1	5.1	39.4	15.1	26.8	10.3	8.0	27.8
12 or 13 years of school visit	37.1	32.1	48.7	30.2	35.6	23.2	56.1	41.8	28.4
College or university degree	37.9	19.4	45.7	19.4	46.6	49.4	33.5	49.0	40.2
Fish consumption									
Occasional fish consumers	47	57	21	68	43	54	30	59	46
Less than once per month	9	8	4	13	9	14	4	10	10
Once per month	10	13	3	17	9	13	4	14	9
Two to three times per month	28	36	14	38	25	28	22	35	27
Regular fish consumers	53	43	79	32	57	46	70	41	55
About once per week	32	33	33	22	40	28	37	32	33
More than once per week	21	10	46	10	17	18	33	9	21

The survey was developed in English and German and then translated into the other languages by professional translation services by means of the back-translation method. The content of the survey and the translations were discussed and reflected with the project partners in the respective countries. It was pretested with 15 participants in Germany. Participants spent about 20 to 25 minutes on average to complete the survey including questionnaire and contingent valuation exercise.

Statistical analyses were performed using the statistical software SPSS version 24. Bivariate analyses including cross-tabulation with chi-square statistics and one-way ANOVA comparison of means with Tukey post-hoc tests were used to analyze the data. Differences were considered statistically significant if $p < 0.05$.

3.2. CONTENT OF THE SURVEY

The survey consisted of a contingent valuation exercise (CVM) and a questionnaire. The questionnaire followed the CVM.

Several methods exist for analyzing consumers' preferences and their willingness to pay – among them choice experiments and the contingent valuation method. During the last years choice experiments have become state of the art in analyzing consumers' preferences for market goods with ethical properties such as environmental impacts.

The contingent valuation method has been widely used in environmental economics in analyzing preferences for public goods and less frequently in the analysis of preferences for private goods. Examples for the use in private goods are the larger topics of GMO free food (Loureiro and Bugbee 2005; Loureiro and Hine 2002; Caswell 1998; Kaneko and Chern 2007; Moon and Balasubramian 2003) and renewable energy respectively fuels (Kallas and Gil 2015; Akcura 2015; Solomon and Johnson 2009; Petrolia et al. 2010; Interis and Haab 2014).

In comparison with Choice Experiments results from CVM were supposed to be upwards biased due to the fact that the design is less close to real market situations. But, methodological comparisons have shown that hypothetical bias in CVM when analyzing WTP for private goods is much lower than expected (Grunert et al. 2009; Lusk and Schroeder, 2004; List and Gallet 2001; Balistrieri et al. 2001).

The reliability and validity highly depends on the design of the study and the way of asking individuals for their WTP. CVM allows for different forms of asking for the WTP, i.e. open- and closed-ended questions. The open-ended format gives much lesser guidance to the participants and it is less close to real purchase decisions. That is why it is supposed to cause biased and strategic answers which may led to overestimation of consumers' willingness to pay. The closed-ended format by asking participants if they are willing or not to pay one exact amount of money renders much less information than the open ended format and therefore needs much more observations. However, it is closer to real market situations. The payment card format lies somewhere in between both approaches by offering participants different amounts of money to choose. It offers participants more guidance. By ending up with one number of WTP for each participant, it reduces the total number of observations needed (Akcura 2015).

In order to be as realistic as possible, scenarios have to be easily understandable and simple. Complex designs will question the validity of the results.

In this research a payment card format was chosen (Box 1). Participants were asked for the amount of money they would spend for a fish to be prepared for an everyday occasion. In order to increase participants' involvement with the willingness to pay exercise and to check if the amounts indicated were realistic, they were asked for the number of people they would be preparing the fish for. Subsequently, participants were asked for their willingness to pay for fish which was caught or produced according to the criteria: sustainability, organic, locally, by coastal fisheries, higher animal welfare standards, in Europe or discard free. The percentages indicated in Box 1 were recalculated to Euro amounts based on the expenses participants had indicated in the earlier question. In doing that higher proximity to real purchase situations were aimed at.

Box 1: Payment scenario of the CVM exercise

Please imagine you are going to shop for fish for an everyday occasion. How much would you spend for this fish in total? Approx. _____ €.

For how many people would you prepare this fish? _____

Based on the price you just indicated for the fish. Imagine that all other properties of the fish (e.g. freshness, taste) which are not mentioned here are in line with what you expect: How much would you be willing to pay for a fish that is caught/ produced…

	100%	105%	110%	…	140%	150%	175%	200%
… sustainably								
… according to organic standards								
… locally (within your region)								
… by coastal fisheries (no deep-sea fishing)								
… with higher animal welfare standards								
… in Europe								
… without causing discards								

Note: Percent numbers were recalculated to total numbers depending on the answers in the first question.

The questionnaire contained various questions related to fish, including perception of European and local production, perception of sustainable fisheries and fish farming and associations with aquaculture. Additionally, we measured subjective knowledge about fish, involvement with fish and perceived consumer effectiveness (PCE).

Knowledge has an important impact on consumer's decision making and this holds true also for seafood purchases (Alba and Hutchinson 1987; Brunsø et al. 2009; Kole 2003; Pieniak et al. 2010a, 2013). In this context, we assessed the subjective knowledge about fish. Subjective knowledge is the individual self-assessment of the knowledge a person has about a topic (Altintzoglou et al. 2010). Subjective knowledge has been found to be related to information and information processing, e.g. use of labels (Bettman and Park 1980; Pieniak et al. 2007). We thus included four statements to explore consumer's subjective knowledge:

- Compared to an average person I know a lot about fish
- I have a lot of knowledge about how to evaluate the quality of fish
- People how know me consider me as an expert in the field of fish
- I know a lot about the preparation of fish.

All items were measured on a 7-point Likert scale ranging from 'do not agree at all' to 'fully agree'. The Cronbach's alpha for the total sample yielded a value of 0.87 indicating good internal reliability of the subjective knowledge construct.

Involvement is the sustained concern, care and significance a person attaches to an issue, product or activity (Olsen 2001). Since different studies (e.g., Vanhonacker et al. 2011; Verbeke et al. 2007b; Olsen 2001) found a positive relationship between fish consumption and involvement with fish, we measured involvement with four statements on a 7-point Likert scale:

- I am interested in where the fish I eat comes from

- I enjoy cooking fish for others and myself

- Making the right choice of fish is important

- Fish is an important part of my diet.

The chosen statements were based on items of Birch and Lawley (2014), Olsen (2001) and Bell and Marshall (2003). Cronbachs' Alpha for the involvement displayed with a value of 0.83 good reliability.

PCE is a concept for measuring a persons' judgement in the ability of individual consumers to affect environmental issues (Roberts 1996). A recent study by Verbeke et al. (2007c) showed that PCE was positively correlated with the importance attached to sustainability and ethical issues related to fish. That is, consumers who perceive ethical and sustainability issues as important also think that they can contribute by their own activities to improved fish welfare and sustainability in fisheries and aquaculture. Therefore, we measured the PCE with four statements to which the participants indicated their level of agreement on a 7-point Likert scale:

- By purchasing sustainably produced fish products I can support sustainable fisheries

- My consumption patterns influence the environmental-friendliness of fish production

- Purchasing European fish supports the preservation of European fisheries

- Whenever I can I chose sustainable fish

The four statements were constructed on the basis of statements by Scholder Ellen (1994) and Kim and Choi (2005) as well as Roberts (1996). We used Cronbach's alpha for assessing the internal reliability consistency of the measure of the PCE. Cronbach's alpha for the PCE-construct exceeded 0.8 displaying good reliability.

We also included a battery of Schwartz values to assess participant's values related to tradition, benevolence-caring and universalism-nature:

- Tradition:

- It is important to him/her to maintain traditional values or beliefs

- Following his/her family's customs or the customs of a religion is important to him/her

- He/she strongly values the traditional practices of his/her culture

- Benevolence-caring:

- It's very important to him/her to help the people dear to him/her

- Caring for the wellbeing of people he/she is close to is important to him/her

- Universalism-nature:

- He/she strongly believes that he/she should care for nature

- It is important to him/her to work against threats to the world of nature

- Protecting the natural environment from destruction or pollution is important to him/her.

The chosen items were based on the PVQ-R version of the Schwartz value system (Schwartz et al. 2012). An overview of the topics addressed in the questionnaire is shown in Table 2.

Table 2: **Topics addressed in the survey and kind of question**

Topic	Kind of question
Associations with fish	
Associations with fish	Open (words)
Perception of fish associations	Closed
Consumption and attitude towards fish	
Preferred preparation forms	Closed
Consumption of particular fish species	Closed
Attitude towards fish	Closed
Willingness to pay in the contingent valuation exercise	Closed
Importance of European and local production	
Importance of European, domestic and local production	Closed
Reasons for the importance of European production	Closed
Reasons for importance of local production	Closed
Subjective knowledge about fish	Closed
Perceived consumer effectiveness with respect to the support of sustainable fisheries	Closed
Attitudes towards aquaculture	Closed
Attitudes towards farmed versus wild fish	Closed
Perception of sustainable…	
Fisheries	Closed
Aquaculture	Closed
Schwartz values	Closed
Socio-demography	
Living area – coastal or inland	Closed
Educational level	Closed
Household size	Open (number)
Number of children in household	Open (number)
Net income	Closed

4. RESULTS

The presentation of the results will not follow the order of the description of the study design for logical reasons and for better understanding of the results. First, the outcome of the questionnaire will be presented and discussed followed by the results of the CVM exercise.

4.1. QUESTIONNAIRE

4.2. PREFERENCE FOR DIFFERENT PREPARATION FORMS

Fresh fish filets were the most preferred preparation form in the majority of the study countries while whole fresh fish was the second most preferred form followed by frozen fish (see Figure 1). This is not surprising since fresh fish is in general perceived as being healthier, having superior taste, appearance, texture and shelf life than frozen and processed fish (Vanhonacker et al. 2013). On average, we found in all study countries a tendency for a lower consumption frequency of preserved and ready meal fish compared to fresh and frozen fish. This is in line with results by DG Mare (2008) and Vanhonacker et al. (2013). In particular Finnish and Irish participants favored fresh filets. In contrast, Italian and Spanish participants preferred whole fresh fish the most (see also Vanhonacker et al. 2013). Frozen fish was particularly favored in Germany and Italy as well as in Ireland. Fish-based ready meals were the most favored in France and UK. Of all countries Polish participants had the highest preference for preserved fish and were the only ones who preferred preserved fish over frozen fish.

Figure 1: Preference for different preparation forms in total and for every study country
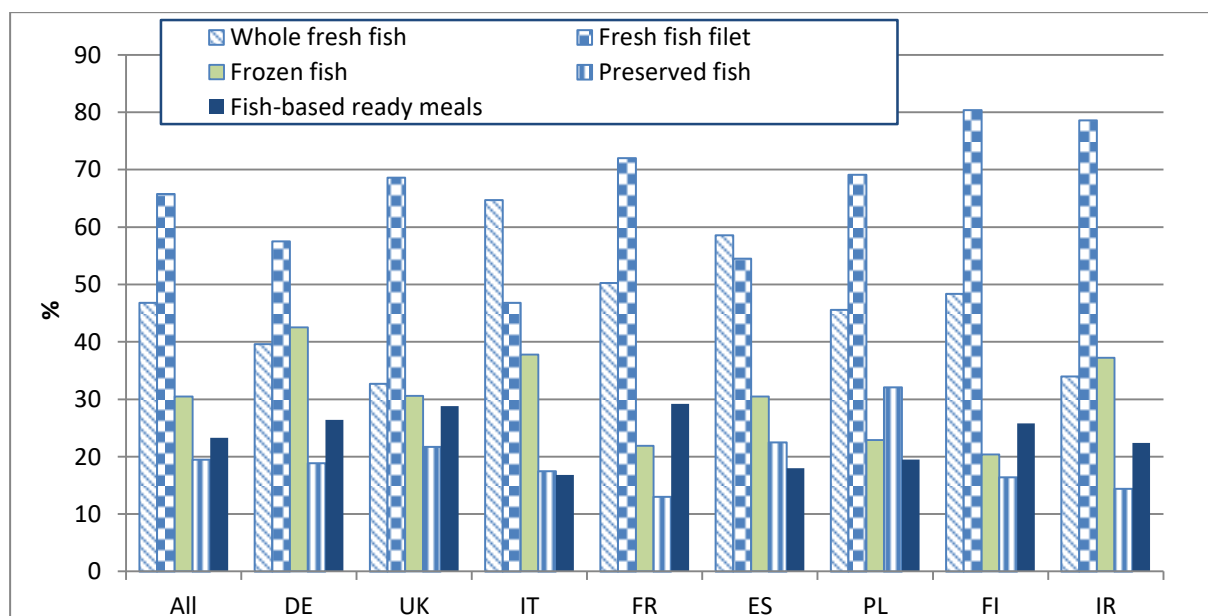
Question: From your point of view as fish consumer: Which two forms of preparation do you prefer the most from the list below? Please indicate up to two forms of preparation

4.3. CONSUMPTION OF CHOSEN FISH SPECIES

Over all listed fish species salmon was the most bought/consumed fish followed by tuna and Coley/Saithe. The least indicated species were tilapia, carp and pangasius. Salmon was in particular preferred in Finland, France and Germany. Tuna was the most favored in Spain, Italy and UK and as such in the three countries with the highest consumption frequency. Coley/Saithe was most bought in France, Germany and Finland. Polish participants appreciated all the three least mentioned species the most: tilapia, carp and pangasius. The most frequent fish species indicated in addition to the provided list were: European perch, northern pike, zander, patagonian toothfish and lavaret. A summary of the given fish species participants indicated to mostly buy/consume is given in Table 3.

Table 3:   **Most bought/consumed fish species per country and over all countries (%)**

Fish species	All	DE	ES	FI	FR	IR	IT	PL	UK
Salmon	62.3	61.9	53.2	90.0	69.4	70.8	53.4	43.6	57.2
Tuna	44.3	35.1	62.4	57.0	42.2	37.4	52.6	21.5	45.6
Cod	43.3	15.3	45.9	7.6	36.4	75.4	54.8	41.2	70.6
Coley/Saithe	19.1	45.5	0.6	37.6	51.8	7.8	0.6	5.0	3.6
Trout	15.3	32.3	13.5	8.2	15.7	6.6	13.5	26.3	5.7
Herring	13.5	23.8	2.1	17.4	5.2	2.8	4.1	49.4	3.9
Sea bream	13.2	8.5	32.4	0.2	14.9	0.8	40.9	4.6	2.0
Sea bass	12.0	2.6	25.1	0.0	11.4	13.4	24.0	4.6	14.4
Haddock	10.9	1.9	0.0	0.2	4.6	35.8	0.6	0.2	45.4
Plaice	8.7	15.1	0.6	3.0	2.3	10.2	23.0	7.0	8.5
Pangasius	5.2	12.3	2.8	0.0	4.4	0.4	4.9	16.1	0.6
Carp	3.1	3.4	0.2	0.0	2.1	0.0	1.2	17.7	0.6
Tilapia	1.9	0.9	1.1	0.2	0.8	0.4	0.6	9.2	2.2
Do not know	1.2	2.1	0.6	2.8	1.7	0.0	0.4	1.6	0.8
N	4103	530	534	500	517	500	513	502	507

4.4. ATTITUDES TOWARDS FISH

Figure 2 provides an overview of participants' attitudes towards fish consumption. In general, participants revealed a very positive perception of fish. Most of the participants considered fish as a healthy, nutritious and an easy to prepare product. Simultaneously, our results confirm that price is a potential barrier for fish consumption. Recent studies (e.g., Brunsø et al. 2009; Vanhonacker et al. 2013; Verbeke and Vackier 2005) highlight that fish is frequently perceived as more expensive than meat products and that price is one of the main barriers for fish consumption across countries and user groups.

Figure 2:   Share of participants agreeing with statements about fish* (n=4103)
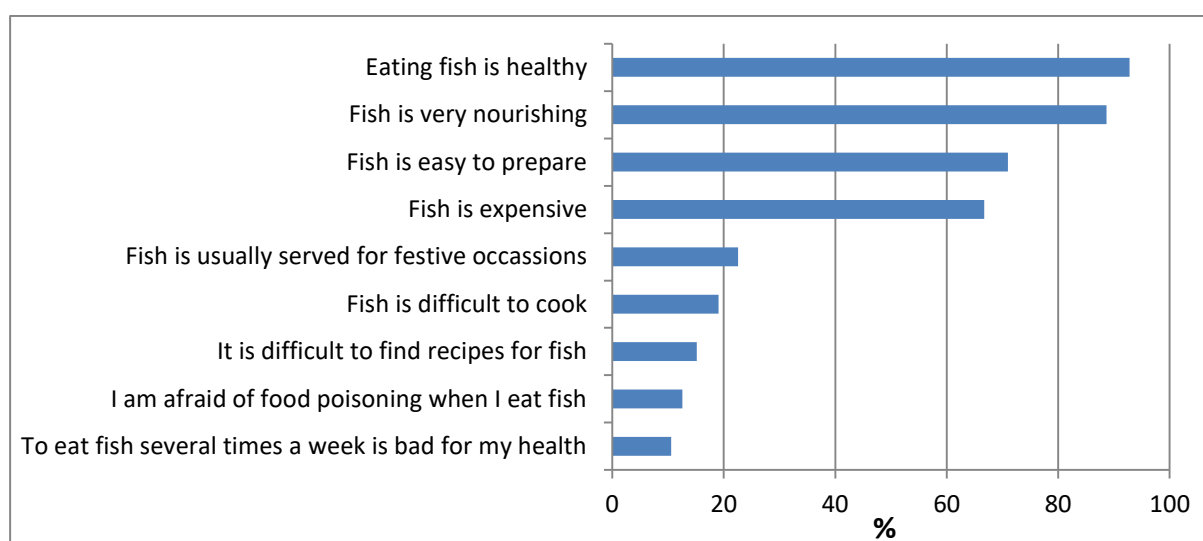
Question: Please indicate your level of agreement with the following statements.
*The agreement/disagreement with the statements was measured on a 7-point Likert scale ranging from 1 'totally disagree' to 7 'totally agree'. Scores of 5 or more were merged and classified as agreement with the statements.

Attitudes towards fish differed between countries to a certain degree (Table 4). In particular Finnish participants differed in their attitudes from the other study countries. Finnish and Irish were the most convinced that eating fish is healthy. Finnish participants perceived fish also the most as a dish served for festive occasions while this was the least the case for Spanish and Irish participants. Concern about food poisoning was the most expressed in Italy and the least in Finland. Fish was in particular perceived as nourishing in Ireland and UK. French participants had together with Polish participants the highest tendency to perceive fish as expensive.

Table 4:   Mean values per country for attitudes toward fish

Attitudes	DE	ES	FI	FR	IR	IT	PL	UK
Eating fish is healthy	6.35[a,b]	6.41[a,b,c]	6.53[c]	6.24[a]	6.53[b,c]	6.24[a]	6.41[a,b,c]	6.40[a,b,c]
Fish is usually served for festive occasions	3.52[c]	2.80[a]	4.18[d]	3.06[a,b]	2.86[a]	3.30[b,c]	3.33[b,c]	3.03[a,b]
I am afraid of food poisoning when I eat fish	2.23[b]	2.63[c]	1.91[a]	2.71[c]	2.44[b,c]	3.07[d]	2.68[c]	2.58[c]
Fish is very nourishing	6.05[b,c]	6.25[c,d]	6.14[b,c]	5.45[a]	6.38[d]	5.96[b]	5.99[b]	6.25[c,d]
To eat fish several times a week is bad for my health	2.18[a]	2.31[a,b]	2.36[a,b]	2.56[b]	2.14[a]	2.26[a,b]	2.23[a]	2.42[a,b]
It is difficult to find recipes for fish	2.60[a]	2.65[a,b,c]	2.57[a]	2.95[c,d]	2.98[d]	2.61[a,b]	2.56[a]	2.92[b,c]
Fish is difficult to cook	2.99[a,b]	2.73[a]	2.82[a]	3.29[b]	2.68[a]	3.28[b]	2.90[a]	2.84[a]
Fish is expensive	4.73[a]	4.78[a,b]	5.05[b,c,d]	5.43[e]	4.92[a,b,c]	5.14[c,d,e]	5.29[d,e]	4.66[a]

Notes: a,b,c,d,e Scores in one row with a different superscript are significantly different at p<0.05 (one-way ANOVA and Tukey post-hoc test). Measured on a seven-point Likert scale ranging from 1 'totally disagree' to 7 'totally agree'.

4.5. IMPORTANCE OF EUROPEAN AND LOCAL PRODUCTION

From other studies we know that European consumers are interested in the geographical origin of fish and that they differentiate between domestic, local and foreign production (e.g., Asensio and Montero 2008; Claret et al. 2012; Pieniak et al. 2013). Some studies even highlight geographic origin as one of the most influential fish attributes for consumers' choice (e.g., Birch et al. 2012; Brécard et al. 2009; Lawley et al. 2012). In this study we explicitly compared participants' preferences for different origins.

Table 5 shows that the majority of the participants found domestic production important followed by local and European production. Domestic production was in particular important to Italian and French participants while local production was appreciated the most by Italian, Irish and British participants. Polish and Germans attached a particular importance to European production. These results are consistent with findings of previous studies (Brécard et al. 2009; Claret et al. 2012; Jaffry et al. 2004; Mauracher et al. 2013; Pieniak et al. 2013). Claret et al. (2012), Brécard et al. (2009) and Mauracher et al. (2013) found that consumers prefer local and domestic fish products over foreign products which is in line with the trend towards locally sourced food (e.g., Feldmann and Hamm 2015; Zepeda et al. 2006). Additionally, Pieniak et al. (2013) showed that consumers were less interested in 'European origin' than in other geographical origins.

Table 5:   **Importance of different geographical origins (%)**

…production	All	DE	ES	FI	FR	IR	IT	PL	UK
European…	55.2	53.6	58.8	53.4	60.3	48.4	61.2	63.1	42.2
Domestic…	64.7	45.3	76.6	50.2	76.4	71.0	82.8	63.9	51.1
Local…	60.5	45.7	72.3	58.2	55.5	72.2	73.3	46.4	60.6
N	4103	530	534	500	517	500	513	502	507

Question: Is it important to you that the fish you buy originates from European production/ local production/ domestic production? – Yes/No

Figure 3 highlights 'greater freshness', 'higher food safety', 'shorter transport distances' and the 'support of the European economy' as the four most frequently indicated reasons for attaching importance to European production. 'Higher environmental standards', 'better regulation' and the 'generation of jobs in Europe' were nearly equally often indicated. 'Higher transparency' was the least indicated choice. Accordingly, European origin was in particular important to participants due to quality, safety and sustainability reasons. This result supports findings by Altintzoglou et al. (2010) and Feucht and Zander (2015) who pointed out that the indication of European origin can enhance the positive image of seafood since consumers might perceive the European Union as a credible controlling agent.

Greater freshness due to European origin was in particular important in Finland (57%) and in Poland (52%). German (48%) and Finish (43%) participants mentioned shorter transport distances the most often as reason for attaching importance to European production. Higher food safety was valued the most as attribute of European origin by Spanish (40%) and Italian (40%) consumers.

Figure 3: **Reasons for the preference of European origin on average of all study countries (Share of participants who indicated European production as important)**
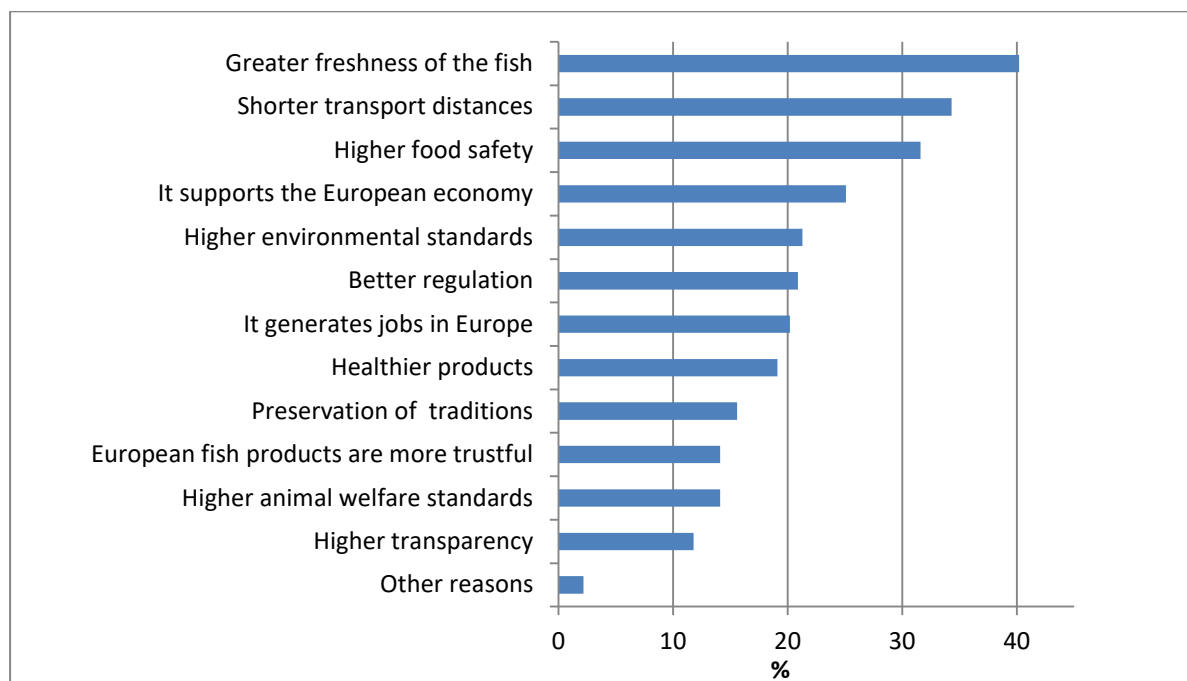
Question: Why is European production important to you? Please indicate up to three reasons.

Consistent with our findings for European origin, participants indicated 'greater freshness of the fish' most frequently as reason for the importance of local origin (see Figure 4). Simultaneously, the support of the local economy was a stronger motive for the importance of local origin than it was the case for European origin underlining the role of ethnocentrism. This points out that the importance of fish origin is related to the fact that fish is a highly perishable product which is associated with higher risks in terms of health and safety (Claret et al. 2012; Mauracher et al. 2013). Accordingly, the geographical origin is used as a quality indicator (Verbeke and Ward 2006). The image of the area of origin in turn influences consumers' quality evaluation of food (Claret et al. 2012; Schnettler et al. 2008). Schnettler et al. (2008) point out that people with ethnocentric tendencies value the benefits the purchase of domestic products have for the local economy. The role of ethnocentrism is also reflected in the higher scores for 'generation of jobs' and the 'preservation of fishing and farming traditions' related to local origin. However, the effect of ethnocentrism on product evaluation is product-specific (Schnettler et al. 2008).

Figure 4: **Comparison between the reasons for the importance of local and European origin over all study countries (Share of participants who indicated local/European production as important)**
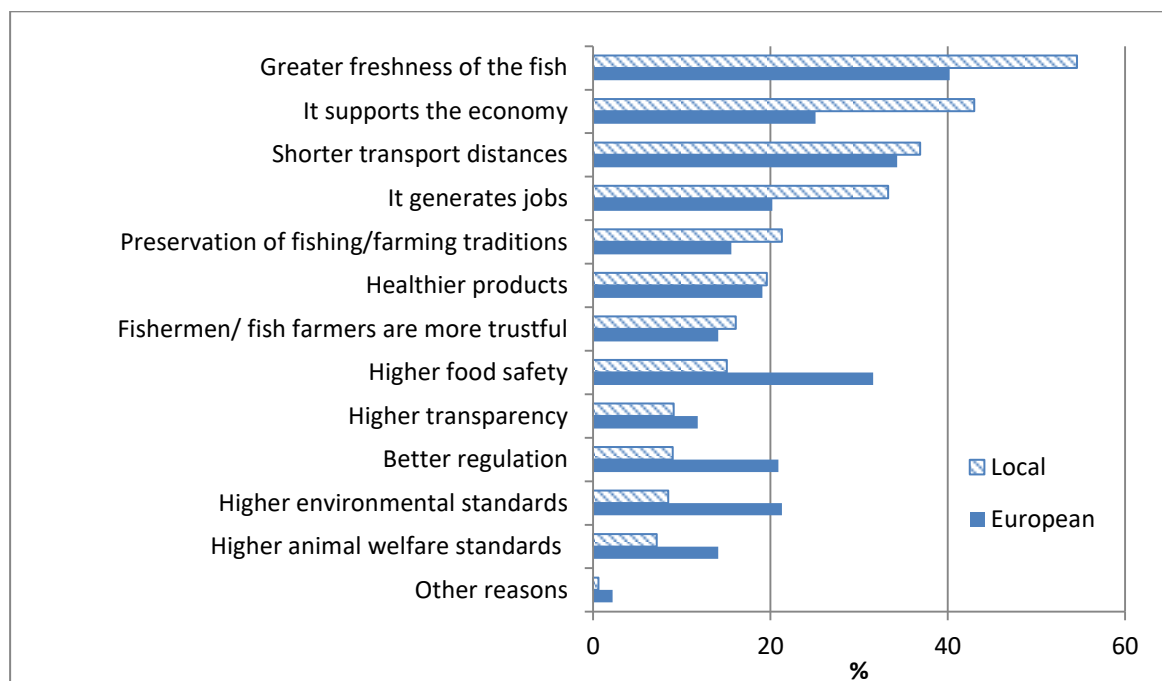
Question: Why is European/local origin important to you? Please indicate up to three reasons.

Interestingly transparency, safety and regulation aspects with the exception of the choices 'healthier products' and 'fishermen/fish farmers are more trustful' were more strongly associated with European origin than with local origin. This underlines the potential of the 'European' origin indication to serve as a guarantee for food safety and ethical responsible production with respect to environmental and animal welfare issues. Shorter transport distances were a slightly stronger motif for the importance of local origin. Considering that shorter distances between production and consumption location are associated with fewer preservation treatments and higher freshness this result is not surprising (e.g., Carlucci et al. 2015; Birch et al. 2012). In addition, shorter transportation distances are associated with a lower environmental impact (Carlucci et al. 2015; Claret et al. 2012; Feucht and Zander 2015; Mauracher et al. 2013).

In line with our findings for European origin, participants associated local origin in particular in Finland (66%) and Poland (59%) with greater freshness of the fish. The support of the local economy was in particular a motif in Ireland (55%) and Spain (55%) as was the generation of local jobs (45% IR, 39% ES). Again in accordance with the results for European origin shorter transport distances were in particular indicated in Germany (47%) and in Finland (43%) as reasons for the importance of local origin.

4.6. SUBJECTIVE KNOWLEDGE, INVOLVEMENT AND PERCEIVED CONSUMER EFFECTIVENESS

Participants reported to have a limited knowledge about fish. However, consumer's knowledge about fish differed significantly between the study countries (see Table 6). Participants from the two included Southern European countries felt the most knowledgeable followed by participants from France, Germany and UK. Finnish and Irish participants felt the least knowledgeable. These results are in line with previous studies (e.g., DG Mare 2008; Feucht and Zander 2015; Pieniak et al. 2010b, 2013; Vanhonacker et al. 2011).

Table 6:   Mean ratings for the subjective knowledge construct

	All	DE	FI	FR	ES	IR	IT	PL	UK
Compared to an average person I know a lot about fish	3.8	4.0	3.2	3.8	4.1	3.4	4.1	3.8	3.7
I have a lot of knowledge about how to evaluate the quality of fish	3.8	3.9	3.7	4.2	4.0	3.3	4.1	3.4	3.7
People who know me consider me as an expert in the field of fish	3.1	3.1	2.6	3.3	3.5	3.3	3.8	3.1	3.1
I know a lot about the preparation of fish	4.0	4.3	3.3	3.9	4.2	3.6	4.4	4.1	3.9
Mean of all items	3.7	3.8[b,c]	3.6[b]	4.1[d]	3.8[b,c]	3.9[c,d]	3.6[b]	3.2[a]	3.2[a]

Notes: Measured on a seven-point Likert scale ranging from 1 'totally disagree' to 7 'totally agree'.
a,b,c,d Scores in one row with a different superscript are significantly different at $p<0.05$ (one-way ANOVA and Tukey post-hoc test).

Involvement is an important measure for exploring the degree of significance consumers attach to an issue. With a mean value of 5 the participants in our study revealed to take a certain interest in fish. Participants agreed the most with the statement 'Making the right choice of fish is important'. Involvement with fish was highest in Italy followed by Spain, France and UK. Participants from Finland and Poland were the least involved reflecting to a certain degree the found fish consumption frequency (see Table 7).

Table 7: **Mean ratings for the involvement construct**

	All	DE	ES	FI	FR	IR	IT	PL	UK
I am interested in where the fish I eat comes from	5.0	4.9	5.0	4.7	5.0	4.9	5.6	4.5	4.8
I enjoy cooking fish for others and myself	4.8	4.7	4.8	4.4	4.9	5.2	5.0	4.9	5.0
Making the right choice of fish is important	5.3	5.2	5.4	4.7	5.6	5.2	5.8	5.2	5.2
Fish is an important part of my diet	5.0	5.0	5.3	4.6	4.8	5.0	5.4	4.5	5.2
Mean of all items	5.0	5.0[b,c]	5.1[c]	4.6[a]	5.1[c]	5.0[b,c]	5.5[d]	4.8[a,b]	5.0[c]

Notes: a,b,c Scores in one row with a different superscript are significantly different at p<0.05 (one-way ANOVA and Tukey post-hoc test). Measured on seven-point Likert scales

We measured PCE in order to elicit to which degree participants judged consumers to be able to affect fish welfare and sustainability in fisheries and aquaculture by their individual purchase behavior. Over all study countries PCE had a positive score with a mean value of 5. Thus, participants thought in general that their own purchase behavior helps to foster sustainable fishing and farming practices as well as supports the preservation of European fisheries. Since consumers' levels of PCE have an impact on their likelihood to perform ethical behavior, our results also indicate a stronger likelihood amongst the participants to act in line with their ethical and sustainability attitudes. Differences between countries were significant with Spanish (μ=5.18) and German (μ=5.13) participants displaying the highest PCE and Polish (μ=4.80) and Irish (μ=4.90) participants revealing the lowest PCE.

4.7. ATTITUDES TOWARDS AQUACULTURE

Recent studies show that aquaculture is a topic about which consumers hold quite diverse and contradictory beliefs and attitudes (e.g., Schlag and Ystgaard 2013; Claret et al. 2012, 2016). In addition, consumers often lack a more detailed understanding of aquaculture (e.g., Aarset et al. 2004). Thus, gaining deeper insights into consumers' attitudes towards aquaculture is important in order to understand their preferences for fish.

Over all study countries participants showed a rather positive attitude towards aquaculture. Aquaculture was foremost associated with the provision of jobs and as being of importance for covering global fish demand (see Figure 5). More than half of the participants agreed that the consumption of farmed fish preserves natural resources. One reason for this might be that aquaculture is frequently believed to decrease pressure on wild fish stocks and is in many European countries seen as causing less environmental damage than fishing (Freeman et al. 2012; Schlag and Ystgaard 2013). In addition, 65% of the participants deemed fish ponds worth of protection which might be due to the fact that ponds are appreciated as important elements of particular landscapes (e.g. the Aischgrund in Bavaria) and that fish farming is sometimes associated with the preservation of biodiversity through providing habitats for wildlife (Feucht and Zander 2016). Simultaneously, more than half of the participants believed that aquaculture production is highly industrialized. In the same direction, some consumers perceived aquaculture as a highly technical activity having a negative effect on the environment, using a lot of energy, endangering surrounding ecosystems and polluting water (see also Behrens 2009; Feucht and Zander 2015; Kaiser and Stead 2002; Solgaard and Yang 2011). Nonetheless, over 40% of the participants agreed that

modern farming systems with a high technical level help to save resources such as water and energy.

These beliefs may be caused by consumers' transfer of ideas about intensive terrestrial animal farming onto aquaculture which has been reported on before (e.g., Claret et al. 2014; Feucht and Zander 2015). In this respect, many participants also thought that aquaculture uses too much drugs which is consistent with consumers' concerns about potential traces of drugs in farmed fish found by Aarset et al. (2004) and Solgaard and Yang (2011). Notwithstanding these results, 42% of the participants stated to have no idea of fish farming.

Figure 5:   Share of participants agreeing with statements about aquaculture* (n=4103)
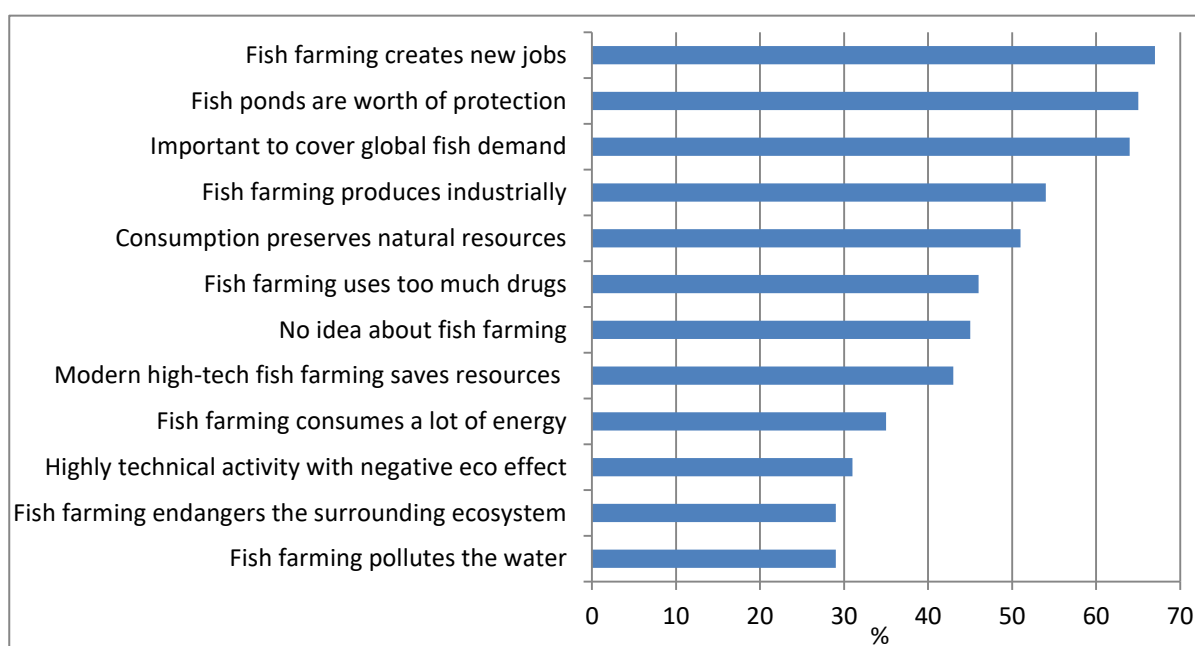
Question: Please indicate your level of agreement with the following statements. *Agreement/disagreement with the statements was measured on a 7-point Likert scale ranging from 1 'totally disagree' to 7 'totally agree'. Scores of 5 or more were merged and classified as agreement with the statements

Regarding differences between countries we found that in particular Polish, Spanish and English participants valued the aquaculture sector as provider of jobs (see Table 8). Also Polish participants together with Germans and Italians deemed fish ponds the most as worth of protection. Aquaculture was in particular perceived as important provider of fish protein in Germany, Poland and Spain. The perception that aquaculture produces industrially was most frequently hold in Poland, Finland and France. Germans were the most concerned about a too high use of drugs in aquaculture which is consistent with findings by Aarset et al. (2004). The highest share of participants who thought that the consumption of farmed fish preserves natural resources was found in Poland, Spain and Germany (see also Schlag and Ystgaard 2013; Freeman et al. 2012). Simultaneously, German consumers together with French ones were the two consumer groups who were in particular convinced that fish farming requires a lot of energy and is a highly technical activity with negative effects on the environment. In addition, French, Italian and Irish participants showed the highest score for the statement 'Fish farming endangers the environment'. Participants in Germany and Finland, followed by France, UK and Ireland revealed to be the least knowledgeable about aquaculture.

Table 8: Share of participants agreeing with statements about aquaculture % (n=4103)

Statements about aquaculture	DE	ES	FI	FR	IR	IT	PL	UK
Fish farming creates new jobs	69.0	77.2	64.9	69.1	73.5	74.8	79.7	76.1
Fish ponds are worth of protection	81.0	63.3	60.3	72.4	62.0	76.7	81.2	71.1
Important to cover global fish demand	76.7	75.6	57.0	70.0	63.0	70.1	76.3	73.0
Fish farming produces industrially	58.7	65.9	66.5	69.6	51.6	55.6	71.0	58.4
Consume of farmed fish preserves natural resources	64.9	66.1	31.9	58.0	47.0	58.4	66.1	59.8
Fish farming uses too much drugs	75.4	54.5	38.2	68.4	52.9	52.6	65.5	52.7
Modern high-tech fish farming saves resources	48.2	57.1	51.0	52.1	46.5	60.1	55.7	54.6
Fish farming consumes a lot of energy	55.8	46.4	27.4	51.5	41.0	49.0	40.5	41.0
Highly technical activity with negative eco effect	45.5	32.5	32.5	41.1	39.2	31.8	33.8	43.3
Fish farming endangers the surrounding ecosystem	37.7	31.4	29.2	41.8	41.5	38.1	26.3	36.6
Fish farming pollutes the water	33.6	27.5	36.0	43.3	39.3	42.3	26.0	31.6
No idea about fish farming	53.6	41.0	53.9	51.8	48.5	38.2	38.9	50.1

Note: Differences between countries were significant with p <0.01. The agreement/disagreement with the statements was measured on a 7-point Likert scale ranging from 1 'totally disagree' to 7 'totally agree'. Scores of 5 or more were merged and classified as agreement with the statements.

4.8. ATTITUDES TOWARDS FARMED VERSUS WILD FISH

The participants did not have a better image of farmed fish than of wild fish. The majority of the participants was convinced that wild fish tastes better (see also Claret et al. 2014) (see Table 9). This was in particular the case for participants from France, Spain, Ireland and Italy. Also the preference for farmed fish over wild one was with 23% low. The highest preferences for farmed fish were found in Poland, Germany, Italy and Spain. Farmed fish was with 17% over all countries also rather seldom perceived as healthier than wild fish. The highest agreement with this statement was found in Italy and Poland. 38% of the participants thought that the consumption of wild fish contributes to the depletion of natural resources. In contrast to the other study countries, more than half of the German participants agreed with the before mentioned statement underlining a heightened sensitivity for this issue also found in the studies of DG Mare (2008) and Freeman et al. (2012).

Table 9: **Agreement with statements about farmed fish vs. wild fish (n=4103)**

Attitudes to farmed fish vs. wild fish	All	DE	ES	FI	FR	IR	IT	PL	UK
Farmed fish is healthier than wild fish	17.1	14.7	20.6	5.0	17.3	9.8	26.4	22.5	19.3
Farmed preferred over wild fish	23.0	29.9	25.5	12.0	20.5	12.4	27.3	30.5	24.4
Wild fish tastes better than farmed fish	62.7	55.8	69.8	58.8	71.1	66.8	65.6	56.6	56.4
Consuming wild fish contributes to the depletion of natural resources	38.1	55.5	43.8	16.1	46.7	31.3	28.2	39.3	42.9

Note: Differences between countries were significant with p <0.01. The agreement/disagreement with the statements was measured on a 7-point Likert scale ranging from 1 'totally disagree' to 7 'totally agree'. Scores of 5 or more were merged and classified as agreement with the statements.

4.9. ELEMENTS OF SUSTAINABLE FISHERIES AND AQUACULTURE

Since we aimed to explore European consumers' preferences for seafood from European production with the additional attribute of ecological and/or social sustainability, we analyzed the participants perception of sustainable fisheries and aquaculture.

Participants in our study related sustainability in fisheries mainly to the protection of endangered species, to the avoidance of overfishing, the recovery of depleted stocks and the protection of juvenile fish (see Figure 6). Accordingly, participants associated predominantly a reduced impact on the marine environment and the protection of the aquatic biodiversity with sustainable fisheries. Good working conditions for the fishermen, small scale coastal fisheries and vessels with low energy consumption were less frequently related to sustainable fisheries. Thus, participants in our study linked sustainability in fisheries more to environmental sustainability than to economic and social sustainability which is in line with previous research (e.g., Gutierrez and Thornton 2014; McClenachan et al. 2015; Onozaka et al. 2010; Zander et al. 2013).

With respect to differences between countries, we found that out of all study countries Finnish, Polish and German participants attached the highest importance to the protection of endangered species (see Table 10). 'No overfishing' was in particular related to sustainable fisheries by Polish, French, Irish and German participants. Finnish participants followed by French and German ones mentioned the 'recovery of depleted stocks' most frequently as decisive element of sustainable fisheries. 'Good working conditions for the fishermen' were in particular highlighted by participants from the UK and Ireland. Finnish, French and Italian participants attached particular importance to 'small scale coastal fisheries' with respect to sustainable fisheries.

Figure 6: **Associations with sustainable fisheries**
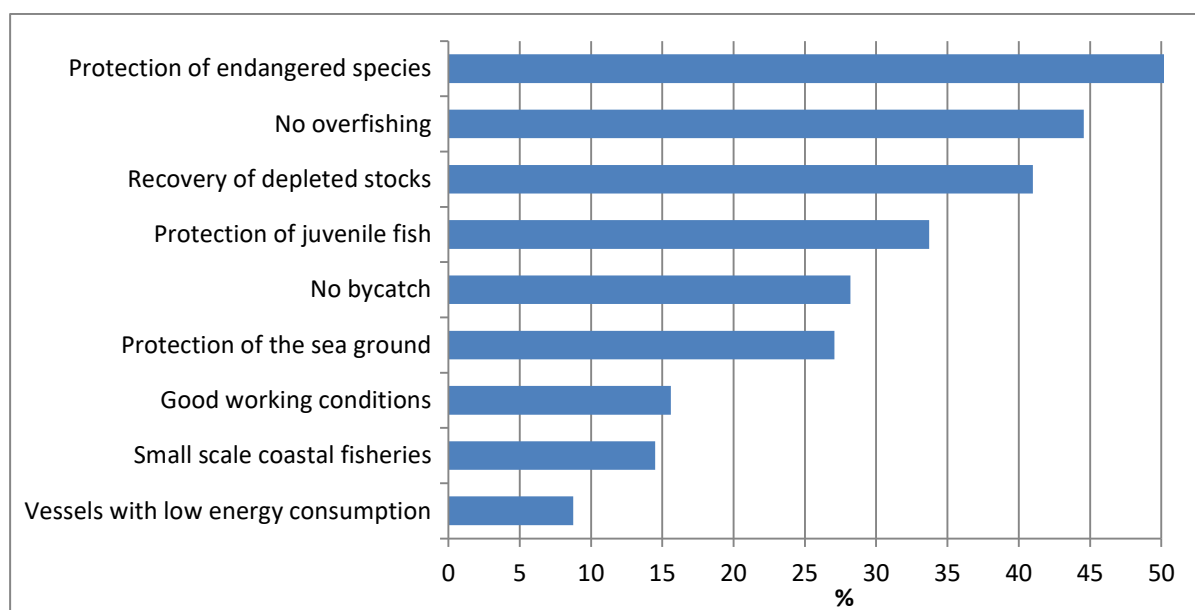
Question: Please indicate the three most decisive elements of sustainable fisheries from your point of view.

Table 10: **Associations with sustainable fisheries by study country (%)**

	All	DE	ES	FI	FR	IR	IT	PL	UK
Protection of endangered species	50.6	57.7	52.4	59.0	49.3	40.6	51.9	57.8	35.9
No overfishing	44.6	49.1	37.5	45.8	49.3	49.2	32.0	54.4	39.6
Recovery of depleted stocks	41.0	49.1	29.6	59.0	33.7	51.0	28.3	36.7	41.6
Protection of juvenile fish	33.7	31.3	45.3	21.4	30.4	31.6	40.4	44.4	24.3
No bycatch	28.2	40.0	27.7	26.8	16.8	29.2	32.6	16.9	35.1
Protection of the sea ground	27.1	25.1	35.4	22.8	36.8	17.6	41.1	12.9	23.9
Good working conditions	15.6	14.5	15.0	11.4	12.4	21.6	19.5	8.6	21.9
Small scale coastal fisheries	14.5	12.6	11.6	17.8	17.4	14.6	16.6	9.6	16.0
Vessels with low energy consumption	8.7	5.5	7.3	8.2	12.0	9.4	13.6	6.6	7.5

Question: Please indicate the three most decisive elements of sustainable fisheries from your point of view

Note: Differences between countries were significant with $p < 0.07$.

Sustainable aquaculture was foremost associated with 'minimal use of hormones and drugs', 'helping to protect endangered species', 'no pollution of the environment' and 'respect of fish welfare' (see Figure 7). In contrast, a low technical level, good working conditions for the

fish farmers and the support of rural areas were less decisive elements of sustainable fish farming. That is, similar to our findings for the elements of sustainable fisheries the environmental dimension of sustainability was more pronounced than the social and economic dimension. This is in line with findings by Claret et al. (2012); DG Mare (2008); Schlag and Ystgaard (2013) and Vanhonacker et al. (2011). Our results also highlight that participants equated sustainable aquaculture with a healthy product derived from healthy animals as expressed by the importance attached to a minimal use of hormones and drugs in aquaculture (see also Kaimakoudi et al. 2013). Thus, individual's health considerations played a decisive role in the understanding of sustainable aquaculture (see also Feucht and Zander 2015). A part from that, it became also obvious that animal welfare considerations and a near natural production were perceived as facets of sustainability confirming earlier findings by Feucht and Zander (2015).

Figure 7:   Associations with sustainable aquaculture
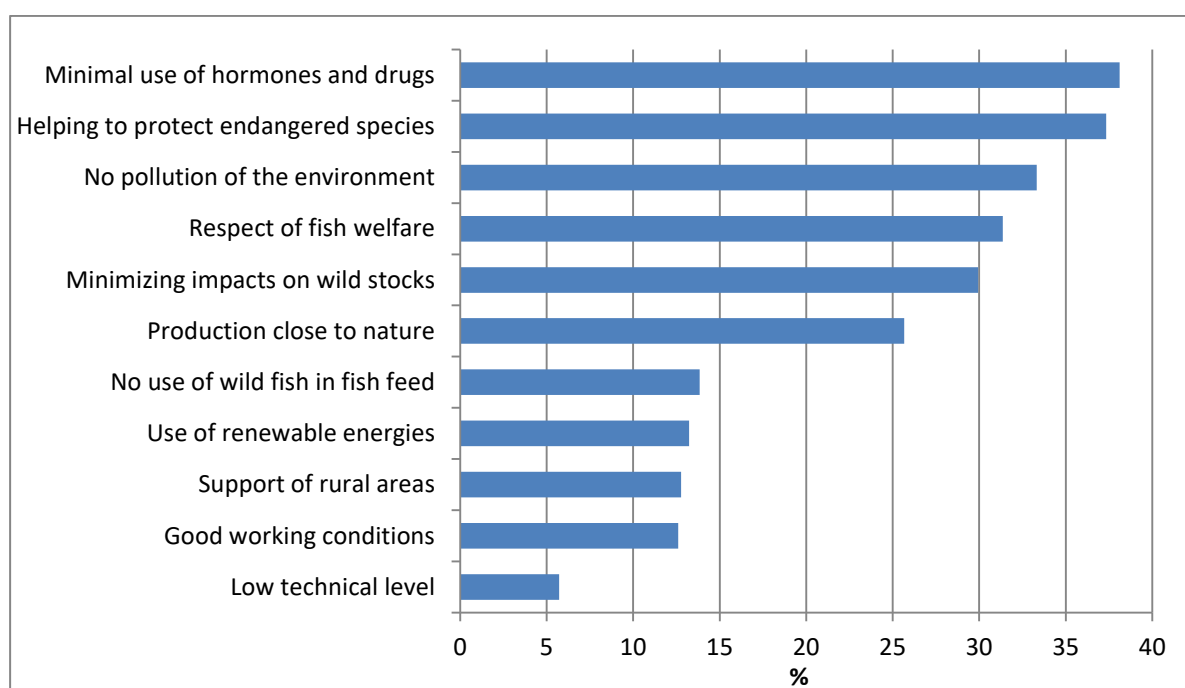
Question: Please indicate the three most decisive elements of sustainable fish farming from your point of view.

The 'minimal use of hormones and drugs' was in particular a decisive element for consumers in Finland, Germany and Italy (see Table 11). German, Finnish and Spanish participants associated 'helping to protect endangered species' the most of all study countries with sustainable aquaculture. Fish welfare was a particular important element in Germany. The support of rural areas as a trait of sustainable aquaculture was especially highlighted by participants from Ireland and UK. Also participants from Ireland, UK and Italy associated good working conditions for fish farmers most frequently with sustainable aquaculture.

Table 11: **Associations with sustainable aquaculture between study countries (%)**

	All	DE	ES	FI	FR	IR	IT	PL	UK
Minimal use of hormones and drugs	38.1	42.6	27.0	53.6	34.2	38.2	42.3	38.6	29.0
Helping to protect endangered species	37.3	48.3	40.4	43.8	31.3	35.0	34.5	31.7	33.1
No pollution of the environment	33.3	36.8	25.5	42.0	30.9	36.8	37.6	27.9	29.4
Respect of fish welfare	31.4	49.4	27.7	30.2	25.7	27.4	29.0	28.5	32.3
Minimizing impacts on wild stocks	29.9	28.3	37.5	34.4	22.4	35.4	23.2	21.3	36.9
Production close to nature	25.7	23.0	26.6	27.4	21.7	15.6	33.5	42.6	15.0
No use of wild fish in fish feed	13.8	14.7	11.6	10.2	23.6	14.0	14.4	10.0	12.0
Use of renewable energies	13.2	7.9	16.9	8.8	15.7	12.8	24.0	8.0	11.6
Support of rural areas	12.8	11.3	10.5	6.4	11.8	19.0	10.5	14.3	18.5
Good working conditions for fish farmers	12.6	10.6	13.9	7.0	11.0	16.6	16.0	9.8	16.0
Low technical level	5.7	4.3	7.7	2.8	3.5	3.8	7.8	12.0	3.9

Note: Differences between countries were significant with p <0.000.

5. PREFERENCES FOR SUSTAINABLE FISH

This section focuses on the presentation of the results of the contingent valuation (CVM) exercise. It will start with showing the average numbers of participants' willingness to pay, the share of people without any willingness to pay, the distribution and will close with a segmentation of consumers with regard to their willingness to pay.

5.1. WILLINGNESS TO PAY

Average willingness to pay (WTP) differed between countries and between attributes (Figure 8). The average WTP for different attributes and thus the preferences varied largely between countries. Highest overall level of additional WTP was observed in Germany followed by Italy. While in Finland, Germany, Spain and the UK WTP was highest for higher animal welfare standards, organic production was the most important attribute in France, Ireland and Poland. Production from coastal fisheries was only important in Italy. Caught discard free and caught or produced in Europe caused lowest additional WTP in all countries. Thus, higher animal welfare standards, organic and sustainable production are the most promising attributes with respect to product differentiation in European fish markets.

With respect to different attributes on average of all countries additional WTP was highest for organic production (+14.8%), followed by sustainable production (+14%) and higher animal welfare (+14%), locally produced or caught (+12.6%), from coastal fisheries (+11.7%), without discards (+10.3%) and produced/caught in Europe (+9.4%).

Figure 8: **Average additional willingness to pay for different fish attributes**
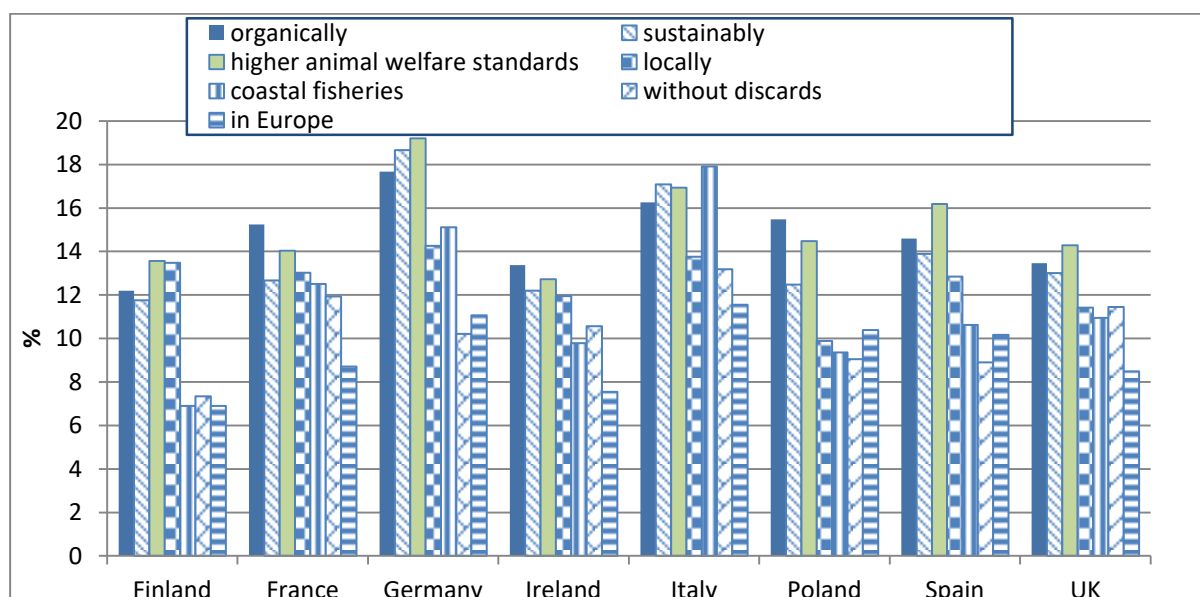
Question: How much would you be willing to pay for a fish that is caught/ produced…?

These average numbers only give a first idea of relative WTP and preferences between countries and attributes since it merges the WTP of people without any WTP and those with a high WTP. Therefore, the share of participants without any without any additional WTP was identified by country and attribute (see Figure 9).

In line with the results on the average WTP, the share of participants without any additional WTP varies largely between countries and attributes. It is highest for the attributes 'in Europe' and 'without discards'.

Figure 9: **Share of participants without additional willingness to pay by country and attribute**
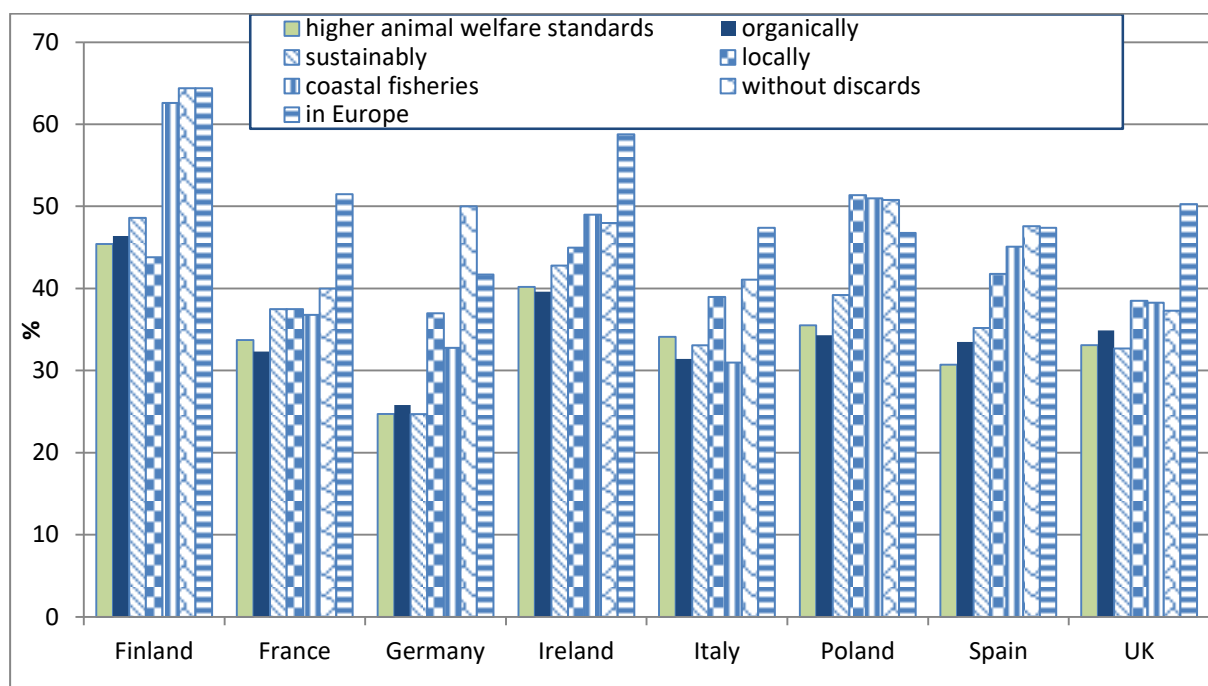
5.2. CONSUMER SEGMENTS

For marketing and communication issues, the share of participants with a (high) additional WTP is of particular interest. A (two-step) cluster analysis using participants' WTP for the various attributes tested was conducted to identify different consumer segments. Three clusters were found: the first 'No WTP' with an additional WTP of almost zero (+2%), the second cluster 'low WTP' with an additional WTP of 17% and a third cluster 'high WTP' with an additional WTP of 43%.

The share of participants in the cluster 'no WTP' was 47%, in cluster 'low WTP' 44% and in cluster 'high WTP' 9% on average in all countries.

The share of participants in each cluster varied by country (see Figure 10). The share of people with no additional WTP is by far lowest in Germany, followed by Italy. Accordingly, the size of the cluster 'high' is highest in these two countries. In the other study countries around 50% (in Finland 58%) of the participants were not willing to pay more for sustainably produced fish.

Figure 10: **Consumer segments based on their Willingness to pay (share of respondents per cluster)**
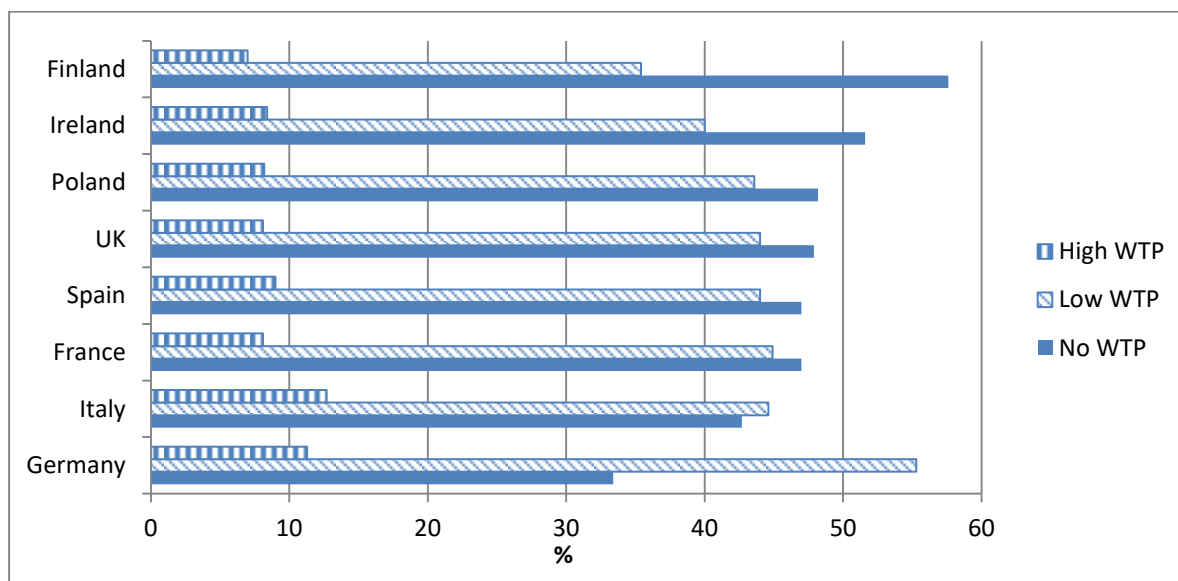
Participants' WTP for the different attributes tested turned out to be highly correlated (correlation coefficients between 0.6 and 0.77). This result was to be expected since it can be assumed that people with a higher WTP for organic also have a higher WTP for sustainability and so on.

The differences between the additional WTP for different attributes increase with higher WTP (see Figure 11). While in the Cluster 'No WTP' WTP is (almost) zero for all attributes, in the cluster with low or high WTP participants differentiate more, and animal welfare, organic production as well as sustainability are gaining the highest importance. Consistent with our findings in the questionnaire local production is of higher relevance than European origin in this consumer group. Accordingly, when aiming at addressing the members of this group, emphasis should be laid on adjusting production processes with regard to animal welfare aspects, sustainable and/or organic production. Also communication should be focused on these issues.

Figure 11: **Clusters of participants with low, medium and high WTP for different product attributes**
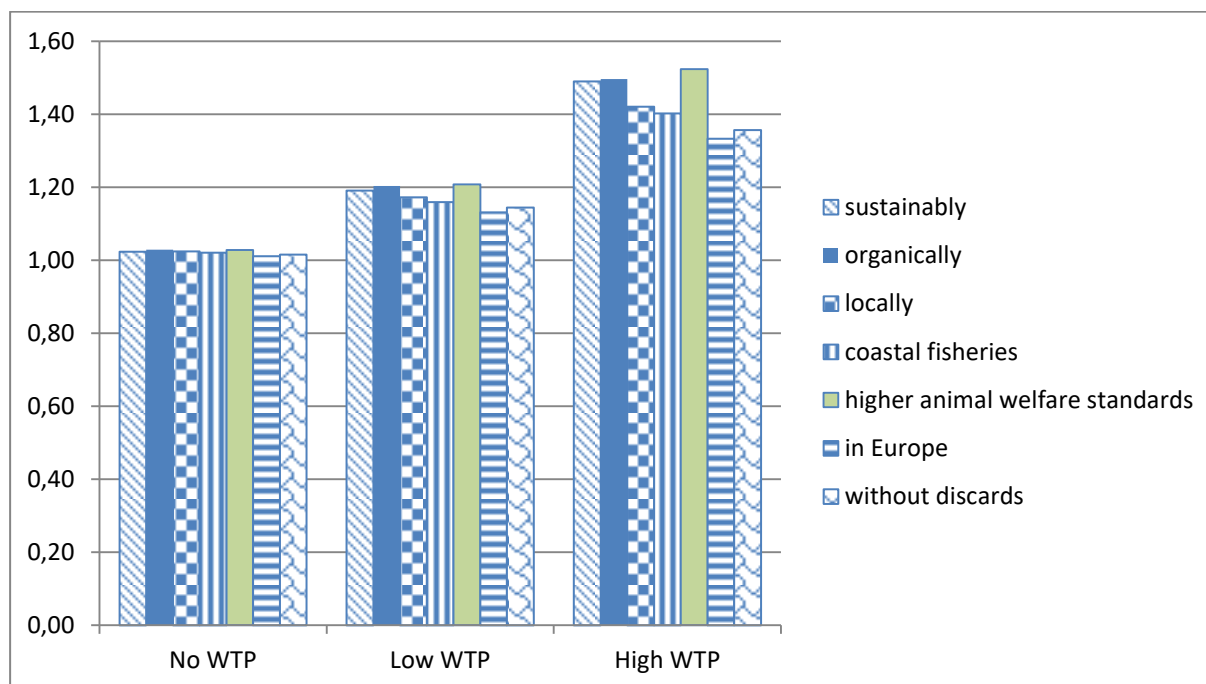
5.3. HOW CAN CONSUMERS WITH HIGH WTP BE CHARACTERIZED?

In order to address consumers in a well targeted manner and to increase their demand for sustainable fish made in Europe, more information about the members of the clusters is needed.

The comparison of various indicators between the three consumer groups allows for a sound differentiation: Consumers with high WTP are more knowledgeable about fish they show higher involvement and a higher PCE. Altruistic values are significantly more prevalent in this group and they are more frequently in favor of aquaculture. Also, in this group the share of women is higher than in the two other groups. In the group 'no WTP' people are older than average.

6. CONCLUSIONS

The results of the survey reveal that in all study countries participants had a rather positive attitude towards aquaculture. Aquaculture was foremost associated with the provision of jobs and as an important contribution to cover global fish demand. Considering the high sensitivity for the use of drugs in aquaculture the industry needs to ensure the production of safe and healthy food and should try to highlight its capacities in this respect.

Furthermore the results clearly indicate that there is a small consumer segment with a higher WTP for fish (and seafood) produced according to sustainable production methods and from European origin. About 10% of the consumers belong to this segment their WTP is at almost 50%. By emphasizing animal welfare, organic and/or sustainable production, this consumer segment can be successfully addressed and their additional WTP can be activated. In addition, the indication of European origin can strengthen the positive perception of a fish produce since consumers perceive the European Union as a credible controlling agent. However, the local/domestic origin is valued more by consumers than European origin.

Sound communication, considering specific consumer interests and focusing on animal welfare, specific sustainability issues and/or organic production is needed and promising. With respect to sustainability issues the communication should focus more on environmental sustainability than on economic and social sustainability. For the fisheries as well as the aquaculture sector the conservation of biodiversity is an important issue. In addition, topics related to an eco-friendly production should also be addressed by the aquaculture sector.

An important issue when communicating with consumers about sustainable production is to offer them a real 'plus' over common production standards. Consumers need to be able to make out the differences when asked to pay significantly higher prices.

Limitations of this research refer, as with almost all studies on consumers' WTP, to the gap between stated and revealed or real WTP. This so-called attitude behavior gap is frequently cited when observing that consumers state high WTP in surveys but do behave quite differently at the market place. Consumers' WTP in the market place depends to a very large degree on the way they are communicated.

Further research should investigate issues of sustainable production in different fish species as well as specific and promising communication messages.

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SEAFOOD PRODUCTS IN FOOD BASED TV PROGRAMS (UBO)

Bertrand Le Gallic, Myriam Nourry, Estelle Masson and Claudio Pirrone

GOALS

The H2020 *SUCCESS* project aims at improving the competitiveness and economic sustainability of the European Seafood sector. A part of the project deals with the understanding of the consumption patterns in different European Countries. TV and other media programs have an undebatable impact on consumption patterns. In this context, it is of central importance of the project to consider the worldwide development of food and cooking TV shows, and their likely effects on diet decisions.

This research will analyse the place of seafood products in specialised TV programs, broken down into market segments (whitefish; mussels and crustaceans, etc.). A survey of the potential spectators will help understanding how these programs are actually modifying the buying patterns of seafood products. In addition, broadcast companies will be interviewed to analyse their own understanding of the potential benefits of seafood products.

1. OUTCOMES FROM THE PRELIMINARY WORK

In order to design the questionnaire, a first explanatory work has been conducted as from April 2015 at the University of Brest, where the University staffs of several components have been surveyed.

This section presents the preliminary outcomes of the research, including the historical development of cooking programs in France, as well as the place of seafood products within some selected TV culinary programs.

As the questionnaire was developed to investigate if, and to which extent, these programs are actually modifying the consumption patterns of seafood products, the following specific questions have been included:

- Q9: "further these culinary programs, did you integrate new ingredients in your recipes"
- Q10: "did you replicate a course presented during a culinary program"
- Q16: "did culinary programs modify your seafood consumption?"
- Q17: "did you discover new seafood products thanks to culinary programs?"

The full Online survey is can be found at the following address: https://docs.google.com/forms/d/1xLsPG_RQMhKDWdLuIN0-bxKY21FZrWClDOfRL-ZeUdw/viewform?edit_requested=true.

Historical development of cooking programs in France
The first TV program dealing specifically with food issues is been identified in 1954 - *'Art et magie de la cuisine'.*

The programs were mostly based on the preparation of recipes (real time). As from 2008 however, a development of new TV culinary programs occurs, based on different types of competition to design the best Chef. More recently, travel based culinary programs also developed, often including some information regarding cooking habits.

Quantitatively, this development of cooking TV program can been captured by the Figure 12.

Figure 12: Historical development of cooking TV programs in France

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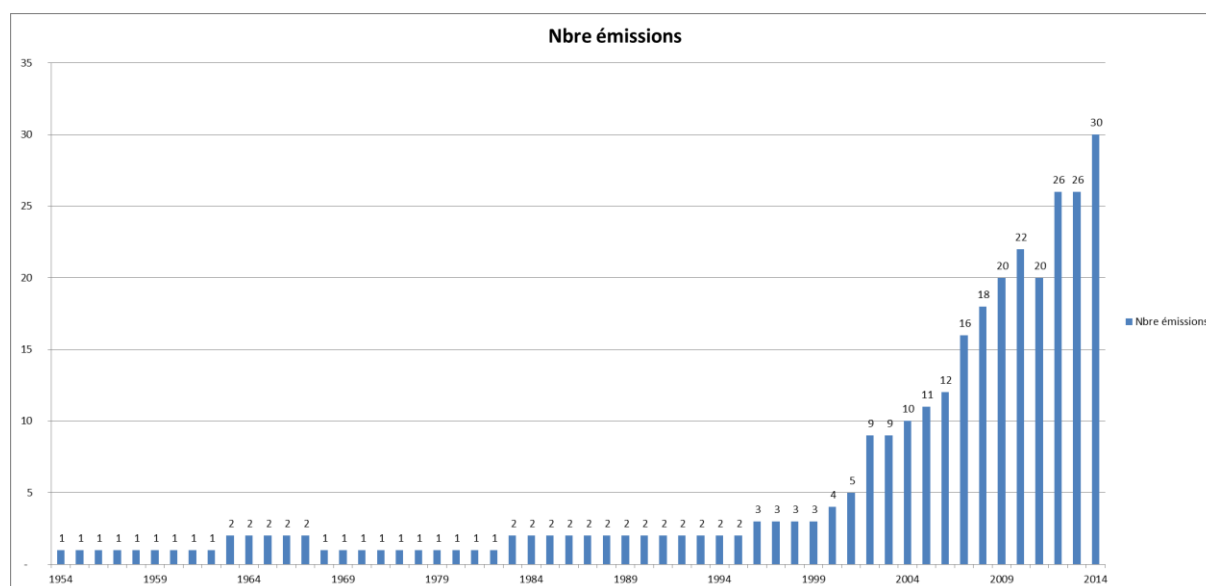
As from 2011, more than 25 programs were identified. This strong increase can be liaised to the listing of the French gastronomy under UNESCO immaterial assets in 2010 (http://www.unesco.org/culture/ich/en/RL/gastronomic-meal-of-the-french-00437).

In order to appreciate the scope of the phenomenon, the audiences of three of the most popular shows are the following (2014 basis):

- Master Chef: 3,500,000 persons
- Top Chef: 3,144,000 persons
- 'Un diner presque parfait': up to 2,500,000 persons

Such programs appear to have a rather efficient economic model, pleading for some forms of durability. For instance, advertising revenues were estimated to around 49.4 EUR million for the season 3 of Master Chef, and the programs also benefit from 'derived products' and global companies' sponsoring (e.g. for Master Chef: 100 partners in 2013 – incl. Beghin Say, Brita, Aoste…).

Some first answers regarding the motivation for watching the programs (question 7) suggest that the increase in the number of programs played an important role in enlarging the audience (greater supply and higher diversity creates a greater demand, as in most economic sectors). In the same vein, 37% of the respondents declared that their attendance increased in the last period.

In order to apprehend the place of seafood products within TV culinary programs, it was decided to base the analysis on the most popular show (Master Chef), as all the menus were available online (http://www.tf1.fr/masterchef/recettes-masterchef/toutes-les-recettes/)[2].

In 2014, on the 662 menus proposed, 124 were based on seafood courses (share of 18.7 %). The range of seafood products used in these 124 courses is described in the figure 13 and the table 12 below:

Figure 13:   relative importance of seafood products
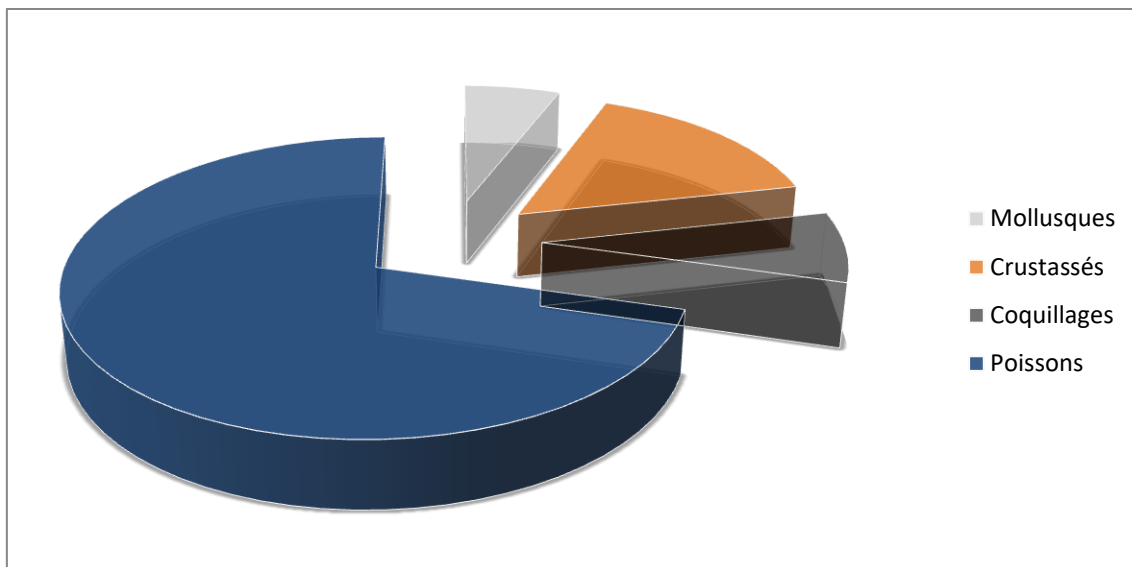
Table 12:   Top 10 species used

Salmon	18
Octopus	16
Cod	10
Sea Bream	9
Sole	8
Bass	7
Cod liver	6
Monkfish	6
Red Mullet	6
Gambas	5

Some preliminary outcomes from the survey answered by around 270 persons (see Table 13) are presented below.

Table 13:   Socio-demographic profile of the respondents

Age groups (years)	male	female	Percentage (%)	
			male	female
16-29	32	141	11,81%	52,03%
30-49	19	49	7,01%	18,08%
50-64	11	16	4,06%	5,90%
Over 65	0	3	0%	1,11%
Total	62	209	100,00%	100,00%
			22,88%	77,12%

Around 60 % of the respondents declared watching cooking TV shows (see Table 14).

Table 14:   Percentage of respondents watching cooking TV shows

1) Do you watch culinary TV programs?	
Yes	164
Non	109
Total	273

Among the people who are mostly supposed to watch TV programs around 20% declared that they replicated a course presented during a culinary program (Table 15).

Table 15:   Replication of a course

	Q10: "did you replicate a course presented during a culinary program"?	
No	80,12%	137
Female	64,33%	110
Male	15,79%	27
Yes	19,88%	34
Female	18,13%	31
Male	1,75%	3
Total	100,00%	171

Also interesting from our research point of view, 56% of the respondents declared integrating new ingredients in their recipes after watching the cooking programs (Table 16).

Table 16:   New ingredients

Q9: "further these culinary programs, did you integrate new ingredients in your recipes"?	
Yes :	97
No:	75
Total	172

In the same vein, 10 % of the total sample surveyed, and 14% of those watching programs, declared being inspired or influenced by the cooking programs to prepare seafood courses (Figure 14).

Figure 14: **Influence of seafood programmes**

Q18 – Were you inspired / influenced by the TV culinary program to prepare seafood products?
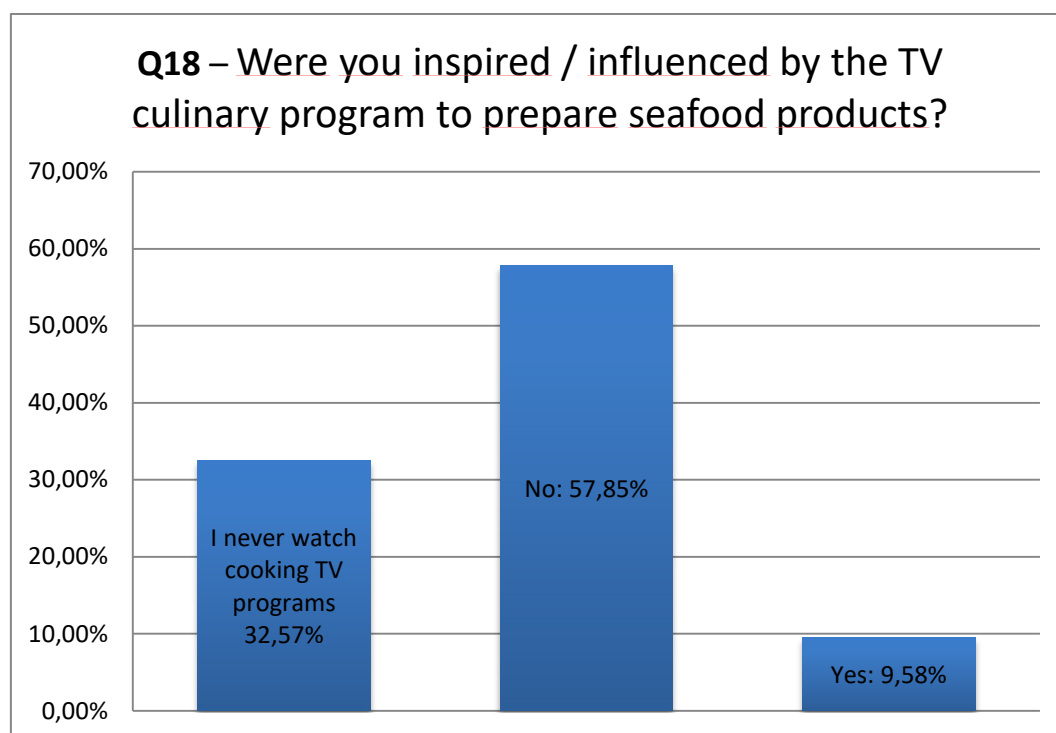
More generally, 16% of the respondents who are watching programs declared that their seafood consumption was modified by these programs (Table 17).

Table 17: **Modification of the seafood consumption**

Q16: "Did culinary programs modify your seafood consumption?"	
I never watch cooking TV programs:	75
Not at all:	162
Slightly:	31
Total	268

A question asking for the reasons preventing people to consume more seafood products was also included in this first analysis (Table 18). The three main reasons cited were the price, the lack of knowledge, as well as some concerns regarding some production methods[3].

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[3] E.g., in France, the consumption of salmon has reportedly being recently influenced by some TV documentaries criticising some producing and processing methods.

Table 18:   reasons for not consuming more seafood products

Q14 – Reasons that prevent you to consume more seafood products	
Price of the seafood products	171
Time for preparing the course:	36
Lack of knowledge regarding recipes and preparation mode:	87
I don't like touching fish nor cooking the crustaceans :	23
I have some questions regarding the production methods for some species :	95
Other:	15
Total	427

2. OUTCOMES FROM THE SECOND SURVEY

Based on the initial survey tested, the work has been further developed with:

a. Making some revisions in the questionnaire

b. Translating questionnaire in Italian and in English, for the dissemination of the questionnaire in Italy and UK.

2.1. METHODOLOGY

2.2. STRUCTURE OF THE SURVEY

The updated questionnaire is organised in 4 parts:

- The first part deals with social representations of fish:
  - Respondents are asked to provide 3 to 5 words associated to fish to obtain the words association
  - Then they rank these words, from the most to the least important;
  - They are also asked about the valence of the words, i.e. whether a word's feeling/connotation is very positive, positive, neutral, negative or very negative to them.
  - Finally, they are asked about their perceptions through the use list of paired characteristics (see Figure 15 below) or the list of reasons for not consuming more seafood products

Figure 15:   Example of paired characteristics

Fish is expensive	1	2	3	4	5	6	7	Fish is cheap

In this example, if you consider that fish is an expensive product you'll tick number 1 or 2 whereas you'll tick 6 or 7 if fish is a cheap product for you.

- Secondly, closed questions, with multiple choice, enable us to get information on the cooking and consumption habits, focusing on seafood products

- **The third part is dedicated to culinary TV programmes**. Here, closed questions, with multiple choices, were preferred.

- **The questionnaire ends up with some <u>socio-economic data as </u>**sex, age, income, city…

The questionnaire was implemented online with Google Forms, available with the following links:

French version: https://goo.gl/forms/raeZzxTEr1F6mrUM2

English version: http://goo.gl/forms/gk2xJguC6m

Italian version: https://goo.gl/forms/b2TeQiQdPx1vCvkj2

3. SURVEY DIFFUSION IN EUROPEAN UNIVERSITIES

In order to follow a similar approach, it was decided to disseminate the questionnaire to Universities' staff, either through personal contacts or by proceeding randomly. The universities contacted are listed in the Table 19. In the 3 countries, both coastal and inland universities were targeted.

Table 19:   Universities contacted

France (14 universities)	Italy (7 universities)	United-Kingdom (10 universities)
Paris – AgroParisTech	Palerme	Plymouth
Dunkerque	Salerne	Londres
Lorient	Sienne	Aberdeen
Bordeaux	Pise	Brighton
Marseille	Bologne	Nottingham
Brest	Bergame	Oxford
Clermont-Ferrand	Parme	Sheffield
Grenoble		Portsmouth
Lyon		Greenwich
Montpellier		Gloucest*r*
Nantes		
Nice		
Tours		
Strasbourg		

Note that Universities written in italic (8 in France, 3 in Italy and 5 in England) are those who sent the link to the online questionnaire to their staff, through a global or more partial mailing list.

4. SAMPLES

The number of respondents from each country is listed in the Table 20, which also indicates the number of universities from which the respondents are from, as well as the survey period.

Table 20:   Origin of the respondents

France	UK	Italy
8 universities	5 universities	3 universities
15/02/2016 to 10/05/2015		
789 respondents	49 respondents	49 respondents

As shown in the Table 20, the answer rate is really uneven between France and the 2 other countries. This probably reflects cultural or organisational differences between countries (in UK for instance, several universities indicated that they were not allow to circulate such questionnaires). As a result, the developments below will be limited to France, at least for

the time being, because the number of answers were not sufficient to apply the econometric analysis in the 2 other countries[4].

In order to refine the sample, the database obtained was restrained / reduced to the number of respondents who provide answers to one of 3 modalities of the tested[5] question "*In the last 12 months, would you say that your consumption of seafood products*": increased, decreased or remained stable. The respondents who chose the answer "I don't know" were dropped from the studied sample, which leads to a database of 738 answers. The following tables present some socio-demographic statistics on this sample (Table 21-24)

Table 21: **Socio-demographic statistics: Region, living close to the coast or not, age and sex**

Region	Number	%
Paris and its region	100	13,55
North East	369	50,00
North West	120	16,26
South West	30	4,07
South East	118	15,99
No answer	1	0,14
Total	738	

Living with respect to coast vaccinity	Number	%
With coastline	241	32,66
Without	495	67,07
No answer	2	0,27
Total	738	

	Male	Female	No answer	Total	%
18-34	40	130		170	23,04
35-44	54	156	2	212	28,73
45-54	65	161	1	227	30,76
55 and more	53	74		127	17,21
No answer		2		2	
Total	212	523	3	738	
%	28,73	70,87			

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[4] Alternative ways to disseminate the questionnaire in Italy and UK are currently investigated.

5 I.e. the question on which the econometric analysis is based.

Table 22:   **Income class**

		Number	*%*
	Less than 1200 €	14	*1,90*
	1201 to 2400 €	136	*18,43*
	2401 € to 3600 €	187	*25,34*
	3601 € to 4800 €	167	*22,63*
	More than 4800 €	176	*23,85*
	No answer	58	*7,86*
	Total	738	

Table 23:   **Fish consumption frequency**

	Number of respondents
Never	8
Less than once a month	35
Once a month	53
2 to 3 times a month	166
Once a week	280
2 to 4 times a week	188
5 and more time a week	8
Total	**738**

Table 24:   **Culinary TV show**

	Number of respondents	*%*
No, I did not watch them	268	*36,3*
Yes, I watched some during the past year	358	*48,5*
Yes, I watched some more than a year ago	112	*15,2*
Total	**738**	

5. RESULTS

5.1. SOCIAL REPRESENTATION OF FISH

The first set of questions was related to the perception of the term 'fish'. Interviewees were firstly asked to provide 3 to 5 words (or expressions) associated with 'fish'; then, they were asked to rank these words, from the most important to the less important; last, they were invited to indicate if the word chosen was positive, quite positive, neutral, quite negative or negative.

The respondents produced 3518 association, so an average 4.76 associations per respondent. These associations have been analysed using the textual analysis software Iramuteq[6]. The semantic universe of the evocations associated with 'fish' appears to be rich and varied. It encompasses 650 specific lexical forms, among which 302 'hapax' (form appearing only once in the corpus) that represent 6.75% of the occurrences. The analysis of the of the different lexical forms' occurrences show that:

- Fish is perceived to be a product from the sea …
  - o ("mer" - sea: 388 occurrences)
- … linked to a human / anthropic activity (*fishing*)…
  - o La pêche (fishing - 179 occurrences) is the second word the most frequently associated to ' the fish', with different linguistic traits also referring to this activity (vessel, net, fisherman, sailor…)
  - o The direct references to farming and aquaculture appear to be rather marginal….
- …although the most common production model mentioned refers to aquaculture (*salmon*)
- Among the negative elements, 'fishbone' and 'smell' are the most important items, together with environmental issues such as pollution (e.g. 'mercury') and overfishing.
- Among the positive elements, 'freshness' and 'health' (e.g. Omega 3) are the most important items.

As for the species mentioned, it should be noted that after 'Salmon' (138 occurrences), the other main species are 'Tuna' (38 occurrences) and 'Trout' (31 occurrences), far ahead high quality products such 'Sole' (12 oc.), 'Hake' (9 oc.), mullet (3 oc.) and 'Bass/Seabass' (2 oc.).

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6 Ratinaud, P. (2009). IRAMUTEQ : Interface de R pour les Analyses Multidimensionnelles de TExtes et de Questionnaires. http://www.iramuteq.org

Figure 16: **Cloud of the words associated with the inducer word "fish". In the graphical representation, the size of the word is proportional to its frequency of occurrence in the corpus.**


The universe of evocations associated with fish is on the whole positively connoted with 65% of positive associations (40% of the associations are coded by the respondents as very positive, 25% rather positive). The analysis of the ranks of importance attributed to the associations shows that the words judged to be the most important are also those that are judged most positively (see Figure 16). On average, the higher the rank of importance, the more positive the valence of the universe of connotation is. 80% of associations rated by the respondents as important were very positive (62% very positive, 18% rather positive), while it was only 47% for those classified as least important (22% very positive, 25% Rather positive). There is also a strong correlation between the association rank and the neutral valency. If only 5% of the most important classified associations are considered "neutral", it is the case of 33% of those considered to be the least important. These associations coded as being neutral are frequently made up of expressions in which the name fish appears ("like a fish in the water", "swimming like a fish", "April fish", etc.), of references to cultural habits ("Friday fish" ...), to modes of preparation (breaded, cooked, smoked ...), or to physical characteristics of the fish (scales, flesh ...).

Figure 17: Distribution of the valences according to the importance of the association
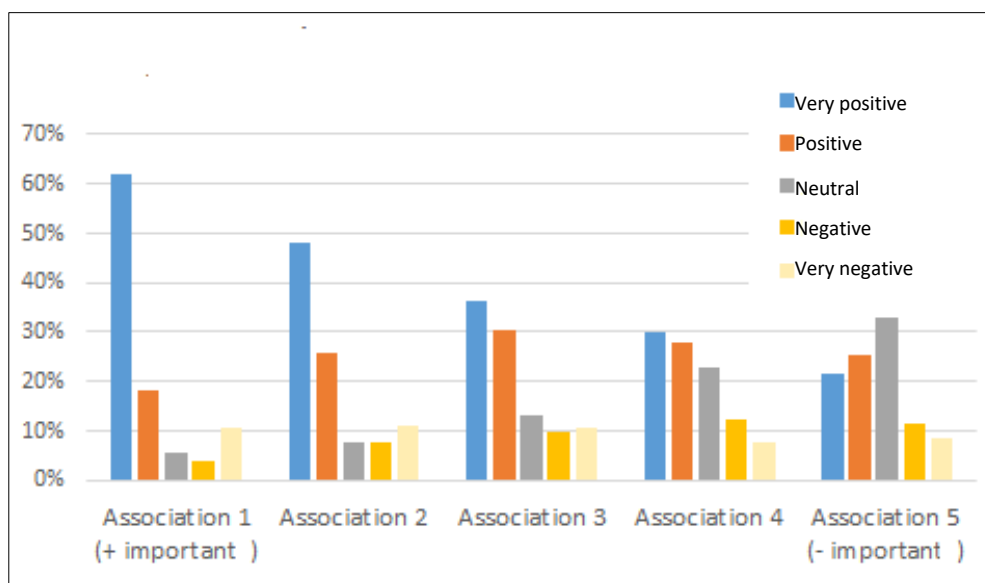
If the global analysis of the corpus of evocations associated with fish collected during the survey shows the prevalence of positive connotations, the analysis of individual responses shows that the personal universes of evocation are frequently cleaved. To investigate this issue, the levels of ambivalence are analyzed for each respondent. The level of ambivalence given by an individual to the various associations he has produced. Thus if the respondent assigns the same valence to all his associations, then the degree of ambivalence of his personal universe of evocation is zero (= 0). On the contrary, if one of the valences assigned is a very positive valence and a very negative valence then the degree of ambivalence of its personal evocation universe is maximum (= 4). Figure 18 shows the distribution of the workforce according to the degree of ambivalence of the personal universe of evocation. The degree of ambivalence is low (difference = 0 or 1) for 28% of respondents, mean (deviation = 2) for 25%, strong for 22% and extreme for 4% for 25%.

Figure 18:   Distribution of the workforce according to the degree of ambivalence of the personal universe of evocation.
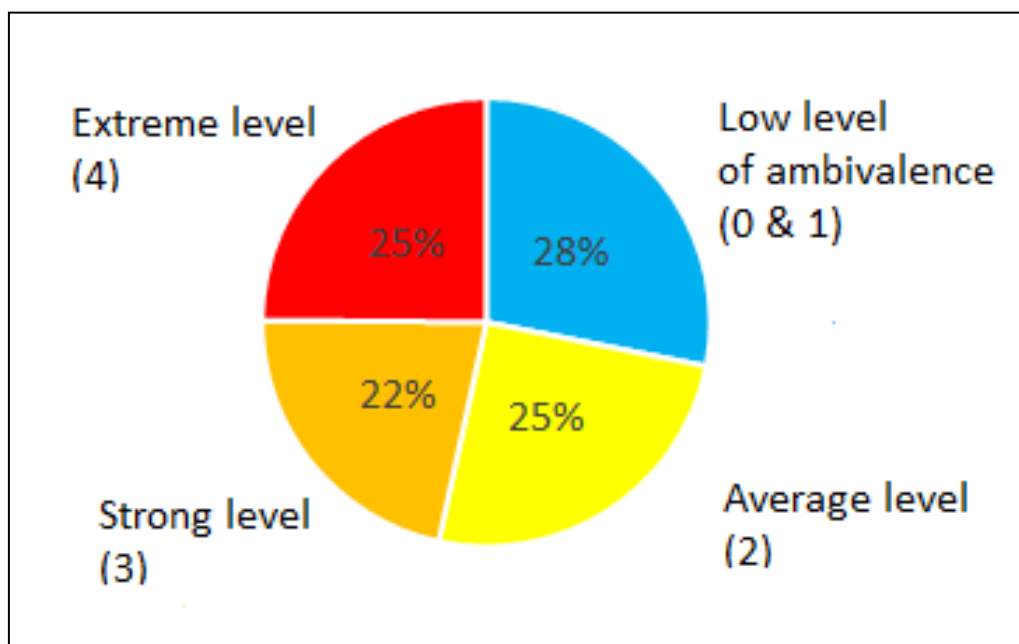
We notice from figure 18 that the sample is divided into two groups: One with quite low level of ambivalence (0 to 2) and the other with a high level of ambivalence. For them, the term "fish" is associated to both positive and negative elements. From a first analysis, it seems that this ambivalence is stronger for people sensitive to environmental issues.

Indeed, it is observed that individuals whose personal universe of evocation exhibits an extreme degree of ambivalence declare more than others questioning the conditions of rearing of fish, judge more often than others that fish comes from productions that are harmful to the environment and perceive it as an exhaustible food resource.

6. THE ECONOMETRIC ANALYSIS

6.1. THE MODEL

The econometric analysis is based on the dependant variable "In the last 12 months, would you say that your consumption of seafood products:

- Decreased (Y=0)
- Remained stable (Y=1)
- Increased (Y=2)"

As indicated above, the analysis is based on the 738 respondents who provided answers to one of these 3 modalities.

In this situation, the dependent variable is an ordinal multinomial variable. Indeed, the three modalities clearly show an ordering. The accurate econometric technique is therefore the Adjacent Logit Model[7], and can be written as follows:

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[7] Rakotomalala R., (2015), Pratique de la régression logistique – Régression logistique binaire et polytomique, Université Lyon 2, Septembre, p. 272.

$$ln \frac{P(Y = k + 1/X)}{P(Y = k/X)} = a_{0,k} + \sum_{i=1}^{J} a_{i,k} X_i \quad k = 0,1$$

With this model, two different equations are tested:

- the first one compares the effect of the dependent variables on the probability fish consumption remained stable against decreased $(P(Y = 1)/P(Y = 0))$

- the second studies the same effects on the probability fish consumption increased against remained stable. $(P(Y = 2)/P(Y = 1))$

In order to have a simpler model, it is possible to test the parallel Logit model, which is based on the assumption of equal slopes $(a_{i,k} = \bar{a}_i)$ for each k level by a maximum likelihood ratio test (known as LR test – Proportional odds). If this assumption is accepted, there is only one coefficient $(\bar{a}_i)$ to be estimated; only the constant are different for each equation.

Different sets of explanatory variables (X_i) were tested:

- Sex

- Age with different variables : age of the respondents or different age classes repartition

- Household structure with different variable : number of persons in the household, number of children, presence or not of children

- Geographic variable represented by the regions, the 4 geographical areas or the presence of a coastline

- Income with different income revenue repartition

- Seafood consumption frequency

- Viewer of culinary TV programs : with 3 possible answers taking into account present or past viewing and with only 2 possible answers (yes or no)

- Variables constructed on the paired of characteristics (cf. first part of the questionnaire on the social representations of fish – sub-section 2.1.1).These variables enables us to test the consumer behaviour concerning price fish, production conditions, fish-eating effects on health…

The results of the analysis[8] can be capture in the table 25.

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[8] Realised with the R-software.

Table 25:   **Results from the Adjacent Logit Model**

		Adjacent category logit
Constant	a0,0 --> P(Y=1)/P(Y=0)	0,48
	a0,1 --> P(Y=2)/P(Y=1)	-2,19**
Household with child	eq1 : stable / decreased	-0,14
	eq2 : increased / stable	-0,65***
Coastline	eq1 : stable / decreased	0,50*
	eq2 : increased / stable	0,12
Perception on price	eq1 : stable / decreased	-0,94***
	eq2 : increased / stable	-0,13
Perception on prod. Conditions	eq1 : stable / decreased	-0,40*
	eq2 : increased / stable	-0,26
Perception on health	D1 : eq1 : stable / decreased	1,58 ***
	eq2 : increased / stable	0,56
	D2 : eq1 : stable / decreased	0,68
	eq2 : increased / stable	-0,06
TV culinary prog. View	eq1 : stable / decreased	0,54**
	eq2 : increased / stable	0,12
LR Test - Constant Only		53,34 ***
LR Test - Proportional Odds		7,58

*** 1%, ** 5 %, * 10%

First of all, the model is globally significant. Indeed, the LR test comparing the model with the dependant variables to the model with constants only show that the hypothesis: $a_{i,k} = 0 \; for \; i = 1 \; to \; 6 \; and \; k = 0,1$, can be rejected at 1% error level. Therefore, the integrated exogenous variable help to explain the trend in seafood products consumption.

The second LR test – proportional odds – indicated that the parallels logit model can be used. The coefficient $a_{i,k} = 0 \; for \; i = 1 \; to \; 6 \; and \; k = 0,1$ are different for the two k levels. Therefore, two different equations have to be estimated, this explains why there is two assessments for each independent variables.

Looking at the results in Table 11, we notice that variables are more often significant for equation 1 than for equation 2. Indeed, 5 variables are significant for equation 1 whereas only 1 - presence of children in the household- is significant for the second equation, meaning that having a child has a negative impact on the probability of increasing seafood consumption.

Focusing on equation 1, two variables have a negative effect: considering fish as an expensive product and doubting about seafood production conditions reduce the probability of a stable seafood consumption. On the other hand, living close to the sea and perceiving fish as a healthy product increase the stability of seafood consumption. The same effect is revealed for culinary TV shows. Consumers watching this type of TV shows have a higher probability to maintain their seafood habits.

This first econometric analysis needs to be developed, firstly with the assessment of the odds-ratio and secondly with the use of a cumulative logit.

6.2. CONCLUDING REMARKS

Some potential impact

Way forwards / recommendations:

- Training of Chef about the preparation of some seafood products
- Sponsoring of TV culinary programs by seafood companies

SEAFOOD PRODUCTS IN COLLECTIVE RESTAURANTS: THE CASE OF MUSIC SCHOOLS IN GREECE (ATEITH)

Lamprakis Avdelas and Sofia Galinou-Mitsoudi

ABSTRACT:

This paper empirically assesses the place of seafood products in Greek public music school catering services. The Greek e-procurement website is used to collect the procurement documents under Common Procurement Vocabulary (CPV) code 15894210-6 "School meals" from 2014 to 2016. The thirty two procurement documents collected and analysed represent a sample of 44% of the forty five Greek music schools. The procurements documents refer to a maximum 1.438 million meals for an average of 147 days during the school period and to a total of 10,036 students. The results from the analysis highlight the fact that not all music schools include seafood in the menu requirements, the frequency of seafood meals varies considerably and no certification or label other than the minimal HACCP certification is required. The results suggest that there is room improvement both in terms of law and in terms of guidelines-recommendations for seafood in the Greek music schools.

Key words: sustainable sourcing, public procurement, seafood products, school catering sector, food supply chain

1. INTRODUCTION

This paper empirically assesses the place of seafood products[9] in the out-of-home catering sector in Greece and more specifically the collective out-of-home catering sector through the case of Greek public music school catering services.

The positive effects of seafood consumption on human health are widely recognised (Chrysohoou *et al.*, 2007 & 2011). WHO (2003) suggests the "*increase of consumption of fish especially in the developed countries*". Moreover, when it comes to the prevention of cardiovascular diseases WHO (2003) states that "*Regular fish consumption (1--2 servings per week) is protective against coronary heart disease and ischaemic stroke and is recommended*". On the other hand, WHO (2003) recognises that recommendations for increased fish consumption may have adverse effects to the fish stocks and stresses the need for sustainable exploitation, while outlining the importance of aquaculture in meeting the demand.

A timeless objective of the European Union as stated in the Common Fisheries Policy[10] is the sustainable exploitation of living aquatic resources and of aquaculture, recently[11] expressed as the need to ensure that fishing and aquaculture activities contribute to long-term environmental, economic, and social sustainability. In this context, from the supply point of view, the European Commission stresses the need for economic sustainability of the seafood production enterprises and among other issues seeks[12] to "*investigate market niches as well as the potential of existing marketing tools promoting responsible practices (labels, certification schemes etc.) to boost the competitiveness of the European fishing and aquaculture industry*"

There is growing literature regarding market driven incentives (such as labels and certification) to promote sustainability while contributing to the competitiveness of the seafood producers. Jaffry *et al.* (2004) argue that there may be potential benefits available with the development of quality and sustainability labels for fish products and opportunities for private enterprises in terms of niche marketing. Avdelas and Jaffry (2015) report positive willingness to pay for labelled (eco, organic, safety) seafood products in Greece while they identify freshness, Greek origin and price as main determinants of consumer choice. Nevertheless, increased margins for labelled seafood may not be transmitted in the value chain back to the producers as suggested by Washington and Ababouch (2011). The findings of Jaffry *et al.* (2016) also concur that rewards to the seafood producers from the certification are not guaranteed and, benefits experienced by the already certified fisheries may not be financial.

While we do not expect that the demand for seafood in collective restaurants in Greece is a major part of the overall seafood demand, we consider this segment of particular importance to the formation of eating habits[13] in large parts of the population (children in

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[9] Seafood products include all the aquatic organisms suitable for human consumption

[10] Council Regulation (EEC) No 3760/92 of 20 December 1992 establishing a Community system for fisheries and aquaculture, Council Regulation (EC) No 2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy

[11] Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy

[12] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/bg-10-2014.html

[13] We are addressing the issue of habit formation in the consumer survey under Task 2.3

catered schools, university restaurants and army restaurants) along with the possibility to educate yang people in terms of fisheries and aquaculture sustainability.

As a side effect, considering that catered schools and university restaurants in Greece are using public procurement procedures for the supply of meals, we expect that minimum requirements in the public procurement may raise the quality standards for seafood consumption and promote sustainability. Public procurement procedures may also contribute to the education of yang people in terms of fisheries sustainability if sustainable labelled seafood products are presented in collective restaurants.

School food policy in Greece covers mostly food and nutrient based standards for non-lunch meals (JRC, 2015[14]). Regarding food-based standards for lunch (as reported by JRC, 2015), *"the Mediterranean diet pyramid based on dietary guidelines for Greece (Ministry of Health, 1999[15]) is in place and applies only to schools with dining halls, which offer school lunches to students; no other recommendations included; school lunches are offered only by specific private schools in Greece, for which the Mediterranean diet menu applies".* The Mediterranean diet pyramid requires 5-6 servings[16] of seafood per week. There exists also a separate policy for nursery schools and kindergartens which includes lunch guidelines and standards. In the case of music schools, where no dining hall is available, there are no guidelines or recommendations.

There exist 45 music schools in Greece spread all around the country offering high school education (i.e. for students 12 to 18 years old). The Ministerial decision No 3732/1988 states that in these schools lunch is served. Till recently, it was rather difficult to collect data on music school menus. This is the reason why to date there is no relevant literature in Greece accessing school food menus. The scarce literature regarding schools and universities focuses on factors affecting food choice in Greek primary-school students (Risvas *et al.* 2007) and eating habits of University students living at, or away from home in Greece (Papadaki *et al.*, 2007). After the beginning of the electronic public procurement in Greece, since 2014, menu requirements are publicly and readily available on the internet subject to minimum budget threshold of the procurement.

To our knowledge this study is original in the literature because no quantitative study discussing public procurement requirements for seafood products in the Greek collective catering sector is available in peer-reviewed journals.

In the remaining of this paper we discuss the extent of the out-of-home sector in Greece and we present the data collected in section two. In section three we present and discuss our findings and in section four we conclude.

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[14] https://ec.europa.eu/jrc/en/publication/school-food-policy-country-factsheets

[15] http://www.nut.uoa.gr./dietaryENG.html

[16] Serving under the Mediterranean diet pyramid is specified as half of the portion (125 g) requires by the Greek market regulation

2. DATA AND METHODS

2.1. DESCRIPTION OF THE CATERING SECTOR

Out-of-home catering sector can be defined as all the meals taken by households outside their home. This sector has shrunk in Greece during the recent debt crisis. According to our estimations based on the annual national household surveys (ELSTAT 2009, 2016), the consumption of food outside home as share of the Greek household food budget, decreased from 45% in 2008 to 29% in 2015. At the same period, the Greek nominal household food budget decreased by 15%.

To our knowledge, there is no formal definition of the Greek out-of-home catering sector; nevertheless we may somehow (arbitrary) divide the sector into two categories: the commercial out-of-home catering sector and the collective out-of-home catering sector. The commercial out-of-home category is comprised of commercial restaurant chains (mainly fast food), meat based traditional fast food shops, taverns, canteens and catering services. We consider as collective out-of-home catering sector (public or private) regular cases of catering provision to collective customers, with or without payment. Food provisions at schools, universities, hospitals and the army are some examples of the collective out-of-home catering sector in Greece. The magnitude of the collective out-of-home catering sector may be approximated by the national household surveys (ELSTAT 2009, 2016), where under the code 1112101, expenses at canteens (work, office, school, universities) are reported. These expenses at canteens (with or without payment) represent approximately 3.3% of the Greek household food budget for 2014 slightly decreased by 0.3% since 2008.

3. DATA COLLECTION

The Ministerial decision No 3732/1988 states that the lunch served at music schools is outsourced using public procurement procedures. The Greek e-procurement website[17] is used to collect the procurement documents under Common Procurement Vocabulary (CPV) code 15894210-6 "School meals" from 2014 to 2016. Thirty two unique procurements are identified, one for 2014, sixteen for 2015 and fifteen for 2016. These thirty two procurements are conducted by twenty municipalities, twelve of which have conducted school meal procurements for both the years 2015 and 2016. All the procurement documents refer to music school meals. The data represents a sample of 44% of the forty five music schools in Greece. We expect that the rest of the municipalities are not present in the e-procurement website due to minimum budget threshold required by the e-procurement procedures.

The procurements documents refer to a maximum 1.438 million meals for an average of 147 days during the school period and to a total of 10,036 students. The average procurement price for each meal is €3.17 and the total budget of all the procurements is €4.551 million. The weekly menu included in the minimum requirements of the menus varies, and depending on the municipality, the requirements may specify the menu of one to six weeks period.

Data gathered includes the occurrence of seafood in the menu, the number of the seafood servings, whether fresh and/or frozen seafood is specified and the species specified. As the Ministerial decision No 3732/1988 states that only lunch is served and the menus include main course and side dish, seafood is included only in the main course. Side dish usually includes bread, fruits, rise and potatoes. According to the Greek market regulation the quantity of cooked fish in the meal is at least 125 g.

The presentation of seafood, i.e. fillet, fish fingers etc. is specified in limited number of procurement documents and thus it is not included in the data. The requirement of specific certification was also under consideration during the data collection; nevertheless while HACCP certification was specified as minimal requirement in all procurement documents, no other certification/label was identified. For the municipalities that conducted two e-procurements during the period of 2014-2016, we have searched for differences in the menu especially for seafood, but we identified only one case that the menu has changed. In this changed menu, the requirements of the Mediterranean diet pyramid are introduced.

We did not consider differences based on proximity to the sea as only two municipalities are relatively far away (more than 100 km) from fisheries landing sites (not including inland waters) and fisheries auction markets. We also did not consider the differences based on population concentration as most music schools are based at the capital the former prefectures in Greece.

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[17] http://www.eprocurement.gov.gr

4. RESULTS

As already mentioned, the data refers to music school meals for a sample of 44% of the forty five music schools in Greece, based on thirty two unique procurements, one for 2014, sixteen for 2015 and fifteen for 2016 conducted by twenty municipalities.

The occurrence of seafood in the minimal requirements of the menu is presented in figure 19.

Contrary to the Mediterranean diet menu, there exist procurement documents that do not require fish in the menu at all. Out of the four menus without seafood, one municipality located far away (more than 100 km) from fisheries landing sites does not require seafood in the menu in two consecutive procurements.

**Figure 19:   Occurrence of seafood in the minimal requirements of the menu**
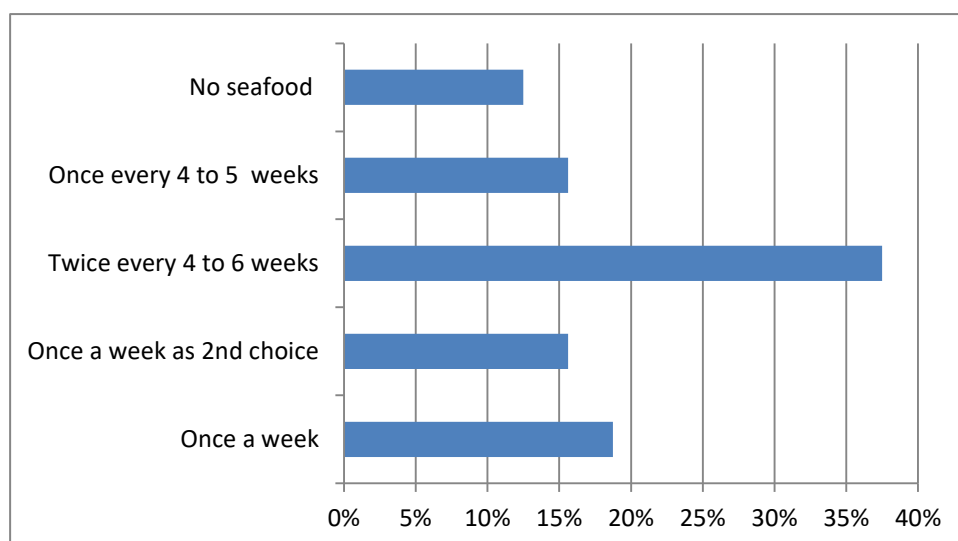
The frequency of seafood in the menu varies considerably (Figure 19), once every 1 to 5 weeks. In most of the procurements (38%), seafood is required twice every four to six weeks period. Once per week seafood is required by 19% of the procurements or as second choice, in 16% of the procurements. Once every four to five weeks, seafood is required in 16% of the procurements. No seafood is required in four procurements (13%).

In figure 20, the form (fresh, frozen) of the seafood required in the procurement documents is presented. We identified one case were no form is specified and three cases where exclusively fresh seafood is required. In the rest of the cases, when fresh seafood is required there exists at least one species also specified in frozen form.

Figure 20: **Form of seafood in the minimal requirements of the menu**
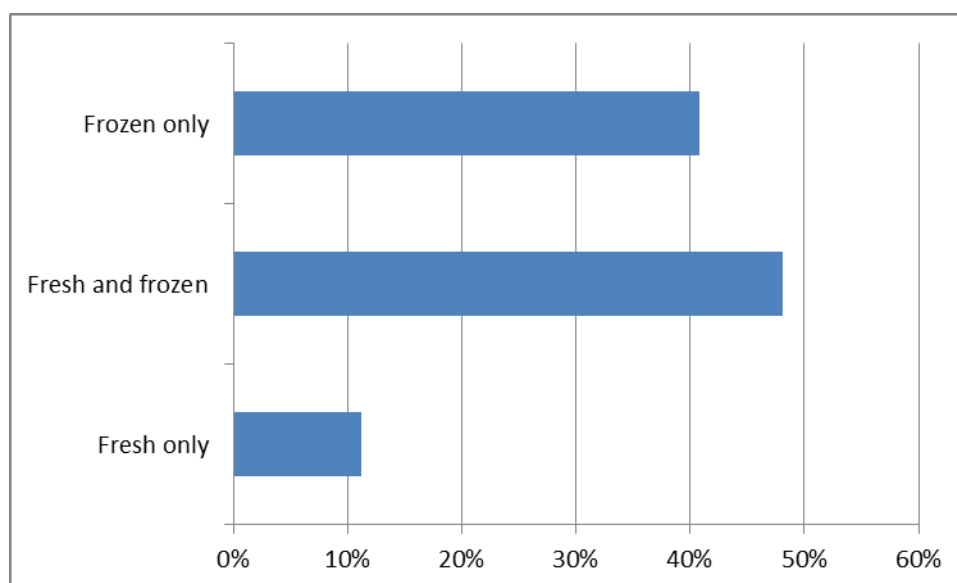
In the vast majority (48%) of the menus, fresh and at least one frozen species is required whereas in 41% of the menus only frozen seafood is stated. Despite the fact that fresh seafood is regularly produced and it is available in Greece both from fisheries and aquaculture, fresh seafood exclusively is required in only 11% of the menus.

Figure 21: Species of seafood in the minimal requirements of the menu
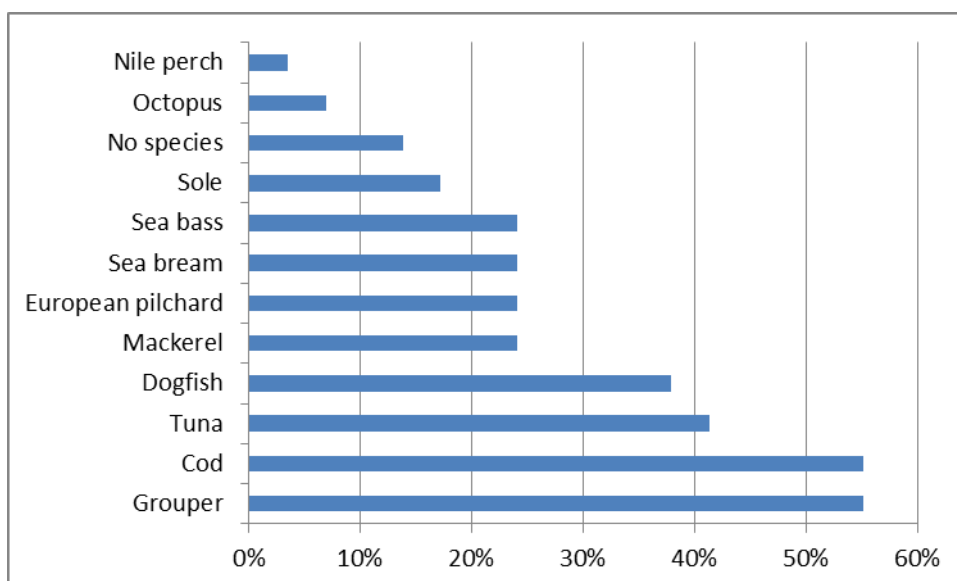
The species specified in the procurement documents are presented in figure 21. In all the cases, the common name of the species is presented and not the equivalent scientific name.

Out of the 29 procurement documents in which seafood is required, in four cases (14%) no species is specified. The most commonly frozen required species are grouper (55%), cod (55%), tuna (41%) and dogfish (38%). While we may not present quantitative data on the origin of the seafood, we expect that the vast majority of these commonly required frozen species are imported in Greece.

Species that are commonly produced in Greece, such as European pilchard (sardine) from fisheries and seabream or sea bass from aquaculture are required in 24% of the procurements. In these procurements, seafood is required fresh but also frozen tuna is provided as an option.

5. CONCLUSION

Through the case of the Greek music school catering, this study contributes to feed the debate about the quality of food supply in the collective catering sector and more particularly the place of seafood products in the sector. We recognize the fact that this paper is based on procurement documents and not on actual menus, nevertheless we expect that our findings also hold for the actual menus.

The results presented in this paper are summarized below:

- School food policy in Greece covers mostly food and nutrient based standards for non-lunch meals

- For schools with dining halls the Mediterranean diet menu applies

- In the case of music schools, where no dining hall is available, there are no guidelines or recommendations

- Not all music schools include seafood in the menu requirements

- When seafood is required, the frequency of seafood meals varies from once a week to once every five weeks

- While fresh seafood is produced and available in the Greek market, only 11% of the procurements require fresh seafood exclusively

- The vast majority of the commonly required frozen seafood species are imported in Greece.

- No certification or label other than the minimal HACCP certification is required

As a conclusion, there is room improvement both in terms of law and in terms of guidelines-recommendations for seafood in the Greek music schools. The inclusion of certification and labels for sustainable fisheries and aquaculture needs to be considered by the Government and the municipal authorities, subject to budget constrains during the ongoing debt crisis period currently in Greece. Certification and labels may serve as means to raise the quality standards for seafood served in collective restaurants and contribute to education of yang people in terms of fisheries and aquaculture sustainability.

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