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PrimeFish

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Deliverable D 4.6

Report on social awareness, attempts to stimulate fish consumption and negative press

October 2017

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Executive summary

Introduction

During the last decades, fish consumption has registered a significant increase (FAO, 2014), fish becoming one of the most consumed products, in big part due to the expanded worldwide popularity of Asian cuisine, especially sushi. Unfortunately, increased popularity means increased demand, which leads to overfishing and its negative ecological impact.

The example of fish is very representative when talking about the tragedy of commons which means the exhaustion of common natural resources by people whose objective is to maximize their individual utility (Hardin, 1968). Each fisherman rationally prefers to catch as much fish as possible to increase the profit. Due to this way of thinking, the stocks of wild fish are constantly reduced, people being interested in short-term gains and not in long-term consequences.

The decrease of natural stocks stimulated an important interest for farmed fish. To satisfy the demand, farmed production was doubled compared to the beginning of XXI century, making aquaculture the fastest growing food sector in the world with almost 70 million tons of annual production (FAO, 2014). The industry of fish products has one of the most impactful consequences for global food security and environment. For obtaining 1 kg of farmed fish, 2 to 5 kg of wild fish are used as meal, which means a waste of natural resources (Lang *et al*., 2009). Furthermore, the farming sites have an important impact on the quality of the nearby waters. The medications and pesticides designated for farmed fish growth are further dispersed in the waters and damage the normal functionality of the ecosystem. In addition to all these negative effects, consumers prefer to buy wild fish, perceiving the quality of farmed fish as unsatisfactory (Verbeke *et al*., 2007b). This preference will most likely increase the damage on the ecosystem.

Theoretical framework

The model used in this work is based on the Ajzen and Fishbein's (1975) theory of reasoned action (TRA). This theory is systematically used in the analysis of behaviours related to food consumption and changes in diet (Ajzen and Timko, 1986; Povey et al., 1999).

According to the TRA, the behavioural intention is the main determinant of the behaviour. Behavioural intention is composed of two dimensions: Attitude towards behaviour and subjective norms. Attitudes are formed by behavioural beliefs that could potentially be influenced by increased knowledge (Fishbein and Ajzen, 2011). This means that exposure to information on a specific subject increases consciousness and, therefore, influences behavioural beliefs that determine a positive or negative attitude toward behaviour (Müller and Gaus, 2015). In this work, it's therefore assumed that the reasoned action model of Fishbein and Ajzen (2011) is applicable in the case of changes in diet due to health or environmental problems resulting from exposure to information on a food issue.

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Materials and methods

3766 salmon consumers from five European countries were interviewed. In fact, the same respondents had to respond to two questionnaires that were sent to them with an interval of 15 days. The first questionnaire consisted mainly of socio-demographic data, sensitivity to health and the environment, and a first measure of their attitudes towards salmon. In the second questionnaire, respondents received an article on the negative impacts of salmon consumption. Four different articles could be presented either about health or environmental issues, from an official government source or an informal blog. After reading the article, consumers had to answer questions about the credibility of the information, before facing for the second time the questions regarding attitudes. They were also asked about their future consumption behaviour and the intention to choose labelled products was also esteemed.

Results

First, the usefulness of information was confirmed for all the four types of messages. However, the messages presented from official sources had higher credibility scores than those presented from blogs.

All the types of stimuli (presenting information on health or environmental impact) negatively impacted the average value of attitudes related to salmon consumption. In addition, respondents who faced a negative message about the health problems linked to salmon consumption have deteriorated their attitudes toward health items, as well as toward environmental items (and vice versa). However, salmon consumers are generally more sensitive to health problems than to environmental problems. Even though the credibility of official and unofficial messages was perceived differently, surprisingly there is no significant difference in attitude changes with respect to the source of information.

As for behavioural intentions, the highest score is recorded for the intention: "read more carefully the information presented on the salmon label / package" while the lowest is marked for "no longer eating salmon".

Conclusion

According to the results, exposure to a negative message has a significant impact on consumers' attitudes and intentions. The attitudes related to health aspects (healthy and safe) decrease by 13.5%, while the attitudes related to environmental aspects (good for environment, ethical, sustainable) decrease by 14.4%. Furthermore, regardless of the content of the messages, respondents deteriorated their assessments of the health characteristics of salmon consumption, as well as assessments of environmental characteristics. However, there is no difference in the impact of the information source on attitudes. This means that despite the lower perceived credibility of private blogs, these sources of information can have an impact on consumer attitudes. Therefore, encouraging the development of informal sources of information can also enable rapid and accessible communication in the event of a food crisis.

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1. Introduction

During the last decades fish consumption has significantly increased (FAO, 2014); fish becoming one of the most consumed products, in big part thanks to the recent worldwide popularity of sushi. This increase has a negative ecological impact due to overfishing. The decrease of natural stocks stimulated an important interest for farmed fish.

To satisfy the demand, farmed production was doubled comparing to the beginning of XXI century, making aquaculture the fastest growing food sector in the world with almost 70 million tons of annual production (FAO, 2014). The industry of fish products has one of the most important consequences for global food security and environment. For obtaining 1 kg of farmed fish - 2-5 kg of wild fish are used as meal, which means a waste of natural resources (Lang *et al*., 2009).). It should be noted however that with recent development of feed for farmed fish we can now obtain 1 kg of farmed fish with about 1 kg of wild fish as meal (Arnason, 2017; personal communication). Furthermore, the farming sites have in important impact on the quality of the nearby waters. The medications and pesticides designated to grow the farmed fish are further dispersed in the waters and damage the normal functionality of the ecosystem. In addition to all these negative effects, consumers prefer to buy wild fish, perceiving the quality of farmed fish as unsatisfactory. That's why the industries need to know how to improve fish characteristics to develop a product which will perfectly respond to consumers' needs.

According to FAO (2014), the increase of fish consumption is due not only to the world's growing population but also to the growing of world per capita fish consumption from the average of 9.9 kg in the 1960's to 19.2 kg in 2012. However, many studies are showing that people consume less fish than the recommended two servings per week (Burger and Gochfeld, 2009; Myrland *et al.*, 2000; Pieniak *et al.*, 2007; Verbeke *et al.*, 2008). Given that the benefits of eating fish are well known, it is important to understand what factors determine people not to eat enough fish. These barriers are related not only to fish attributes (price, smell, taste) but to consumers' perception of risks associated with fish consumption as well.

In order to develop a solid food production and distribution system, it is vital to understand the factors (individual characteristics, foods attributes, and environmental determinants) which influence fish consumption. Furthermore, the analysis of consumers' attitude towards contaminants in fish will provide important insight for health authorities which are interested in improving public health. Thus, the study of these factors can be useful not only for the social or economic aspects, but for solving the environmental problems, caused by this industry as well.

Despite the world recognized importance of this subject, there are not many studies analysing the fish consumption determinants. Some studies treat this subject through individual characteristics. Myrland *et al.* (2000), Trondsen *et al.* (2003) and Verbeke and Vackier (2005) showed the positive correlation between the age and the frequency of fish consumption. Only Mirland *et al.* (2000) found a direct positive effect of education level on the fish-eating frequency. Trondsen *et al.* (2003) and Verbeke and Vackier (2005) highlighted the influence of education level on the intention of eating fish.

The perception of fish quality attributes is divided in two categories: intrinsic and extrinsic cues (Szbillo and Jacoby, 1974). Intrinsic cues imply to fish' taste, appearance, smell and texture, while extrinsic

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cues are of lower importance and depend on country of origin, production method, preserving method etc. The taste represents both: a driver and a barrier for fish consumption (Sveinsdottir *et al.*, 2009), many teenagers report not liking the fish's taste (Birch and Lawley, 2012). With respect to extrinsic cues, consumers evaluate the fish quality according to fish's price and country of origin (Lawley *et al.* 2012).

Situational determinants received the least attention from the researchers. Jaeger *et al.* (2011) and Castro (2011) analysed preferences between fish and meat choice regarding the time and location of the meal.

Generally, people associate fish consumption with positive health effects due to the presence of proteins, unsaturated essential fatty acids, minerals and vitamins. But few people know about the contaminants in fish and potential health risks brought by them (Burger and Gochfeld, 2009; Verbeke *et al.*, 2008). There is a lack of studies which analyse how the knowledge of health risks impacts the consumer's intention to eat fish. That's why the purpose of this study is to investigate the effect of negative information regarding fish consumption on consumer's attitudes and intention to eat fish. This study will also examine if there is a different impact according to the content of the communicated message (impact on health versus impact on environment), as well as according to the source of information (official versus unofficial).

Therefore, a two-part study was realised in order to respond to the question: "Can information concerning the negative effects of fish consumption influence the consumers' intention to eat fish?"

The first part is the empirical study which consists of the explanation of the main determinants of fish consumption by analysing the most relevant academic literature. Findings regarding perception of health risks associated with fish consumption represent the emphasis of the literature's review. The examination of methods and limitations of previous studies helped in defining the research method for this analysis. The survey data were collected through questionnaires with an experimental message design. Each of the respondents had to be exposed to only one of the four risk messages. Before reading the risk message, the respondents were asked to rank on the Likert scales their attitudes regarding fish consumption. After having read the message, the respondents were asked to rank again their attitudes. Thus, the change in attitudes permitted to assess the impact of negative information. The final step was to cross the responses regarding the attitudes/intentions and the version of the questionnaire to highlight the possible differences in perception.

In order to analyse the possible differences in perception through different consumer categories, the respondents had to provide some personal information: gender, age, education level, the presence of children in the household, income etc.

The reminder of this deliverable is structured in three sections. The next section represents an overview of existing literature regarding the determinants of fish consumption. These determinants are treated with three approaches: individual characteristics, consumer's evaluation of fish attributes and situational and environmental factors. The empirical analysis which consists of methods and materials, results and discussions is presented in section three, rounded up by the conclusion.

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2. Theoretical framework and model: determinants of fish consumption

Because of the uniqueness of the decision system of everyone, it is difficult to follow the factors that have the strongest impact on those decisions. There are many models trying to explain the factors (and their interactions) which describe the food choice.

Olsen (2001) and Verbeke and Vackier (2005) explain fish consumption through the theory of planed behaviour. Olsen (2001) analysed the impact of attitude, negative feelings, social norm and moral obligation on involvement and how the last one influences the behavioural frequency.

In their study, Verbeke and Vackier (2005) analyse how the personal characteristics and the main components of the theory of planed behaviour determine the fish consumption intention and frequency.

They used as a conceptual framework the hypotheses of Ajzen (1991, p. 179) regarding the theory of planed behaviour: "Intentions to perform behaviours of different kinds can be predicted with high accuracy from attitudes toward the behaviour, subjective norms, and perceived behavioural control; and these intentions, together with perceptions of behavioural control, account for considerable variance in actual behaviour".

According to Randall and Sanjur (1981) food consumption represents the result of food preference which is determinate by three large categories of factors: individual characteristics, food characteristics and environment characteristics. Figure 1 provides some insights regarding each category.

The literature overview of this study is mainly based on the model of Randall and Sanjur (1981) with little changes considered being pertinent in the case of fish consumption. Thus, individual determinants were divided in further subcategories: gender, age, education, income, household size and structure, region of residence and health and environmental beliefs and perception of risk message about fish consumption. The last subcategory includes the main interest of this paper. Food characteristics, were divided in two grand subcategories: intrinsic and extrinsic cues (Szbillo and Jacoby, 1974). Taste, appearance, smell, texture and fish bones were included in intrinsic cues, while extrinsic cues were defined by price, country of origin, production method, perceiving method and eco-labelling. There is a lack of research on the subject of environmental characteristics, but based on current literature, this paper provides some insights about influence of consideration set (Rortveit and Olsen, 2009). Also, a brief comparison of preferences between fish and meat depending on time and location of the meal is provided.

It is important to stress that household size and structure was included in the category of individual determinants similar to the studies of Myrland et al. (2000), Trondsen et al. (2003) or Verbeke and Vackier (2005), which is different from the concept of Randall and Sanjur (1981) who included it in the category of environmental characteristics.

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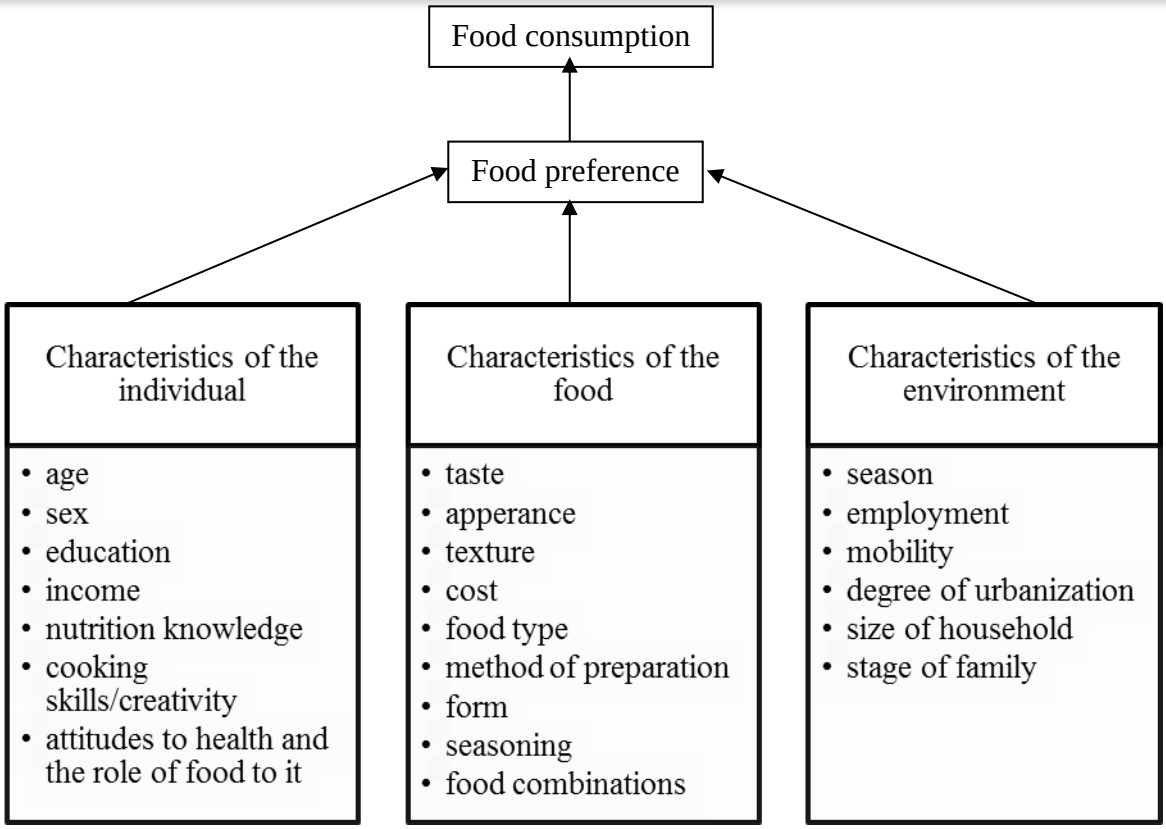

Figure 1. Factors influencing food preferences (from Randall and Sanjur, 1981)

2.1. Individual characteristics

"Relevant personal characteristics include socio-demographic characteristics, involvement in food as a product category and awareness of the relation between food and health" (Verbeke and Vackier, 2005, p.70)

The paper will continue by analysing each of the most pertinent socio-demographic factors and will put accent on consumer's health beliefs and perception of risks message associated with fish consumption.

2.1.1. Gender

Based on Fagerli and Wandel (1999) research, women are more conscious of their health than men, which can be an explanation for a higher intention in eating fish and stronger fish consumption behaviour (Verbeke and Vackier, 2005). Moreover, the percentage of women that eat fish at least once a week is higher than that of men. Those results are contrary with the findings of Myrland *et al*. (2000) which don't highlight differences in fish consumption between men and women.

Cardoso *et al*. (2013) analysed gender influence on the fish consumption preferences. His analysis shows that women are more predisposed to frozen fish consumption compared to men. Women consume more frequently species of white fish (hake, pink cusk-eel, and redfish), while men eat more cephalopods and sardines.

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The evaluation of the attitude towards eating fish shows that women are more sensitive to health claims ("eating fish is healthy") and they are more satisfied when fish is on the menu ("I am very satisfied when fish is on the menu") (Verbeke and Vackier, 2005).

2.1.2. Age

Age represents another important factor in determining fish consumption habits. Even if the study of Myrland *et al.* (2000) is based on an age-restricted sample of women (30-44 years), it managed to find that the marginal probability of eating fish at least once a week is more important for women between 40-42 years than women between 30-32 years old (14.8% for lean fish and 6.8% for fat fish). This can be explained by the decreasing importance of the experience variable "difficult to prepare", with increasing age women being more confident in their ability to prepare fish at home. The belief "without access to prepared dishes", which declines with age, has a negative impact on the consumption of processed fish.

The same findings are specific for the study of Trondsen *et al*. (2003), whose respondents were women between 45 and 69 years of age. Their responses regarding fish consumption revealed a positive correlation between age and the satisfaction with the quantity of eaten fish.

The study of Verbeke and Vackier (2005) is based on a sample of 429 respondents, men and women, within a large interval of ages (≤ 25, 26-35, 36-45, 46-55, >55). It shows that the respondents under 25 years eat fish less frequently and their intention to eat fish is lower compared to people in other age categories.

2.1.3. Education

Education level has a direct effect on the fish consumption frequency; people with a university degree consume fish more often than those with 10 and 12 years of education (Myrland *et al*., 2000). An explanation can be that individuals with a university degree have a higher consideration for the nutritionists' advices. Those people prefer to consume more fish, rice and porridge and less meat.

Trondsen *et al*. (2003) found a negative correlation between education level and some of the factors which impede fish consumption. The number of respondents which perceived fish taste as a barrier is 60% less among people with a university degree compared to people with less than 10 years of education. They are also 50% less influenced by the price and 40% less influenced by the variation of qualities.

Contrarily, Verbeke and Vackier (2005), found no signs of higher fish consumption frequency for the group with a higher education level, but they did find a significantly higher intention of these individuals to eat fish.

2.1.4. Income

The level of income has also been proved to have an influence on each individual's diet. The higher the income the greater is the probability of meat consumption and vice versa for the consumption of porridge (Myrland *et al*., 2000). This determinant is positively related to the belief that there is a shortage of access to prepared dishes. Income level is negatively correlated with the belief that

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seafood is expensive, but this is not an approval of more frequent fish consumption for people with higher revenues. The explanation is: a higher income brings a lower influence of the increasing price on the consumer. The persons with the higher income perceive price as a barrier 90% less than those with the lower income (Trondsen *et al.*, 2003).

Verbeke and Vackier (2005) insist that the frequency of eating fish is only marginally lower through the group with a lower income, but they have less intention to eat fish.

2.1.5. Household size and structure

According to Myrland *et al.* (2000), the household size has a direct impact on fish consumption, especially on the consumption of lean fish. The marginal probability of being a part of a group which eats fish at least once a week is 15% lower for the households composed of 1 person. This study has also found a relation between the presence of kids in a household and the preferred type of fish. Families with children under 12 years consume more processed fish (which is not perceived like seafood) than families with older children or no children. The other seafood categories are less consumed in the households with children older than 8 years.

The same result was found by Trondsen *et al.* (2003). In both studies the family norm: "the family does not like to eat seafood" increases with the increase of the household size. The same increase is observed if teenagers are present in the households.

Verbeke and Vackier (2005) found a non-significant impact of household size on the fish consumption frequency. The same fact is true for the intention to eat fish. Yet their study reveals an important impact of household structure. The presence of children under 18 years old is negatively correlated with the fish consumption frequency and the social norm. It means that families with children under 18 will more probably consider children's preferences to nutritionists' and doctors' advices.

2.1.6. Region of residence

Myrland *et al*. (2000) found that the central regions of Norway consume more fat fish compared to regions North of Norway where the lean and processed fish is preferred.

Trondsen *et al*. (2003) also found an influence of the location determinant. The persons living in North or West Mid of Norway will more probably respond positively at the question: "Do you eat enough fish?" In the inland region of Norway lack of fresh fish and small products choice are more probably to be a barrier for fish consumption comparing to southern, western and northern regions.

The study of Verbeke and Vackier (2005) confirms that people living in the coastal region have a higher fish consumption habit.

2.1.7. Health and environmental beliefs and perception of risk message about fish consumption

Generally, people associate fish consumption with beneficial health effects due to the presence of proteins, unsaturated essential fatty acids, minerals and vitamins (Verbeke *et al.*, 2008; Burger and Gochfeld, 2009). Fish consumption can reduce the probability of the development certain heart

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diseases by reducing the cholesterol level and improving the development of brain and visual system in infants.

According to the study realized in the New York Bight (Burger and Gochfeld, 2009), 94% of interviewed fishers and other recreationists responded "yes" at the question: "do you think there are benefits to eating fish". Half of those knew about the presence of omega-3 oils in fish and only 5% justified the benefits of fish consumption by the propriety of reducing the cholesterol level. The same findings were highlighted in the study of Herdt-Losavio *et al*. (2014): 91% knew that fish consumption has benefits on health, 60% of which were familiar with the positive effects on heart and brain. In a similar Australian study, 91% agreed that fish will help ''overall health'' and over 80% agreed that fish will ''lower cholesterol and other blood lipids'' or will ''improve heart health'' (Grieger *et al.*, 2012).

The percentage of people knowing about the benefits of fish consumption is very high because of advertising promoted by the government, health authorities, fish industries etc. (Olsen, 2003; Pieniak *et al.*, 2007). Pieniak *et al*. (2007) pointed out that the most trusted information sources regarding fish consumption are family and friends, doctors, fish mongers and public health recommendations.

Verbeke *et al.* (2008) found that fish consumption has a very strong positive image which can't be improved by information stressing fish consumption benefits (can't be any higher). Even persons with very low fish consumption evaluate fish as a healthy meal (Olsen, 2003). That's why the frequency of fish consumption is more influenced by healthy eating habits in general than by the belief of fish being healthy. Interest in healthy eating is positively correlated with the fish consumption frequency (Pieniak *et al*, 2010b). Altintzoglou *et al*. (2011) pointed out that total fish consumption is positively associated with a high health involvement. Older people are more health involved (health involvement depends on consumer's age) and this is positively associated to fish consumption (Altintzoglou *et al.*, 2011; Olsen, 2003).

Pieniak *et al.* (2010b) found a very weak correlation between health involvement and fish consumption frequency. Among Norwegian older women (45 to 69 years old) a correlation was found between the statement "food is important for health" and choices of lean or fat fish. Furthermore, the moral responsibility for family's healthiness is also positively associated with fish consumption frequency (Myrland *et al*., 2000; Verbeke and Vackier, 2005).

Some consumers have knowledge of warnings about fish consumption as well. 70% of New York Bight fishers knew that eating fish involves health risks (Burger and Gochfeld, 2009). The study of Herdt-Losavio *et al*. (2014) highlighted several findings: 60% of adults and only 44% of children respondents knew about the fish consumption risks. The high amount of mercury in fish is the main mentioned risk (Burger and Gochfeld, 2009; Herdt-Losavio *et al.,* 2014). Furthermore, the study of Burger and Gochfeld (2009) revealed that people are not interested in additional information regarding health risks, only 10% ask which fish is safe to eat. The general conviction is that fish is safe, and it has more positive than negative effects convinces even people which know about the mercury in fish to consume fish moderately high in mercury (Herdt-Losavio *et al.*, 2014). It means that health risks are not perceived as a barrier to fish consumption (Birch and Lawley, 2012; Verbeke *et al.* 2007b). Furthermore, a study regarding perceptions of risks and benefits associated with fish consumption revealed an unrealistic optimism of Russian consumers (van Dijk *et al.*, 2011). It means that perception of personal risk is lower than for the average person of the same gender and age.

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The environmental concerns related to fish consumption have been very little explored. However, many reforms have been undertaken to encourage sustainable seafood production, which means an ecologically responsible fishing process that minimizes bycatch of non-target species and provides acceptable levels of impacts on the ecosystem (Jacquet *et al*., 2009). Aquaculture solves some of these problems, but it also raises important environmental concerns (Polymeros *et al.*, 2014). For example, Delgado et al. (2003) raised concerns about the environmental impacts of aquaculture expansion, including massive changes in land use, pollution of surrounding waters by effluents, and spread of disease in fish farms.

From the point of view of consumers, fish farming is associated with a stressful environment, which is not good for animal welfare (Verbeke *et al*., 2007a). According to Arvanitoyannis *et al*. (2004), 60.7% of Greek fish-consumers admit being totally unaware of the requirements regarding aquaculture fish welfare.

Verbeke *et al.* (2008) analysed the impact of communicating benefits and risks from fish consumption on consumer's perception and intention to eat fish. The data were collected using a classical attitude-behaviour questionnaire with an experimental message design. The 4 message contents (benefit only, risk only, benefit-risk and risk-benefit) were multiplied by 3 information sources (Fish and Food Industry, Government and Consumer Organization), in order to obtain 12 different message concepts. The use of 3 information sources was needed because the respondent could react differently depending on who provides information (Pieniak *et al.*, 2007). The results of this study were contradictory with the previous findings of Verbeke *et al*. (2001) which revealed that negative information has a stronger impact on consumer's perception of different foods than positive information has. The benefit-only message increases the intention of eating fish with 21% (per month) while the negative-only message decreases it with only 8% (per month), the balanced messages (benefit-risk and risk-benefit) not having an important effect on behavioural intentions. No significant impact was found between the 4 message contents when regarding the information sources.

Unfortunately, the study of Verbeke et al. (2008) registers a lot of limitations. First of all, the conclusions are based on very small samples (about 30 persons) represented only by women of childbearing age. Therefore, the results cannot be generalized to a wide population, but only applied to this specific group. The second issue is that the results could be influenced by the optimistic bias due to the absence of concrete examples of fish species and the concrete types of contaminations. This means that the perception of different fish species may be different even if they are representing the same food category. The principle of "specificity" is also evocated by De Pelsmacker and Janssens (2007). According to them, measures of motivations, attitude, intentions, and behaviours should be specifically related to the context of a study to provide a correct interpretation of the motivational process. A final amelioration of the Verbeke *et al.* (2008) study would be the comparative analysis of the effect due to negative information once related to the impact on health and secondly related to the impact on environment (e.g. overfishing, bycatch).

Thus, the purpose of this study is to investigate if negative information regarding fish consumption can affect consumer's perception and intention to eat fish. Furthermore, it will examine if there is different impact according to the content of communicated message (impact on health vs impact on environment) and the source of information (official = government and unofficial = blog). And finally,

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in order to follow the principle of "specificity" the negative information will be related to one focus fish species: salmon.

In order to realize the evocated purpose, the model proposed by Muller and Gaus (2015) will be applied using some modifications/adaptations specific to our objective. In their study, they have analysed how the consumer behaviour is impacted by negative media information about certified organic products. The model that they have utilised is mainly based on Fishbein and Ajzen's (2011) reasoned action model and Thøgersen's (2000) model for predicting the purchase of labelled products. According to these models, the exposure to information increases the knowledge which determines attitudes. Thøgersen (2000) argue that the knowledge about the eco-labels (in this case) also impacts the trust in eco-labels. Assuming the fact that negative media information influences behavioural intentions and actual purchasing behaviour not only indirectly, that is, mediated by attitudes or trust, but also directly, Muller and Gaus (2015) propose the further model:

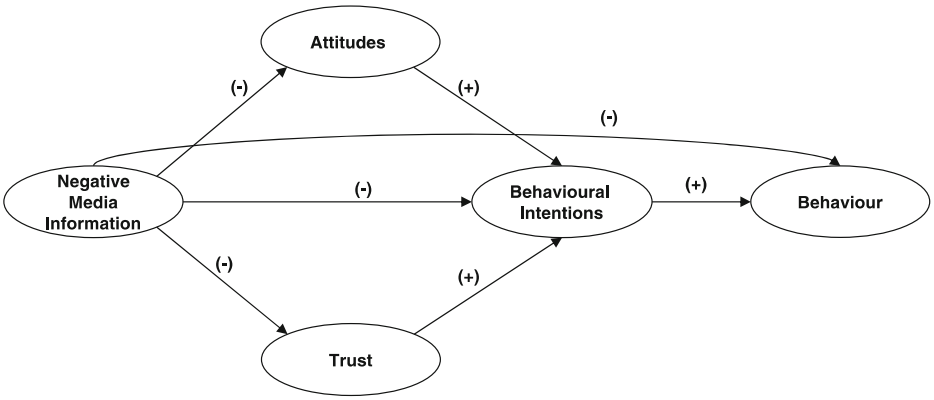

Figure 2. Theoretical model from Muller and Gaus (2015).

In this study, the model will be replicated partially, the main variable of interest being the behavioural intentions and not the self-reported behaviour. The motive to drop the variable "self-reported behaviour" is that it can't suffer any changes in the case where the participants will be asked to provide information regarding the outcome variables of interest immediately after the manipulation. Even in the study of Muller and Gaus (2015) where the follow-up survey was sent to the participants 2 weeks after the manipulation, significant effects on the self-reported behaviour wasn't observed. Another variable that it's not applicable to this study is "trust" in eco-labels (in this case). This variable will be replaced by the "credibility of information".

In order to estimate the impact of the negative media information on attitudes, they will be estimated before and after the manipulation, the variable of interest being called "change in attitudes". Integrating the involvement and health/environmental concern permits the development of the following model:

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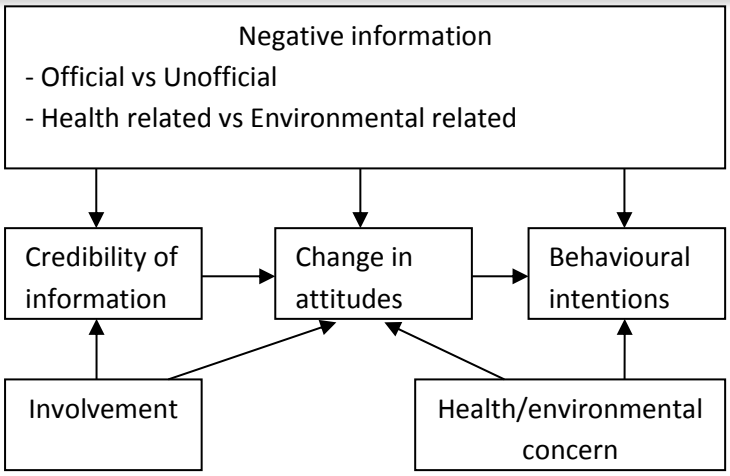

Figure 3. Theoretical model.

According to their level of involvement, consumers may be more or less active in their reaction to information. With regard to health and environmental concern – these measures are also able to explain consumers' decision process.

2.2. Consumer's evaluation of fish attributes

According to Lancaster (1966) the consumer's choice doesn't depend on the goods themselves, but on the characteristics of those goods. The consumers are predisposed to choose the goods, which intrinsic and extrinsic characteristics (and their combination) can best satisfy their necessity and maximize the utility. For each individual the utility level of the same product is absolutely different because it is influenced by socio-demographic, psychological, moral and cultural characteristics of the person. That's why, to better understand the consumer evaluation of fish quality attributes it's required to analyse not only the fish characteristics but the impact of individual factors on those characteristics as well. An investigation of the direct impact of the fish attributes and endogenous influence of individual characteristics follows.

2.2.1. Intrinsic cues

Intrinsic cues represent the physical properties of food products, such as appearance, taste, texture, odour and colour (Veale and Quester, 2009). They are the most important factors which influence consumers' choice because they "can be objectively evaluated before and after consumption" (Lawley *et al*., 2012, p. 260).

The taste is the main driver of fish consumption, while the smell (especially smell during preparation) is perceived as a barrier (Brunsø *et al.*, 2009; Lawley *et al.*, 2012; Verbeke and Vackier, 2005). According to Lawley *et al*. (2012, p. 265) fish flavour "must be free of "off notes", metallic flavours, bitterness or acidity". However, taste can be perceived as a barrier as well (Trondsen *et al*., 2003), particularly among teenagers (Birch and Lawley, 2012). Taste is a crucial determinant of fish consumption because, generally, people don't "eat things they don't like the taste of" despite the associated health benefits (Brunsø *et al.*, 2009, p. 699).

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Verbeke and Vackier (2005) found that smell has a significant lower score than other items of positive attitude, it means that smell is more perceived as a barrier in a sample which consists only of fish consumers. Having young children in the household decreases the probability of associating fish with bad smell (Myrland *et al.*, 2000) the opposite being valid for the presence of teenagers in the household. People that had migraines are more sensible to fish's smell (Trondesn *et al*., 2003).

Many studies (Birch and Lawley, 2012; Grieger *et al*., 2012; Myrland *et al.*, 2000; Trondsen *et al.*, 2003) pointed out the displeasure associated with smell during fish preparation. Belgian consumers associate bad smell during preparation with the lack of freshness (Brunsø et al., 2009). Processed fish is not perceived as "fish", that's why consumption of processed fish is negatively correlated with the smell (Trondsen *et al*., 2003). However, the attitude regarding the smell can change during a person's life (Myrland *et al.*, 2000). Income is negatively correlated with the belief that fish smells during preparation as well.

Through quantitative and qualitative studies, Lawley *et al*. (2012) found that the texture is also an important factor, consumers mostly look for firm and moist fish. Australians consumers would like to have the possibility to determine the fish freshness by touching it (firm and not sticky texture being associated with freshness). However, they confirmed to be disgusted if other consumers touched it. According to Birch and Lawley (2012), only 27% of the respondents don't like the felling of touching the fish (more women than men).

Consumers prefer fish with a uniform colour, bright eyes and non-damaged skin (Lawley *et al*., 2012) when judging by the appearance.

Consumers find fish bones unpleasant (Birch and Lawley, 2012), however this factor doesn't change their fish consumption frequency (Verbeke and Vackier, 2005). According to the study of Grieger *et al.* (2012) only 5% of respondents claimed to be upset by the bones of fresh finfish, the percentage being lower for the canned finfish (2%).

All those intrinsic cues are perceived differently by each consumer and depend on each type of fish product or the way it is prepared. Some consumers may not like the taste of fresh fish but having the positive attitude about smoked fish (intrinsic cues crossed with extrinsic cues). Generally, people prefer fresh fish for its healthiness, while frozen or canned fish is preferred for attributes like texture and "less odour" (Brunsø *et al*., 2009; Vanhonacker *et al*., 2011).

2.2.2. Extrinsic cues

Extrinsic cues are considered to be less important than the intrinsic cues (Veale and Quester, 2009), but sometimes they can play a crucial role on the consumers' perception of product quality.

Consumers' choice of fish is mainly based on following external cues: price, production method (wild/farmed), country of origin (domestic/imported) and method of preservation (fresh/frozen/smoked/ salted/canned).

Generally, fish is perceived to be a quite expensive meal (Birch and Lawley, 2012; Brunsø *et al*., 2009; Myrland *et al*., 2000; Trondsen *et al*., 2003; Verbeke and Vackier, 2005). Thus, Verbeke and Vackier

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(2005) call price a "negative attitude factor" and Birch and Lawley (2012, p. 14) classed it as "financial risk associated with seafood consumption".

However, unsurprisingly, households with higher incomes are less susceptible to perceive price as a barrier (Myrland *et al.*, 2000; Trondsen *et al.*, 2003). Grieger *et al*. (2012) found several differences in price perception depending on preserving method of fish: 37% of respondents reporting fresh/frozen to be too expensive, while canned fish being perceived as expensive by only 15% of respondents. According to Trondsen *et al*. (2003) the statement "high price" is positively correlated with consumption of lean fish (which is cheaper) and negatively correlated with the consumption of fat fish (which is more expensive). However, the perception of price doesn't make a significant difference in consumption patterns of consumers which perceive fish as expensive meal and those who don't (Birch and Lawley, 2012; Myrland *et al*. 2000).

A qualitative focus group discussion reveals that Australians consumers found the country of origin as the most important extrinsic cue (Lawley *et al*., 2012). The origin of the fish is perceived as the main determinant of its quality, domestic products being considered superior because they don't require long transportations and elaborated preservation treatments (Birch *et al*., 2012; Lawley *et al.*, 2012). Another qualitative study showed that only heavy consumers are interested by the country of origin in order to "have an idea of the cleanliness of the water" (Brunsø *et al*, 2009, p. 708). Spanish consumers reported to be more confident in the quality of Norwegian fish than that imported from Morocco. Another reason to prefer domestic products is the "sense of patriotism": buying only domestic products in order to support local economy (Stefani *et al*., 2012).

It is important to stress that the country of origin and the fish price are two interdepending cues. Usually foreign fish products are cheaper than the domestic products; it means that imported fish is perceived as less qualitative (Lawley *et al.*, 2012). Stefani *et al*. (2012) identified consumers' willingness to pay for domestically produced sea bream equal to 18.1 euro/kg. Nguyen *et al*. (2015) insist that the high willingness to pay for the domestic fish might be a result of consumers' ethnocentrism (Verlegh and Steenkamp, 1999).

The survey of Pieniak *et al*. (2013) across eight countries reveals that only consumers from Germany, Italy and Greece were interested if the fish is wild or farmed. German consumers prefer farmed fish, while Italian and Greek consumers prefer wild caught fish. Several studies (Brunsø *et al*., 2009; Lawley *et al*., 2012; Verbeke *et al*., 2007b) pointed out that consumers perceive wild fish having better intrinsic qualities (taste, healthiness, nutritious value etc.). However, due to the difference in prices (farmed fish is less expensive) even the consumers which claim to prefer wild fish consume predominantly farmed fish (Vanhonacker *et al.*, 2011). Furthermore, according to Kole *et al*. (2009), consumers reported to prefer wild fish if being informed about the production method. In the case of a blind experiment, the attributes of wild fish are just slightly perceived to be better than the attributes of farmed fish. This means that consumers can be more influenced by stereotypes and lack of information about aquaculture than by the fish taste or appearance.

Regarding the preserving method, Portuguese consumers prefer fresh (chilled) fish (83.1%) to salted (16.6%), canned (11.5%), smoked (11.4%) or frozen (11.2%); on the other hand, the most disliked fish is smoked (19.3%) (Cardoso *et al.*, 2013). Fresh fish is appreciated for its naturalness, the other forms causing the change of taste, structure, colour, odour etc. According to Vanhonacker *et al.* (2011)

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consumers claim that fresh fish represents the healthiest fish product, followed by frozen fish, preserved fish and ready-meal fish products. Regarding other attributes like quality, price and the availability, frozen fish is more preferred (Birch *et al.*, 2012; Vanhonacker *et al.*, 2011).

During last years, eco-labelling became an important determinant of fish choice. "Fish eco-labelling may contribute to reach a more sustainable fish exploitation by encouraging producers to change their fishery management and consumers to turn towards more eco-friendly products" (Carlucci *et al.*, 2015 p. 225). In the context of increasing pollution, consumers are more motivated to prefer the products of fisheries which practice natural catching methods that have less negative repercussions on environment. Brécard *et al*., (2012) pointed out that 31% of respondents claimed to buy an eco-labelled fish product among other products if the price doesn't differ. USA and Norway consumers are even willing to pay more for an eco-labelled fish product. In the case when an eco-labelled product had a 1.5 times higher price, it would have been selected by 32% of Norwegians or 68% of Americans.

As previously presented, many consumers have doubts regarding the safety of farmed fish (Brunsø *et al*., 2009; Lawley *et al*., 2012; Verbeke *et al.*, 2007b). In order to assess the impact of organic label on farmed fish, Mauracher *et al*. (2013) and Stefani *et al*. (2012) studied the consumers' willingness to pay for organic sea bass and organic sea bream respectively. 55% of respondents were ready to pay additional 2.03 €/kg for organic sea bass (Mauracher *et al*., 2013). The study of Stefani *et al*. (2012) revealed an average premium price equal to 2.76 €/kg.

2.3. Situational and environmental factors

Situational determinants of fish consumption didn't receive enough attention from the researchers. They are perceived as being less important than individual characteristics or perception of product attributes, however a brief analysis will be provided here below.

First, it is important to mention that availability of fish assortment represents an important determinant of fish consumption frequency. Rortveit and Olsen (2009) explained fish consumption through the impact of consideration set (number of fish products alternatives). According to their findings, the larger the consideration set, the higher is the probability to buy a substitute for the non-available preferred fish. Thus, a limited availability of fish product alternatives can determine the consumer to prefer another protein to fish and reduce the fish consumption frequency. Those results are confirmed by the study of Mirland *et al*. (2000) which respondents claimed to not eat enough fish because the product choice is too limited. Furthermore, the persons who have more knowledge about eating fish can find more alternatives among available products (Birch *et al.*, 2012).

The research of Jaeger *et al.* (2011), describes a kaleidoscope-like structure, having as main elements: product, place and person, which helps in discovering some food choice decision patterns. According to its results the consumption of fish is less probable when the individual is alone, which means that fish dishes are associated with family meals. Furthermore, fish meals are positively correlated with "eating occasions that last more than 30 minutes", and with dinner in a restaurant as well. People prefer to consume fish "out of the house" to avoid the smell during preparation.

Another paper (Castro, 2011) analysed the relation between type, quantity and the day period of food consumption. The gathered data of 1009 individuals and their daily food intake for each period of the

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day (morning, afternoon, evening) reveals a strong dominance of meat products (beef, poultry, other meats) over fish, in all three periods. Overall, neither meat nor fish products are popular in the morning. The meat and fish intake grows for the other two periods of the day. Compared to afternoon intakes, poultry and fish consumption grows by ~10% in the evening.

3. Experiment: impact of negative media information on attitudes and intentions

It should be considered that the design of this study case is mostly based on the research method utilized by Verbeke *et al.* (2008) and implies several improvements of its limitations. Firstly, this paper doesn't have the purpose to analyse the impact of communicating benefits associated with fish consumption. Secondly, the risk message has four configurations due to the fluctuations in content or source of information. Finally, the results of the research are based on more than 800 responses for each message type, which is much more than in the study of Verbeke *et al.* (2008).

3.1. Materials and methods

Data for this study was collected by the means of a survey with an experimental message design. The survey consisted of 2 steps. The first step was a questionnaire of 7-8 minutes. The respondents had to answer multiple choice questions and rank several statements on a six-level Likert scale (the response "neither agree nor disagree" was eliminated). The second step was a questionnaire of 5-6 minutes containing an article presenting negative information about salmon consumption. After reading the article respondents had to give their opinion regarding its credibility and rank on six-level Likert scales statements regarding their attitudes and intentions. The next sections will provide additional information about the methodological details.

3.1.1. Experimental design

The purpose of this study is to investigate if negative information regarding fish consumption can affect consumer's attitudes and intention to eat fish. Furthermore, it's of interest to find out if there is different impact according to the content of communicated message and the source of information.

For realising this purpose, an experimental study was conducted in order to compare fish consumption attitudes following food risk information in two scenarios: (a) impact on health, and (b) impact on environment. Moreover, for each scenario a comparison between official and unofficial source of information was done. Thus, one of the four combinations of scenarios (Table 1) was presented to each respondent in a survey conducted in five European countries (France, Germany, Italy, Spain and United Kingdom).

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Table 1. Scenarios.

Source / Subject	Official	Unofficial
Health-related	Official & Health-related	Unofficial & Health-related
Environment-related	Official & Environment-related	Unofficial & Environment-related

The articles were presented as screenshots from actual existing websites. Thus, PrimeFish partners from each focus-country were asked to provide addresses of websites which correspond to the proposed objective. For example for France, the website of French Agency for Food, Environmental and Occupational Health and Safety (ANSES) was selected as official and health-related, for official and environment-related – the website of the Ministry of Ecological and Solidarity Transition, for unofficial and health-related – "Docteur Bonne Bouffe" which is a health, diet and nutrition blog, unofficial and environment-related – "Vedura" which is a portal specialized in sustainable development, the objective of which is to inform and educate all citizens and professionals on sustainable development issues. All the websites for the 5 analysed countries are presented in Table 2.

It's important to mention that in order to follow the principle of "specificity" the negative information was to be related to one focus fish species: salmon. Salmon was selected because it represents one of the most familiar fish species for consumers across five European countries, it's widely consumed and, however, the health benefits of salmon consumption are a subject of very contradictory opinions. According to results from deliverable 4.2 from the PrimeFish project ("Qualitative research report: analysis interviews aimed mainly at identifying the main positive and negative drivers of fish/seafood consumption"), negative information about fish is generally related to farmed salmon from Norway or Scotland. This is a typical verbatim from one of the interviews: *"The fact that I saw a report about the farmed salmon impacted my consumption; for a period, I have reduced my salmon consumption and I started to look carefully at their etiquettes".*

The existing hazards are mainly due to the methods of farming (nutritional qualities of farmed salmon being constantly questioned), but also to overfishing (reinforcing the idea of environmental impact of food issues). Yet, at the moment of the survey (August-September 2017), the salmon didn't receive a special attention from the media which means that our respondents were not sensitized about this subject.

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Table 2. Sources of information.

France	*Official*	*Unofficial*
Health-related	https://www.anses.fr/fr/content/consommation-de-poissons-et-exposition-au-m%C3%A9thylmercure	http://docteurbonnebouffe.com/poisson-pollution-eaux-sante/
Environment-related	http://www.developpement-durable.gouv.fr/lancement-du-label-peche-durable	http://www.vedura.fr/actualite/2446-reserves-mondiales-poisson-fortement-menacees
Germany	*Official*	*Unofficial*
Health-related	https://www.dge.de/presse/pm/regelmaessig-fisch-auf-den-tisch/	http://www.medizin-transparent.at/quecksilber-fisch
Environment-related	http://www.bfn.de/0314_fischerei.html	http://www.gesellschaft-fuer-oekologie.de/
Italy	*Official*	*Unofficial*
Health-related	http://www.salute.gov.it/portale/news/p3_2_1_1_1.jsp?lingua=italiano&menu=notizie&p=dalministero&id=1352	http://www.tantasalute.it/articolo/allarme-pesce-al-mercurio-come-riconoscerlo-ed-evitarlo/63567/
Environment-related	http://www.minambiente.it/notizie/tavolo-nazionale-erosione-costiera-rimini-la-presentazione-delle-linee-guida-la-difesa-delle	https://www.greenme.it/informarsi/natura-a-biodiversita/881-il-tonno-rosso-in-via-di-estinzione-la-ue-da-ragione-agli-ambientalisti
Spain	*Official*	*Unofficial*
Health-related	http://www.estilosdevidasaludable.msssi.gob.es/alimentacionSaludable/queSabemos/comoDistribuir/home.htm	http://juanrevenga.com/2015/06/come-rico-come-sano-come-pescado/
Environment-related	http://fundacion-biodiversidad.es/es/biodiversidad-marina-y-litoral/proyectos-propios/sumergete-en-las-profundidades-del-mar	https://www.xataka.com/ecologia-y-naturaleza/el-pescado-sostenible-es-malo-para-el-medio-ambiente
United Kingdom	*Official*	*Unofficial*
Health-related	http://www.nhs.uk/Livewell/Goodfood/Pages/fish-shellfish.aspx	http://www.behealthynow.co.uk/healthy-living/the-hidden-truth-of-meat-diary-and-egg-industry-in-the-uk/
Environment-related	https://www.gov.uk/government/news/fish-stocks-boost-for-darlington-waters	https://howtoconserve.org/2016/04/08/how-to-stop-overfishing/

Based on existing articles published in newspapers, on viral information on the internet, as well as on close collaboration with researches in fishery and aquaculture sciences, two target messages were developed: one presenting the impact of salmon consumption on health and the second one presenting the impact on environment. Even if the messages were somewhat too "dramatic" and didn't totally correspond to reality, an average consumer couldn't discredit them. Only consumers having enough knowledge would find the information not credible. Both messages contained

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information about farmed and wild salmon simultaneously because presenting information only about farmed salmon would not impact the attitudes and intentions of respondents consuming only wild salmon and vice versa. A series of pre-tests were conducted in order to check the trust in the messages and to define their final forms. The retained messages were:

For impact on health:

Salmon consumption: exposure to mercury and antibiotics

Using numerous samples of wild fish from different sources, University researchers discovered that salmon contains significant quantities of mercury. At high doses, mercury is toxic to the human central nervous system, particularly during prenatal development and early childhood. Wild fish consumption is the main source of exposure to mercury for humans.

Unfortunately, farmed salmon cannot be considered safer than wild salmon because of the use of antibiotics during the farming process. Farmed salmon frequently suffers from bacterial diseases causing lesions and possibly death. Unable to develop effective vaccines, farmers fight these infectious bacterial diseases by consistently increasing the use of antibiotics. These methods of treatment have a negative impact on consumer health as well.

Figure 4. Negative message about salmon consumption's impact on health.

For impact on environment:

Salmon consumption: between overfishing and dangerous farming

Wild salmon populations are under threat from a variety of human activities. Decades of freshwater pollution, habitat destruction, rampant over-fishing and unsustainable marine salmon farming have taken their toll. According to recent scientific studies, salmon populations could face localized extinction in less than 5 years.

While the population of wild salmon is steadily decreasing, there is a huge increase in the production of farmed salmon. Unfortunately, while satisfying the high market demand for this species, fish farming also has negative impact on the environment. The heavy use of antibiotics on salmon farms negatively affects the wildlife in the vicinity of the farm. There were also numerous cases of farmed salmon escaping their cages and entering the wild environment where they cause ecosystem degradation.

Figure 5. Negative message about salmon consumption's impact on environment.

The messages were composed in English and after that translated in four other languages (French, German, Italian and Spanish) by the PrimeFish partners.

It's important to mention that there is no difference between the formulation of message for official and unofficial source of information, the objective being to compare the impact of the framework when the content of messages is exactly the same. Secondly, to avoid other bias, the length of both messages (health and environment related) is approximately the same. For example, in English language the health-related message has 121 words, while the environment-related – 130 words.

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Depending on language, the messages are more or less long, the longest one being in Spanish (157 words for health-related message and 162 words for environment-related).

In order to amplify the impact of the messages they were accompanied by representative photos: a bunch of fish pulling out their heads from the water for the health-related message and a big net full of fish for environment-related message.

Thus, a Photoshop work done on these 3 components (source of information, negative message and photo) permitted to obtain screenshots that look exactly like real websites (Appendix 1). It's important to note that all the messages were dated July 12, which means that the information was perceived as quite fresh as the survey was launched in the end of August.

In order to estimate the impact of the negative media information on attitudes, they were asked before and after the manipulation. Therefore, the same respondents were submitted to two online questionnaires within a 17 days interval. The first questionnaire mainly included socio-demographics, health and environmental sensitiveness and a first measurement of their attitudes towards salmon consumption. In the second questionnaire, respondents were submitted to one of the four articles dealing with the negative impacts of salmon consumption. Respondents were randomly assigned to one of the four articles. After reading the article, consumers had to answer questions about information credibility. They were submitted a second measurement of their attitudes towards salmon consumption and were asked about their behavioural intentions.

3.1.2. Questionnaire

As it was previously mentioned, the survey was composed of two online questionnaires that were sent to respondents within an interval of approximately 17 days. Both questionnaires started with short introductions that mentioned the context of the survey, namely the fact that it is done within the framework of PrimeFish project. The introduction of the first questionnaire also informed the respondents that they will have to respond to another questionnaire which is a part of the same survey. Moreover, in order to put a major accent on the absolute necessity to respond to both questionnaires, they were aware that they will not receive any incentive if they respond to only one of the questionnaires. Some words were written in uppercases for giving more content visibility. A detailed presentation of each questionnaire follows.

The first questionnaire was composed of seven parts. It started with few questions about fish and salmon consumption frequency. The objective of these questions was to distinguish salmon consumers from non-consumers, the respondents which don't eat salmon being immediately eliminated from the questionnaire. The frequency of fish/salmon consumption was determined using a self-administrated food frequency scale. The consumers had to choose one of the following answers regarding the quantity of intake fish: few times per year, once a month, 2-3 times a month, 1-2 times a week, 3-4 times a week and almost every day.

Once the non-consumers of salmon got eliminated, the respondents faced twelve socio-demographic questions. Firstly, they had three quota questions about gender, age and region, the aim being to obtain representative samples in terms of these three variables. Other socio-demographic questions were about education level, employment situation, household composition etc. The responses to these questions were used to verify if the messages had different impact on different consumer

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categories. For some questions the responses were adapted according to national specificities. For example, for the question regarding the income, in United Kingdom the first category is "less than 1000£", while for Spain it corresponds to "less than 699 €".

The third part of the questionnaire was dedicated to the assessment of the attitudes towards salmon consumption. As it was previously mentioned, attitudes towards salmon were measured twice: before and after the negative press stimulus. Both times, the attitudes were measured in the exactly same way: through eight Likert scales. The items were generated from literature review but also following the result of the qualitative study mentioned previously: healthy, safe, nutritious, cheap, tasty, good for environment, ethical, sustainable. In fact, the eight items could be separated in 3 categories: health-related characteristics (healthy, safe, and nutritious), environment-related characteristics (good for environment, ethical, sustainable) and neutral characteristics (cheap, tasty). This part had already to stress knowledge about the negative effects involved in fish consumption.

The fourth part was represented by five statements adapted from Laurent and Kapferer (1985) for measuring the involvement: "I'm interested in salmon (as food)", "I enjoy eating salmon", "The (type of) salmon I buy reflects the sort of person I am", "If I make a mistake when purchasing salmon, the consequences are important to me", "Choosing a salmon is difficult".

In the fifth part consumers were asked if they had already changed (increased or decreased) the amount of intake salmon during the last three years. In the case when the consumption changed, they were asked to give the three main reasons from the following ones: income, available time for cooking, fish prices, better health awareness, availability of fish, variety of fish choices, improved knowledge in selecting, improved knowledge in cooking fish, a raising trend of eating fish, changes in the household composition or other.

In the last two parts the health sensitiveness was evaluated via a set of five items adapted from Honkanen and Olsen (2009) and the environmental sensitiveness was measured through a set of three Likert scales adapted from Jayampathi (2010)

The second questionnaire was composed of eight parts. Like in the previous questionnaire, the first part was dedicated to socio-demographics, this time only the questions about gender, age and region in order to check for a representative sample in terms of these three variables. After that, respondents faced one on the four articles. Details regarding the formulation and the presentation of the message were presented previously.

The third part included six statements for assessing consumers' perception regarding the article related to both information relevance (useful, important and worrisome) and source credibility (serious, reliable and trustworthy).

The fourth part is exactly the same as the third part of the previous questionnaire. Namely it was the assessment of the attitudes after reading the article, the expectation being that the responses will change in the negative way.

While the attitude scale questions refer to more explicit responses, in part number five respondents faced a wall of image which is in fact an implicit measure of attitudes. In fact, consumers were asked to select from 20 images, 3 that they more associate with salmon consumption and explain why. This measure permits to provide an estimation of the attitudes stored in memory. The selection of images

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was made by several researches and was the subject of several pre-tests. The images and their potential associations across the items measuring the attitudes are presented in Table 3.

In the sixth part behavioural intentions were measured through a group of nine items covering both informational and diet-changes behaviours. This measure is crucial to determine the impact of the message in terms of behavioural intention.

In the last part of the questionnaire, respondents were asked to rank in order of preference four salmon products which differ only on one characteristic: the label. Thus, the proposed labels were: bio label, MSC label, ASC label or without label. After making the ranking, the respondents had to explain the choice they made in the first position. The interest is to cross this response with the article that they had and thus to obtain insights on how environmental or health information impacts the choice of label.

In order to be sure that respondents understand exactly the significance of each label, the following short explanations were presented before the task:

> EU certified organic food label indicates that the products come from organic farming. In organic agriculture, artificial fertilizers and chemical pesticides are not used.
>
> MSC label is an international label for sustainable wild fish. It states that the fish has been caught in a manner that respects the environment and fish populations.
>
> ASC label is an international label for sustainable fish from aquaculture. It states that the fish is produced in an environmentally friendly manner and in good working conditions.

Figure 6. Descriptions of labels.

In order to make the task more visual (like in real purchasing situation), images of labelled salmon were used (Figure 7).

Figure 7. Presentation of products for ranking task.

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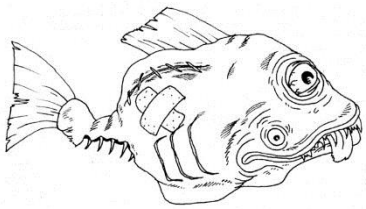
Due to ethical issues, at the end of the questionnaires respondents had to be aware that they need to take a step back regarding the presented information. Thus, in order not to mislead the respondents, on the last page of the questionnaire they were informed that the message they had read doesn't totally correspond to reality and was formulated for the purposes of this research. Moreover, they were provided with links from official structures in order to get trustworthy information either about health or environmental issues related to fish consumption (for health matters: http://www.efsa.europa.eu/ ; for environmental matters: https://www.eea.europa.eu/). For getting the maximum of attention on this crucial indication bolded text was used.

It's important to mention that some questions were formulated in exactly the same way for two other tasks of PrimeFish project (task 4.4 and task 5.4) in order to cross check the results.

The English version of two questionnaires, as used in the survey, is included in the Appendix 2 and Appendix 3.

Table 3. Wall of pictures.

Unhealthy/ Healthy		
Unsafe/ Safe		
Not nutritious/ Nutritious		
Expensive/ Cheap		

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Not tasty/ Tasty		
Bad for environment/ Good for environment		
Unethical/ Ethical		
An unsustainable consumption behaviour/ A sustainable consumption behaviour		
Others	    	

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3.1.3. Data collection and samples

Survey data were collected during a total period of 32 days (25.08.2017-25.09.2017). In fact, as it was mentioned previously, the survey consisted of two questionnaires that were completed by the same respondents within an interval of approximately 15 days. The first questionnaire was launched on the 25.08.2017 and closed on the 06.09.2017. The second questionnaire was launched on 12.09.2017. That day the link was sent only to the respondents which respondent in the first day of data collection for the previous questionnaire. Consistently, the respondents completed the first questionnaire on the 26.08.2017 received the link to the second questionnaire on the 13.09.2017 and so on. In this way, the interval between the responses to the first questionnaire and second questionnaire is approximately the same for all the respondents. The same procedure was applied in each of the five countries.

The collection of data was done using an on-line questionnaire through SphinxOnline. With regard to the national samples, they were provided by a professional access panel, the provider being Bilendi. It's important to mention that all the programming of the questionnaire was done by a team from Le Sphinx. Therefore, the collection of the data represented a process of close collaboration between Université Savoie Mont Blanc, Bilendi and Le Sphinx.

As the survey had a particularity of being composed of two parts, Bilendi partners proposed in the first step to go for a sample which is 33% bigger than our final necessity, as the risk of losing respondents between the 2 questionnaires was very important. Therefore, for the first-step questionnaire 1066 representative responses per country were needed in order to be sure of having 800 representative responses per country by the end. The quotas for representative populations were provided by the PrimeFish team from University of Pavia. The quotas were based on Eurostat 2016 data.

The first questionnaire was completed by 5330 respondents, thus 1066 representative responses per focus-country. However, for some countries (Spain and United Kingdom) it was difficult to gather the total sample, the younger respondents being very inactive. The integration of a speed check in the questionnaires could be a reason of losing responses: the respondents that completed the second questionnaire in less than 150 seconds were eliminated from the final sample. Another reason may be the eliminatory questions regarding the consumption of salmon. Among the 1066 representative responses per country in the first step, it was needed to obtain 800 representative responses per country in the second step. Unfortunately, even if the period of data collection was extended several times, for all the five countries the objective wasn't reached. Moreover, it was needed to ignore some quotas in order to get more responses. Therefore, the final sample for five countries is composed of 3766 responses (234 less than the initial objective).

The following tables permit to compare the compositions of obtained samples per country with the initial intended compositions. Namely, the column *Eurostat %,* represent the percentages of categories inside the three variables: gender, age and region. In the column *Eurostat N* is the number of respondents (out of 800) that should correspond to the category in order to have a representative sample per country. And in the column *Responses N* is the number of real obtained responses. In a perfect situation, the number from the column *Responses N* should be exactly the same as in the column *Eurostat N*, but due to data collection issues it's not always the case. The biggest gaps (>20%) are highlighted in yellow.

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The sample for Germany (Table 4) is composed of 787 responses. The gaps between the excepted number of responses and the obtained ones are not very important, therefore, the responses almost correspond to representative quotas in terms of all the three variables.
758 responses were gathered for France (Table 5). In fact, for this country the female category is under-represented. There is also a deficit of younger respondents.
For Italy (Table 6), 774 responses were obtained. As for France, an important number of younger respondents is missing. With regard to other age categories, they almost correspond to the objective.
The objective of 800 responses also wasn't reached in Spain (Table 7). There are only 723 responses, with a deficit of 43 responses for the younger category.
724 responses were registered for United Kingdom (Table 8). Again, the younger respondents are missing: only 39 responses instead of 101 needed.

It's important to mention, that for all the countries, the objective regarding the older age category is almost reached.

Table 4. Sample for Germany.

	Eurostat %	*Eurostat N*	*Responses N*
Gender			
Female	49,80%	398	395
Male	50,20%	402	392
Total	100%	800	787
Age			
18-24	10,60%	85	73
25-34	17,60%	141	140
35-44	16,60%	133	133
45-54	22,50%	180	180
55-74	32,70%	261	261
Total	100%	800	787
Geographical area			
Baden-Württemberg	13,20%	106	97
Bayern	15,70%	126	132
Berlin	4,40%	35	37
Brandenburg	3,00%	24	25
Bremen	0,80%	6	7
Hamburg	2,20%	18	17
Hessen	7,50%	60	58
Mecklenburg-Vorpommern	2,00%	16	15
Niedersachsen	9,60%	77	74
Nordrhein-Westfalen	21,70%	174	167
Rheinland-Pfalz	4,90%	39	39
Saarland	1,20%	10	8
Sachsen	4,90%	39	36
Sachsen-Anhalt	2,70%	22	22
Schleswig-Holstein	3,50%	28	30
Thüringen	2,60%	21	23
Total	100%	800	787

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Table 5. Sample for France.

	Eurostat %	*Eurostat N*	*Responses N*
Gender			
Female	51%	408	367
Male	49%	392	391
Total	100%	800	758
Age			
18-24	12%	94	71
25-34	18%	141	140
35-44	19%	149	136
45-54	20%	158	154
55-74	32%	258	257
Total	100%	800	758
Geographical area			
Auvergne-Rhône-Alpes	12,25%	98	92
Bourgogne-Franche-Comté	4,38%	35	28
Bretagne	5,13%	41	37
Centre-Val de Loire	4,00%	32	31
Corse	0,50%	4	5
Grand Est	8,75%	70	69
Hauts-de-France	9,13%	73	71
Île-de-France	18,88%	151	148
Normandie	5,13%	41	40
Nouvelle Aquitaine	9,25%	74	73
Occitanie	9,13%	73	68
Pays de la Loire	5,63%	45	44
Provence-Alpes-Côte d'Azur	7,88%	63	52
DOM	0,00%	0	0
Total	100%	800	758

Table 6. Sample for Italy.

	Eurostat %	*Eurostat N*	*Responses N*
Gender			
Female	50,60%	405	374
Male	49,40%	395	400
Total	100%	800	774
Age			
18-24	9,60%	77	53
25-34	15,50%	124	124
35-44	20,20%	162	161
45-54	22,10%	177	177
55-74	32,60%	260	259
Total	100%	800	774
Geographical area			
Nord-Ovest	26%	211	204
Nord-Est	19%	153	148
Centro	20%	159	154
Sud	23%	187	178
Isole	11%	90	90
Total	100%	800	774

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Table 7. Sample for Spain.

	Eurostat %	*Eurostat N*	*Responses N*
Gender			
Female	50,10%	401	355
Male	49,90%	399	368
Total	100%	800	723
Age			
18-24	9,30%	74	31
25-34	16,80%	134	110
35-44	23,10%	185	181
45-54	21,30%	171	167
55-74	29,60%	236	234
Total	100%	800	723
Geographical area			
Noroeste (Galicia, Asturias, Cantabria)	9%	75	85
Noreste (País Vasco, Navarra, La Rioja, Aragón)	10%	76	81
Comunidad de Madrid	14%	111	106
Centro (Castilla y León, Castilla-la Mancha, Extremadura)	12%	95	84
Este (Cataluña, Comunidad Valenciana, Illes Baleares)	29%	231	202
Sur (Andalucía, Murcia, Ceuta, Melilla)	22%	173	147
Canarias	5%	38	18
Total	100%	800	723

Table 8. Sample for United Kingdom.

	Eurostat %	*Eurostat N*	*Responses N*
Gender			
Female	50,39%	403	373
Male	49,61%	397	351
Total	100%	800	724
Age			
18-24	12,70%	101	39
25-34	19,20%	154	145
35-44	18,10%	145	145
45-54	19,90%	159	154
55-74	30,10%	241	241
Total	100%	800	724
Geographical area			
North East	4%	33	34
North West	11%	88	83
Yorkshire and The Humber	8%	66	68
East Midlands	7%	57	55
West Midlands	9%	70	64
East of England	9%	74	56
London	14%	110	100
South East	14%	109	111
South West	8%	67	56
Wales	5%	38	24
Scotland	8%	67	54
Northern Ireland	3%	22	19
Total	100%	800	724

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The following table (Table 9) sums up the five previous ones, while the Figure 8 presents the distribution on the total population by age categories.

Table 9. Sample for the five countries.

	Eurostat N	*Responses N*	*Completion rate*
Gender			
Female	2015	1864	92.5%
Male	1985	1902	95.8%
Total	4000	3766	94.2%
Age			
18-24	431	267	61.2%
25-34	694	659	95%
35-44	774	756	97.7%
45-54	845	832	98.5%
55-74	1256	1252	99.7%
Total	4000	3766	94.2%

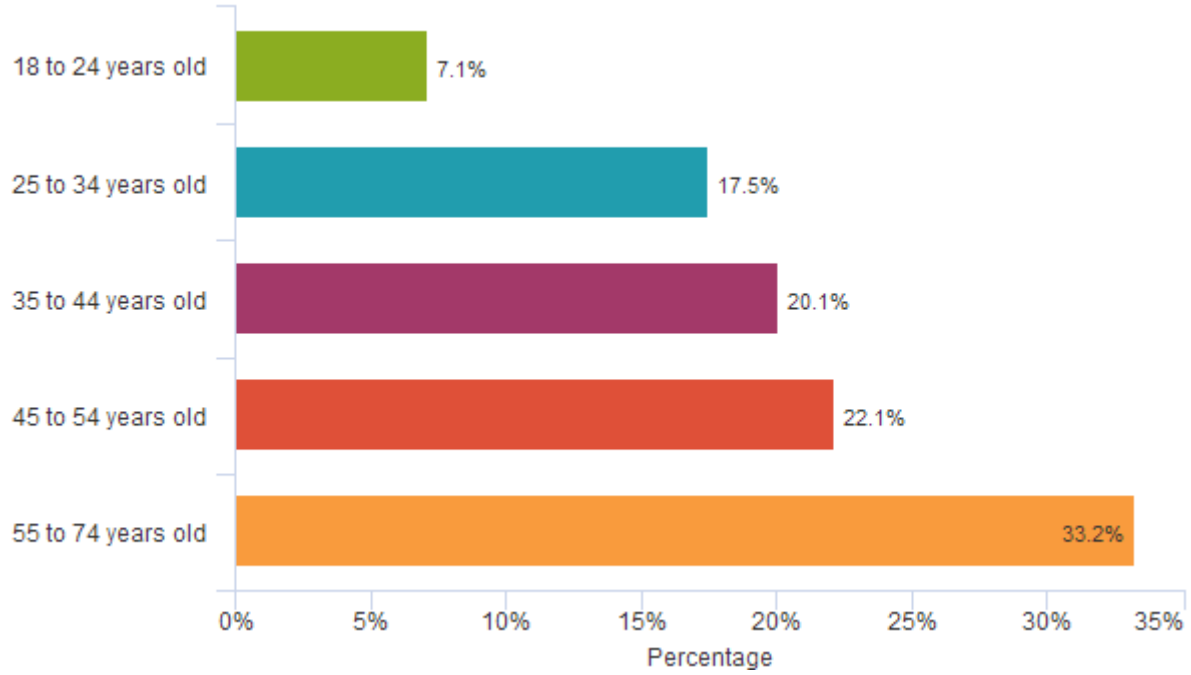

Figure 8. Distribution of the total population by age.

With regard to the distribution of the experimental messages, it was almost equal at the level of five focus-countries (Figure 9), which is important for crossing the responses regarding attitudes/ intentions and the version of the message in order to highlight the possible differences in perception (health/environment, official/unofficial). Furthermore, the repartition of the experimental messages remains quite uniform even when analysed by country. The only country where the difference in article distribution becomes significant is Spain: more than 55% of respondents faced non-official messages (either regarding health or environment). However, it doesn't create problems in data analysis.

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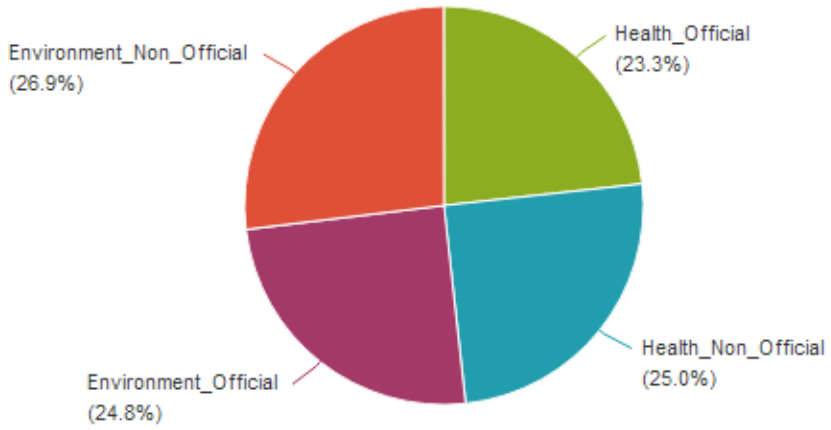

Figure 9. Distribution of the scenarios for five countries.

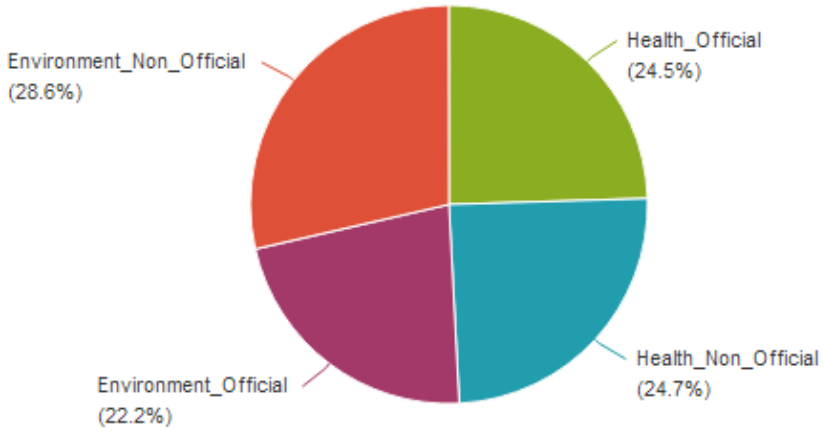

Figure 10. Distribution of the scenarios for Germany.

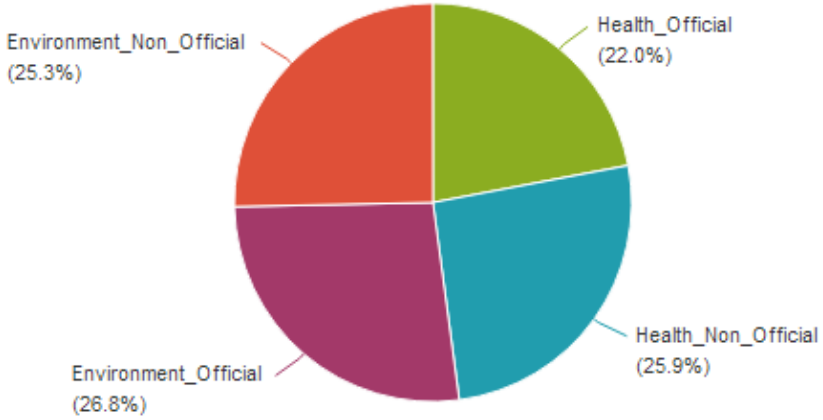

Figure 11. Distribution of the scenarios for France.

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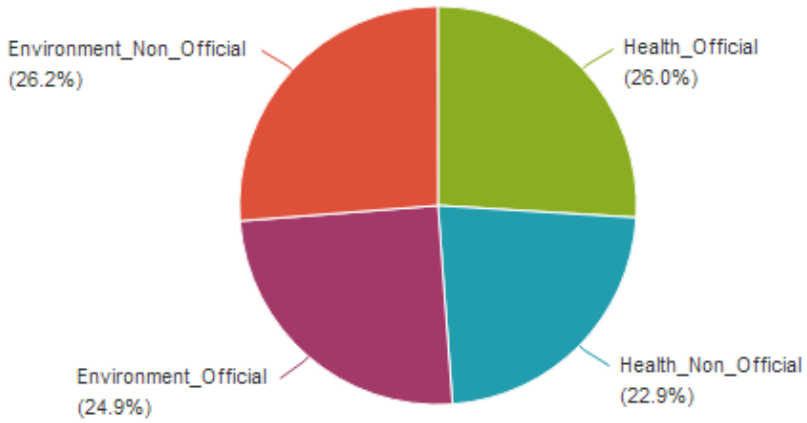

Figure 12. Distribution of the scenarios for Italy.

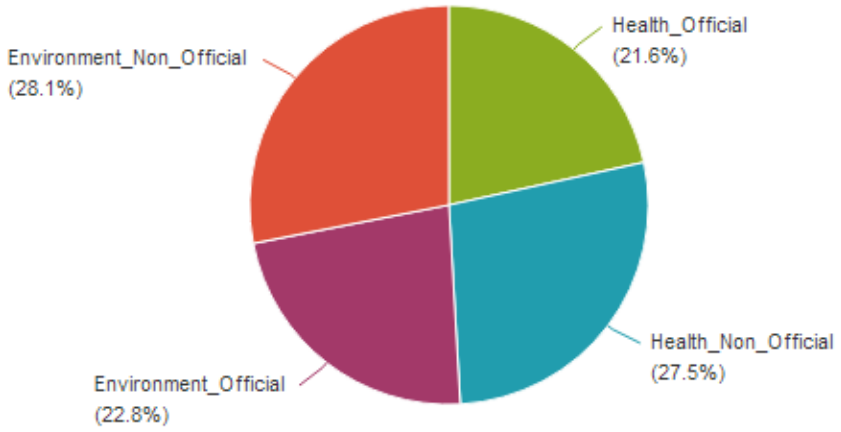

Figure 13. Distribution of the scenarios for Spain.

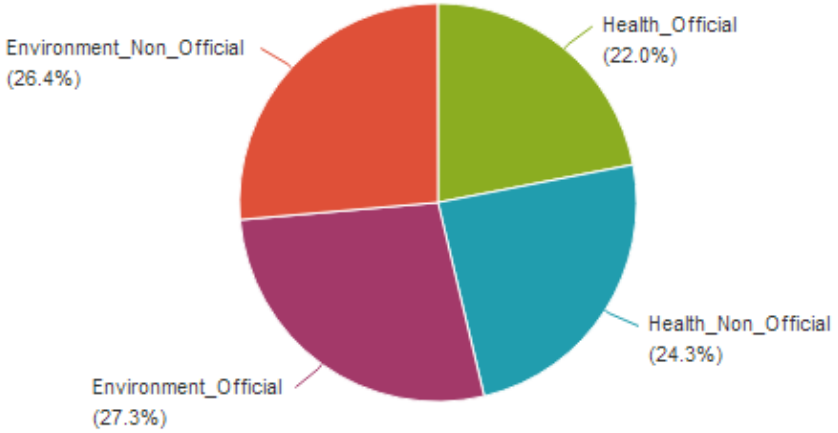

Figure 14. Distribution of the scenarios for United Kingdom.

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3.1.4. Data analysis

Data were analysed using Sphinx IQ2 and Sphinx Dataviv'. Means and standard deviations were used to analyse the attitudes towards salmon consumption before and after the presentation of negative massage, as well as for the analysis of behavioural intentions. More details were offered by multiple F-tests regarding the impact of individual characteristics on the responses on Likert scales. Cronbach's alpha was used to estimate the average correlation between all the items of the construct (latent variables) regarding opinions about the negative message, involvement, health and environmental concerns.

It is important to mention that the scale of fish/salmon consumption was associated with the effective number of intake meals per year: almost every day = 300, 3-4 times per week = 175, 1-2 times per week = 75; 2-3 times per month = 30; 1 time per month = 12, few times a year = 5. Also, the Likert scale was treated like a number: strongly agree = 6, agree = 5, somewhat agree = 4, somewhat disagree = 3, disagree = 2, strongly disagree = 1.

3.2. Results and discussion

The presentation of the results is divided into sections that preponderantly follow the sections of the questionnaires. Thus, it starts with the presentation of fish and salmon consumption frequencies depending on socio-demographic characteristics or country particularities. The second section is dedicated to the presentation of initial attitudes towards salmon consumption. After that, the part dedicated to the change in salmon consumption and its motives follows. Involvement and health/environmental concern results are presented in the sections four and five. The sixth section is focused on the perception of the stimuli, including a cross analysis with responses regarding the information credibility and respondents' involvement. "Impact of the stimuli on attitudes" is the section presenting the main interest of all the study. In fact, the responses regarding the change in attitudes (difference between attitudes before and after reading the negative message) are crossed with the following variables: type of stimuli, credibility, involvement, health /environmental concerns. The results from another measure of the attitudes, using the wall of pictures, are explained in the section eight. The analysis of future intentions is also done depending on other variables, for instance: change in attitudes and health/ environmental concerns. The last section is dedicated to the rank task of preferred products (with and without labels) where the responses are also crossed with determinants like type of stimuli or involvement.

It should be taken into account that the results of this study will be not presented for each country individually, but at the level of all the five countries at once. However, for some analysis an insight will be given for each of the countries. In fact, the results could be very contradictory between the level of all the five countries and each country took apart. Due to a big total sample most of relations are significant.

It's important to mention that all the results are presented in a very descriptive way, based on basic sorting and cross-sorting. Regression analysis for estimating the relationships between variables will be done in a paper following this report.

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3.2.1. Fish and salmon consumption frequencies

The results report starts with the analysis of fish and salmon consumption frequencies. The mean is situated at the level of 76 fish meals per year and there is a slight difference between men and women, women consuming fish more frequently (F=2.8; p-value=0.1). Most of respondents (48.4%) consume fish 1-2 times per week (Figure 15). 9.7% of respondents consume fish once a month or less.

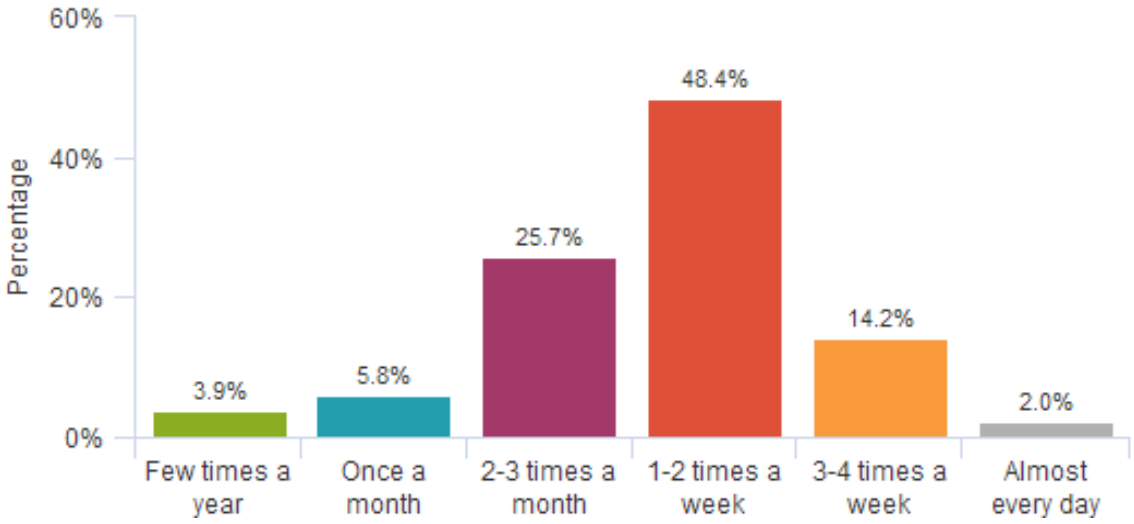
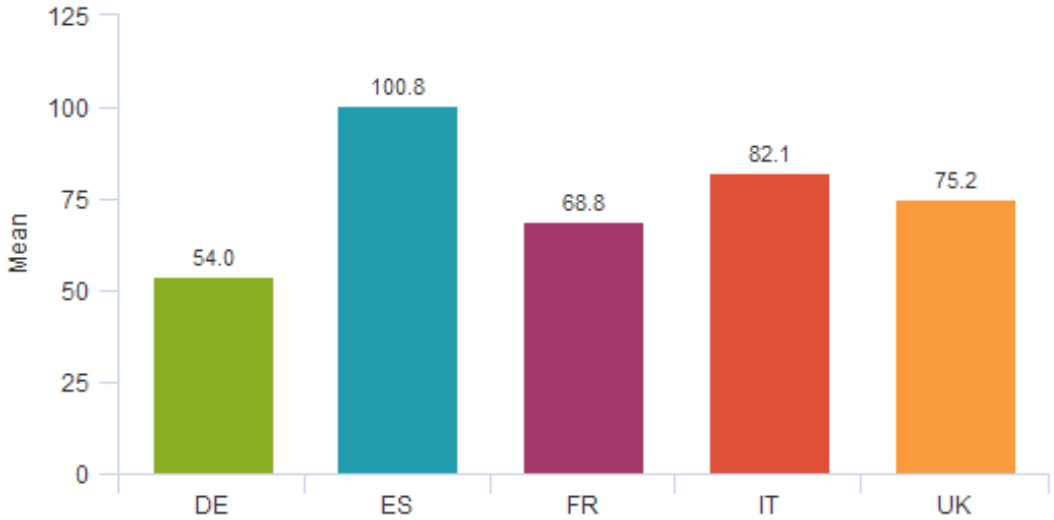


Figure 15. Frequency of fish consumption for five countries.

When analysed by country (Figure 16), some important differences are found. The fish consumption in Spain is almost two times higher than in Germany (F=70.8; p-value=<0.01). In Italy, United Kingdom and France fish meals are consumed less frequently than in Spain as well.



p-value= < 0.01; Fisher= 70.8. The relationship is very significant.

Figure 16. Frequency of fish consumption per country.

The mean consumption of salmon at the level of five countries is 32 times per year, the majority of respondents (34.9%) consuming it 2-3 times per month (Figure 17). While only less than 10% of respondents consume fish not very frequently, almost half of respondents (44.5%) have salmon once a month or less. Less than 1% of respondents consume salmon almost every day.

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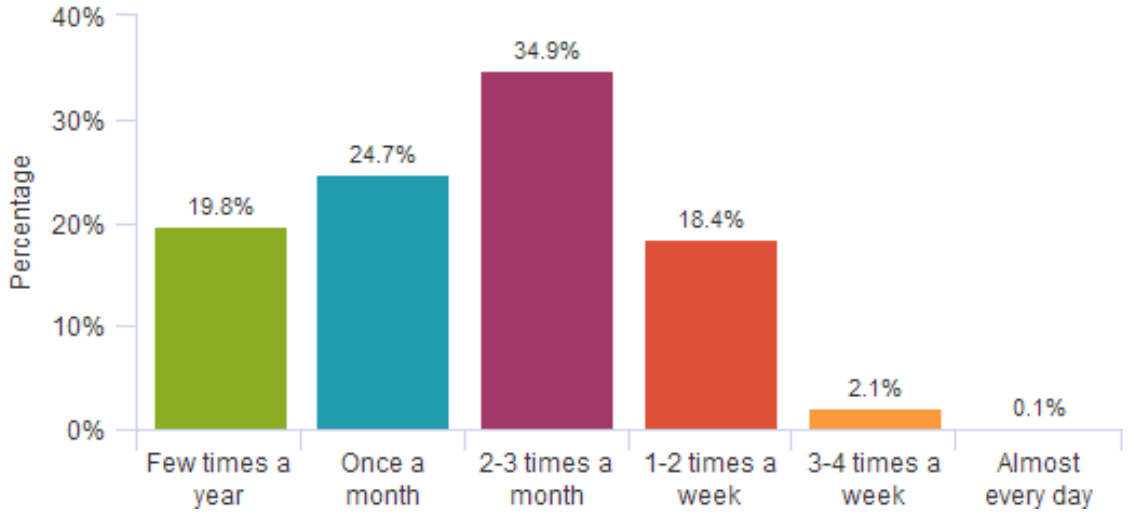
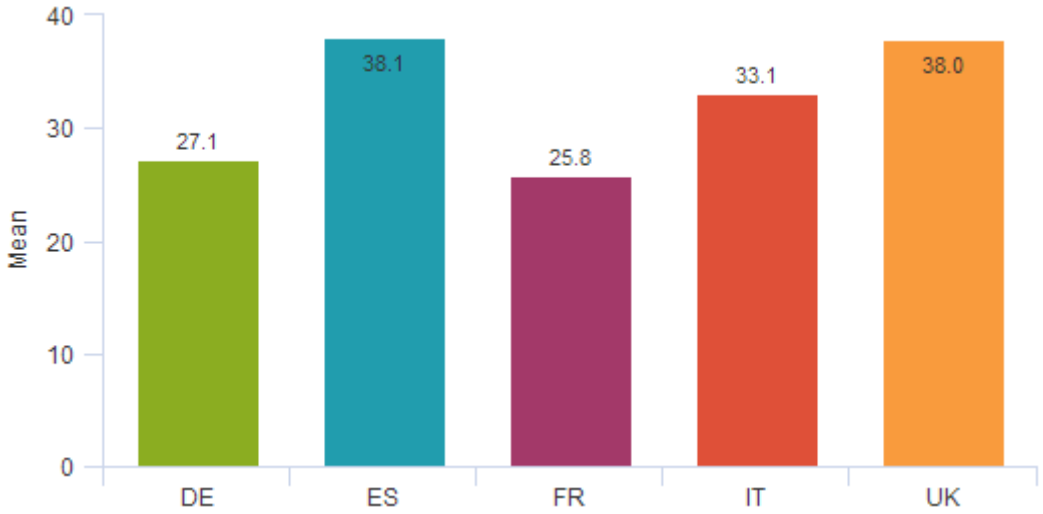


Figure 17. Frequency of salmon consumption for five countries.

The frequency of salmon consumption differs significantly across the five countries (Figure 18) (F=23.3; p-value=<0.01). For both, Spain and United Kingdom, the annual consumption of salmon is around 38 times. It means that on average, in Spain, two out of five fish meals are composed of salmon, while in United Kingdom one out of two fish meals is composed of salmon. In Germany, as well, a half of fish meals per year are composed of salmon. In France and Italy, meals containing salmon represent 40% from the total fish meals. The less frequently salmon is consumed in France – approximately 26 times per year. At the same time, France is one of the biggest salmon consumers in Europe, with a total consumption of almost 180 tons of salmon yearly (www.franceagrimer.fr). Moreover, fresh salmon is consumed in more than 40% of French households, while smoked salmon is consumed in 70% of French households.



p-value= < 0.01; Fisher= 23.3. The relationship is very significant.

Figure 18. Frequency of salmon consumption per country.

With regard to the gender, the difference between men and women is not very important (F=2.5; p-value=0.1): 31 times for men versus 33 times for women. The difference between men and women remains not very significant when analysed for each country separately as well. Moreover, there is no significant difference in the frequency of salmon consumption across the age categories. This finding is contrary to previous studies that found relations between age and the frequency with which fish

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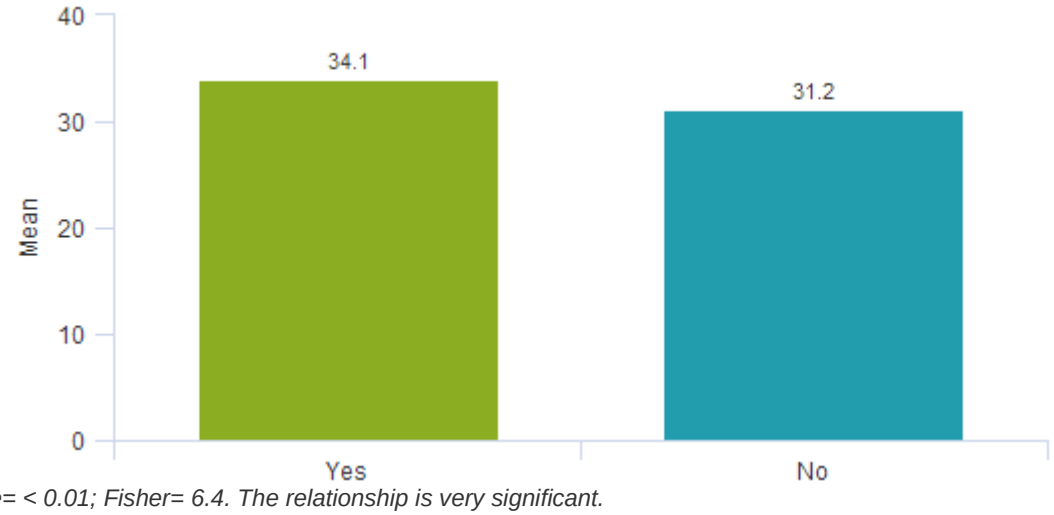
dishes are consumed (Myrland *et al*., 2000; Trondsen *et al*., 2003; Verbeke and Vackier, 2005): older people consume fish more frequently.

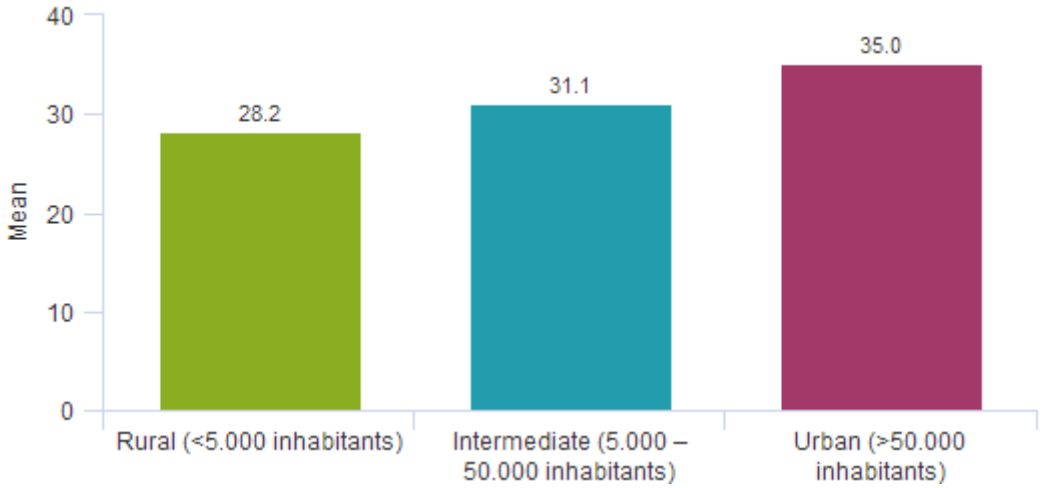


p-value= < 0.01; Fisher= 6.4. The relationship is very significant.

Figure 19. Frequency of salmon consumption crossed with type of area (coastal versus mainland).

People living in coastal area consume salmon more frequently (F=6.4; p-value=<0.01) than people living in inland region because they have direct access to fresh fish (Figure 19). This confirms the findings of Trondsen *et al*. (2003) and Verbeke and Vackier (2005). When analyzed individually, in France, Spain and United Kingdom there is no difference in the frequency of salmon consumption between people living on the coast and those living on the mainland.

People living in urban areas consume fish more frequently than those living in rural areas (Figure 20) (F=12.2; p-value=<0.01). It is frequently due to the fact that in rural areas (which are not close to the coast) it's more difficult to find fresh fish in the markets. These results are not applicable for France, Spain and United Kingdom when analyzed individually.



p-value= < 0.01; Fisher= 12.2. The relationship is very significant.

Figure 20. Frequency of salmon consumption crossed with type of area (rural versus urban).

Consistently with the findings of Myrland *et al*. (2000) and Trondsen *et al.* (2003) the respondents having a low level of education consume salmon less frequently than those having an upper secondary education or higher (Figure 21) (F=4.7; p-value=<0.01). When analyzed individually, in Germany,

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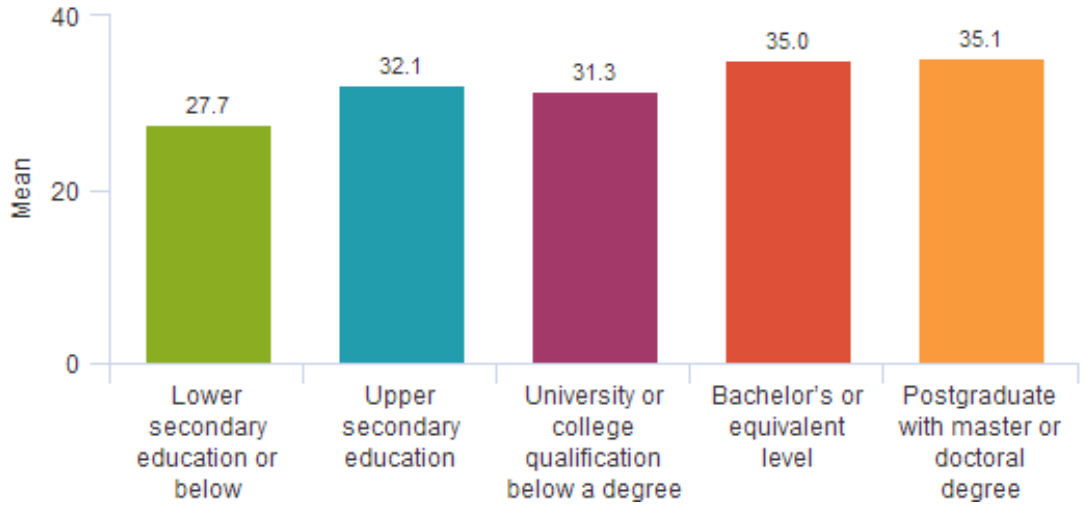
France, Italy and Spain the frequency of salmon consumption is not significantly impacted by the level of education.

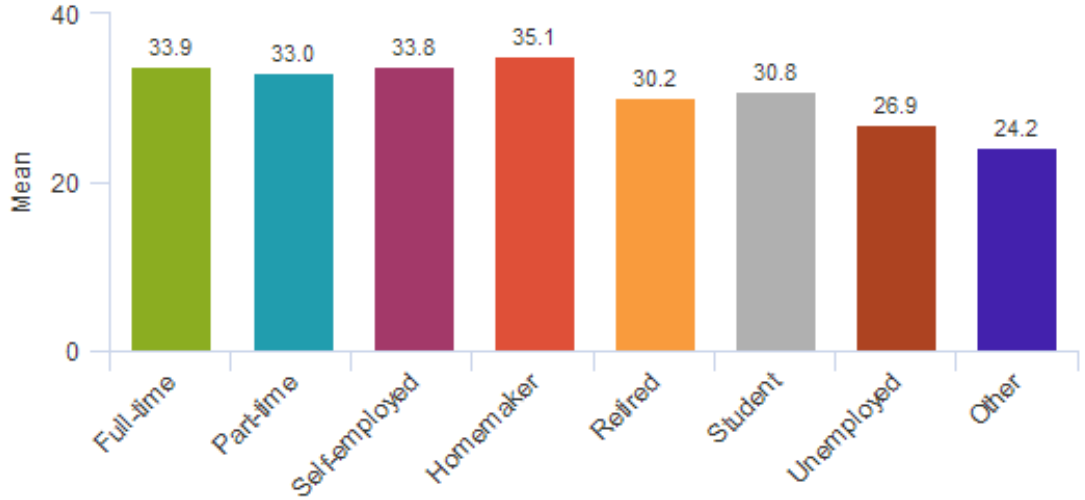


p-value= < 0.01; Fisher= 4.7. The relationship is very significant.

Figure 21. Frequency of salmon consumption crossed with the level of education.

Unemployed people consume salmon less frequently than those having a job or doing their studies (Figure 22) (F=3.2; p-value =<0.01). At country level, some differences are observable. In Germany, the homemakers also consume salmon less frequently than people having another employment status (F=2.4; p-value=0.1). In Spain, the salmon is consumed less frequently by students, self-employed or unemployed respondents (F=2.7; p-value=0.0). In United Kingdom only unemployed people eat salmon less frequently (F =2.0; p-value=0.1), while in France and Italy there is no difference between people from different employment categories.

While Verbeke and Vackier (2005) explain the impact of income as marginally affecting, in this study people having lower revenues consume salmon significantly less frequently (F=3.8; p-value=<0.01). When analyzed by country, these results remain significant only for Germany.



p-value= < 0.01; Fisher= 3.2. The relationship is very significant.

Figure 22. Frequency of salmon consumption crossed with employment status.

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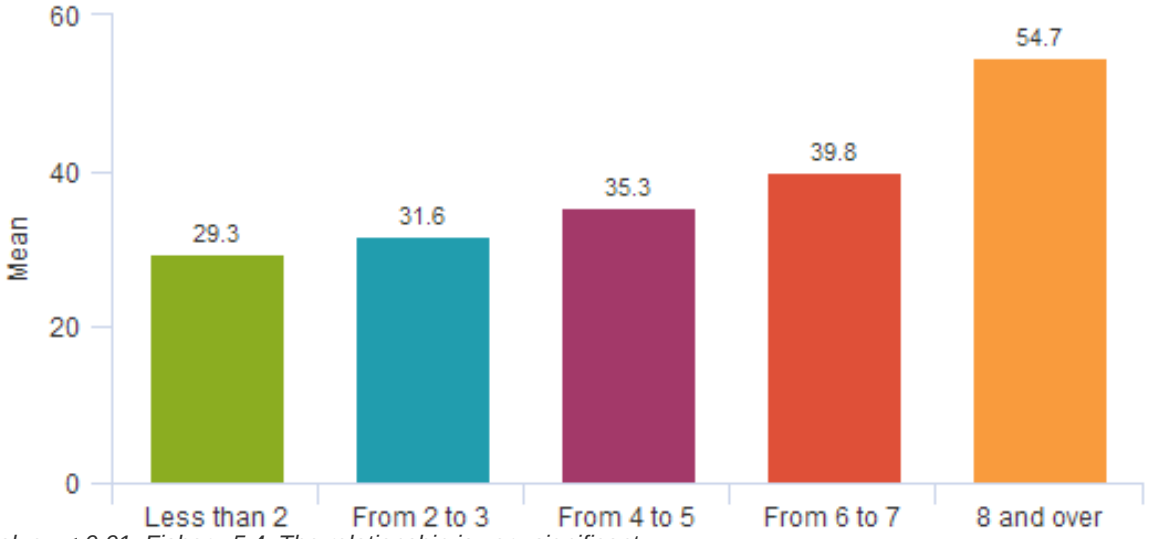
The number of family members impacts positively the frequency of salmon consumption (Figure 23) (F=5.4; p-value=<0.01). In the households composed of 8 persons or more salmon is consumed almost 2 times more frequently than in households composed of only 1 person. The consumption of salmon is low in households composed of one person, it can be explained by the fact that one person will not necessarily cook fish/salmon only for him/herself (Myrland *et al.*, 2000). These results are not meaningful for Spain and Italy individually.



p-value= < 0.01; Fisher= 5.4. The relationship is very significant.

Figure 23. Frequency of salmon consumption crossed with household size.

3.2.2. Attitudes towards salmon consumption

As was mentioned in the design of the study, the attitudes were measured before and after the manipulation. This section presents the main results regarding the attitudes before the manipulation.

Thus, the mean value for all the items is situated at the level of 4.3, which means that generally respondents somewhat agree with all the presented characteristics of salmon consumption: healthy, safe, nutritious, cheap, tasty, good for environment, ethical, sustainable. The only item that registers a mean lower than 3 is "cheap". In fact, as it was revealed in the deliverable 4.2 of PrimeFish project fish is generally perceived as expensive product; it is confirmed by the findings of Birch and Lawley (2012), Brunsø *et al*. (2009), Myrland *et al*. (2000), Trondsen *et al*. (2003), Verbeke and Vackier (2005). The items "nutritious" and "tasty" have the highest scores. The studies of Burger and Gochfeld (2009) and Verbeke *et al.* (2008) also confirm that fish is perceived nutritious and good for health.

The good value of Cronbach's Alpha for the entire construction, confirms the coherence between the eight statements regarding the salmon consumption (Figure 24). This construction can be divided in two smaller constructs that are of interest: one related to health (healthy, safe and nutritious) and one related to environment (good for environment, ethical and sustainable). The construct related to health (Figure 25) registers a Cronbach's Alpha equal to 0.8, while the construct related to environment (Figure 26) has a Cronbach's Alpha equal to 0.9.

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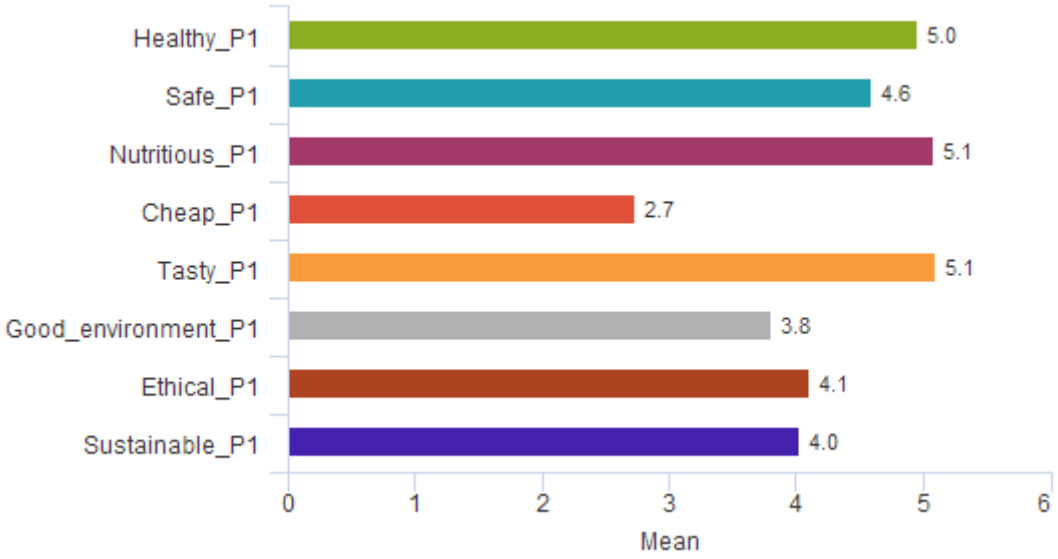
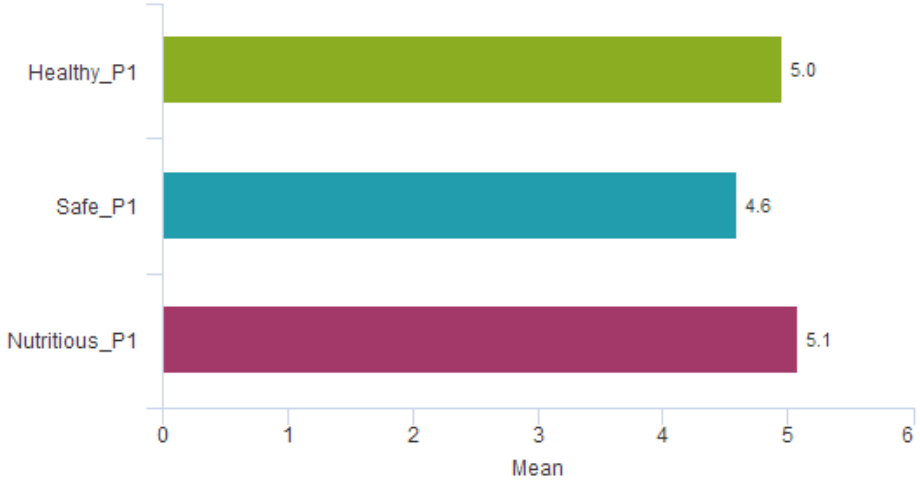


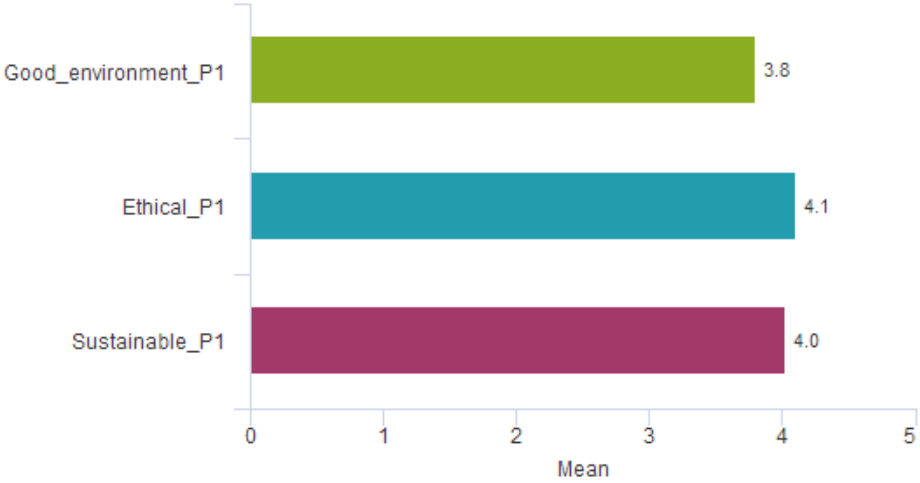
Cronbach's Alpha: 0.8

Figure 24. Pre-manipulation attitudes.



Cronbach's Alpha: 0.8

Figure 25. Pre-manipulation attitudes regarding health items.



Cronbach's Alpha: 0.9

Figure 26. Pre-manipulation attitudes regarding environmental items.

When crossing the attitudes with country variable, all the relations are very significant (Figure 27). Thus, respondents from Spain and United Kingdom have a higher appreciation of the statement "eating

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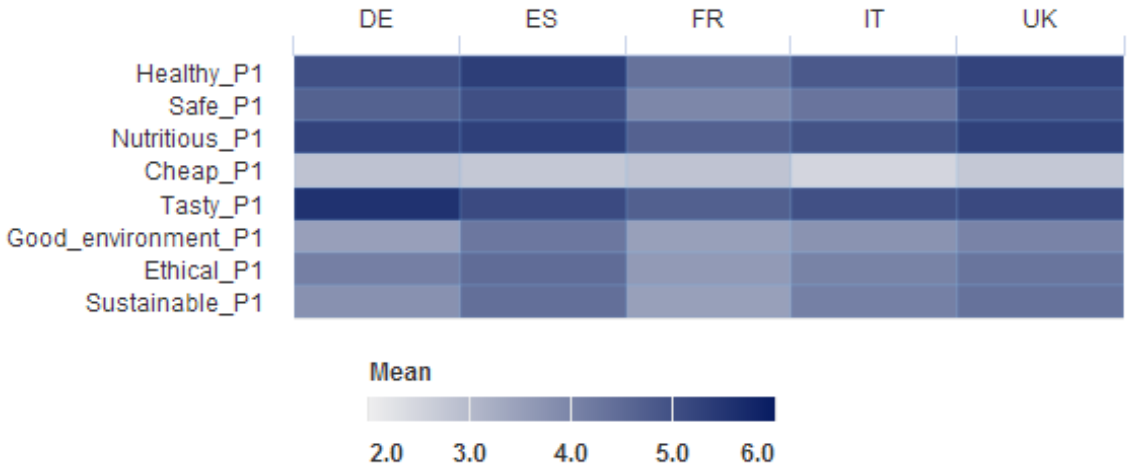
salmon is healthy" (F=128.4, p-value=<0.01), "… safe" (F=200.3; p-value=<0.01) and "… nutritious" (F=102.8; p-value=<0.01) than respondents from France and Italy. Regarding the statements related to environmental issues, important differences are observed between the countries. Respondents from Spain and United Kingdom also register scores that are significantly higher than those obtained from French, German and Italian salmon consumers for the statements "consuming salmon is good for environment" (F=101.8; p-value=<0.01), "consuming salmon is ethical" (F=97.8; p-value=<0.01), "consuming salmon is sustainable" (F=132.8; p-value=<0.01). For the statement "salmon is tasty", the highest score is obtained for the respondents from Germany, while the lowest score is obtained for France (F=123.7; p-value=<0.01). Moreover, French respondents have the lower scores for all the statements apart the statement "salmon is cheap". As it was revealed in the qualitative study of consumer behavior within the PrimeFish project (deliverable 4.2), French consumers face a lot of negative information about fish consumption and especially about salmon consumption. Several consumers participating at the qualitative study claimed that they have reduced their consumption of salmon while others did not change their consumption frequency but paid more attention when choosing fish, avoided certain provenances or bought farmed salmon with bio labels.



Healthy_P1/Country: p-value= < 0.01; Fisher= 128.4. The relationship is very significant.
Safe_P1/Country: p-value= < 0.01; Fisher= 200.3. The relationship is very significant.
Nutritious_P1/Country: p-value= < 0.01; Fisher= 102.8. The relationship is very significant.
Cheap_P1/Country: p-value= < 0.01; Fisher= 20.9. The relationship is very significant.
Tasty_P1/Country: p-value= < 0.01; Fisher= 123.7. The relationship is very significant.
Good_environment_P1/Country: p-value= < 0.01; Fisher= 101.8. The relationship is very significant.
Ethical_P1/Country: p-value= < 0.01; Fisher= 97.8. The relationship is very significant.
Sustainable_P1/Country: p-value= < 0.01; Fisher= 132.8. The relationship is very significant.
Figure 27. Pre-manipulation attitudes crossed with country.

3.2.3. Recent changes in salmon consumption

The majority of respondents (45.2%) didn't change their salmon consumption during the last three years. Among the other 55%, the most common change is the slight increase of consumption. The main reason cited for increasing salmon consumption are: "better health awareness", "availability of fish", "a rising trend of eating fish", "available time for cooking" and "improved knowledge in cooking" (Figure 28). 13.5% of respondents slightly decreased their salmon consumption during the last three years due to: "fish prices", "income (issues)" or "improved knowledge in selecting fish". The last one may be understood as the capability of selecting other fish species (less popular) than salmon.

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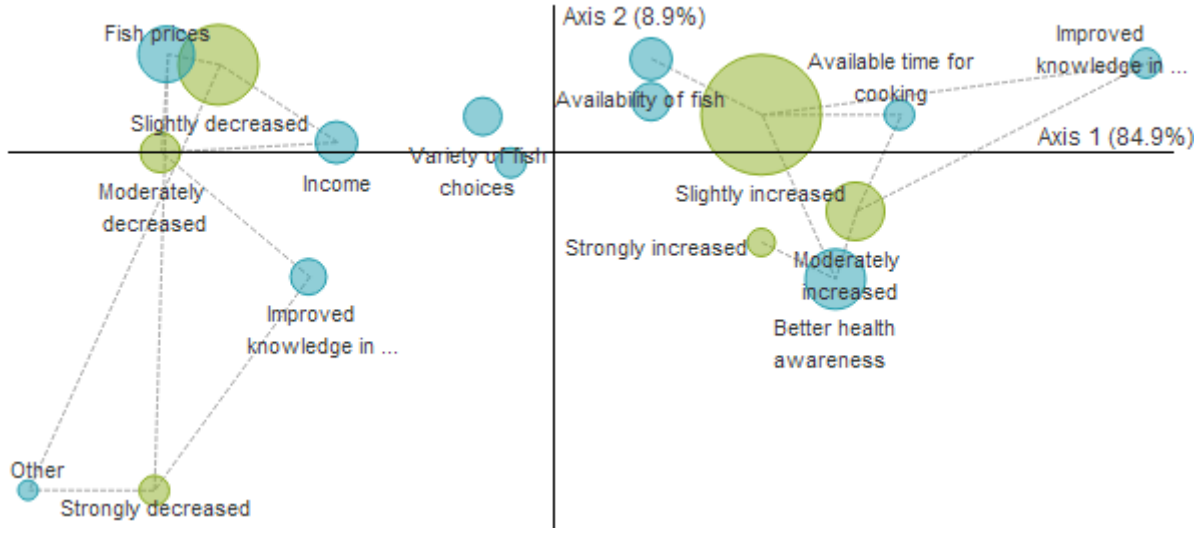
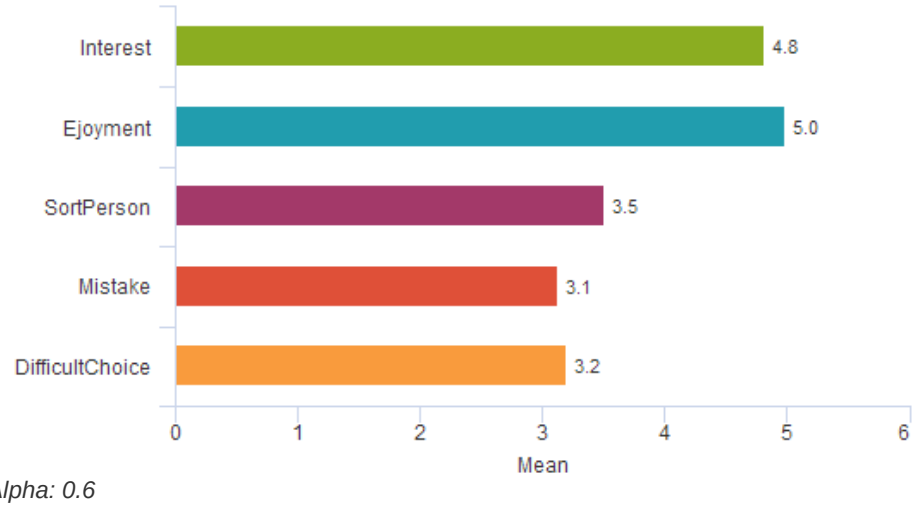


Figure 28. Changes in salmon consumption and motives.

3.2.4. Involvement

The involvement construction registers a low Cronbach's Alpha (Figure 29). In fact, respondents highly rated the statements: "I'm interested in salmon" and "I enjoy eating salmon" (median=5 for both statements) and poorly ranked the statements: "the salmon I buy reflects the sort of person I am", "if I make a mistake when purchasing salmon, the consequences are important to me", "choosing salmon is difficult" (median=3 for all the 3 statements). It can be interpreted that salmon consumption is perceived as a pleasure, but the salmon purchase is not seen as a very risky process.



Cronbach's Alpha: 0.6
Figure 29. Involvement.

Crossing involvement with salmon consumption frequency permits to highlight very significant relations. The respondents consuming salmon more frequently have higher scores for all involvement statements (Figure 30). What is interesting about this relation is the fact that the scores increase consistently from the respondents consuming salmon few times a year to those consuming salmon 1-2 times a week. When salmon is consumed more than twice a week, all the scores related to "interest" (F=49.9; p-value=<0.01) and "enjoyment" (F=39.6; p-value=<0.01) drop, while the statements regarding "sort of person" (F=33.8; p-value=<0.01), "mistake" (F=12; p-value=<0.01) and "difficult choice" (F=7.4; p-value=<0.01) continue to increase.

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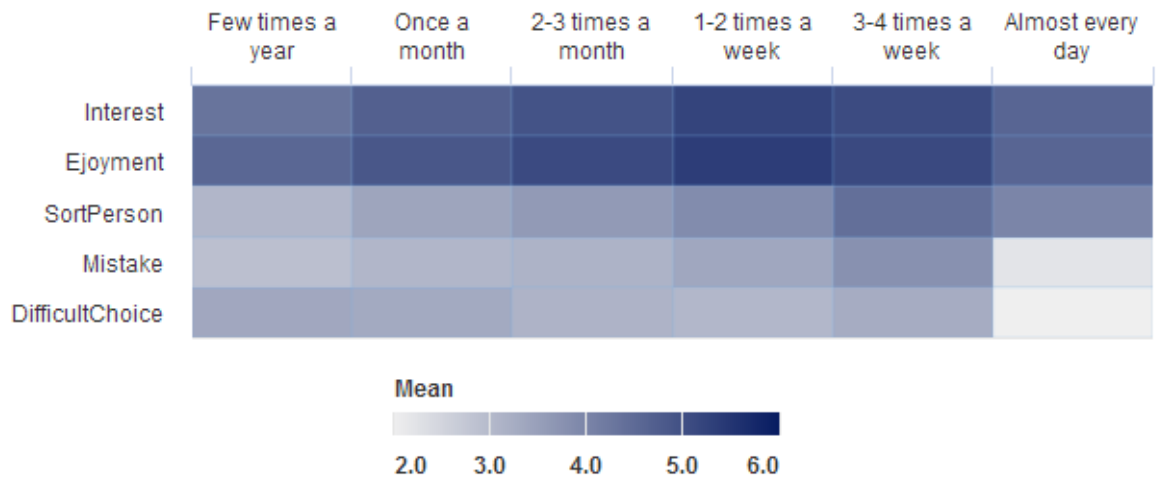
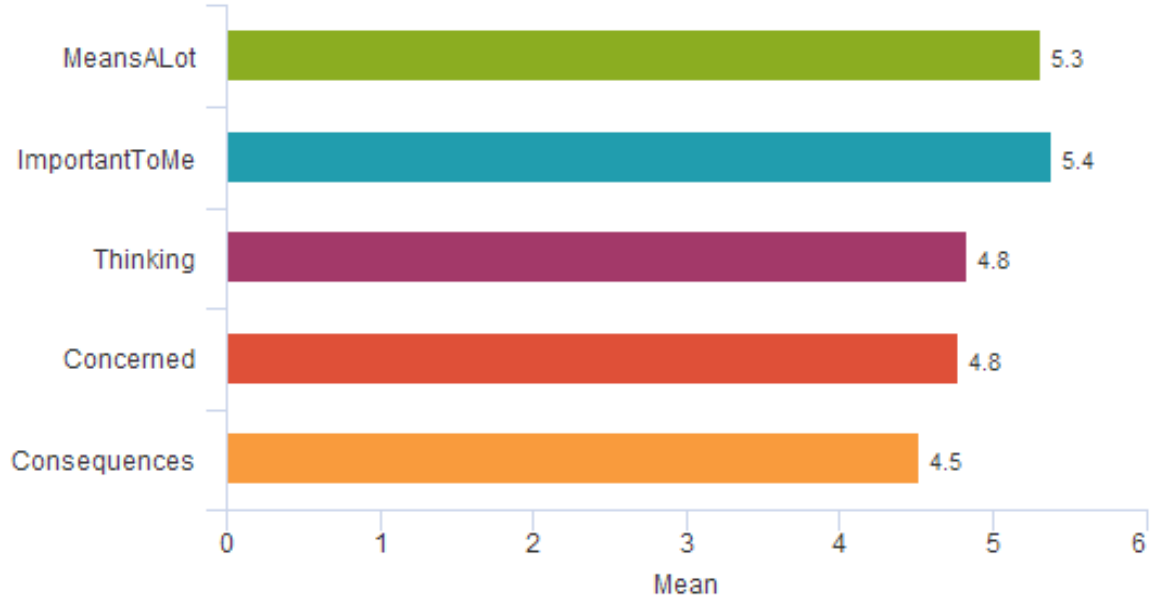


Interest/FrequencySalmon: p-value= < 0.01; Fisher= 49.9. The relationship is very significant.
Ejoyment/FrequencySalmon: p-value= < 0.01; Fisher= 39.6. The relationship is very significant.
SortPerson/FrequencySalmon: p-value= < 0.01; Fisher= 33.8. The relationship is very significant.
Mistake/FrequencySalmon: p-value= < 0.01; Fisher= 12.0. The relationship is very significant.
DifficultChoice/FrequencySalmon: p-value= < 0.01; Fisher= 7.4. The relationship is very significant.
Figure 30. Involvement crossed with frequency of salmon consumption.

3.2.5. Health and environmental concerns

The good value of Cronbach's Alpha (Figure 31) confirms that the statements composing the health concern construction are coherent. The first two statements have higher mean values (and the median=6) than the other three statements (their medians are equal to 5).



Cronbach's Alpha: 0.9
Figure 31. Health concern.

There are some differences in health concern depending on respondents' origin (Table 10). Respondents from Spain and Italy have the highest health involvement. The lowest health involvement (4.7) is registered in Germany, namely for the statement: "I am very concerned about the health-related consequences of what I eat" (F=126.6; p-value=<0.01).

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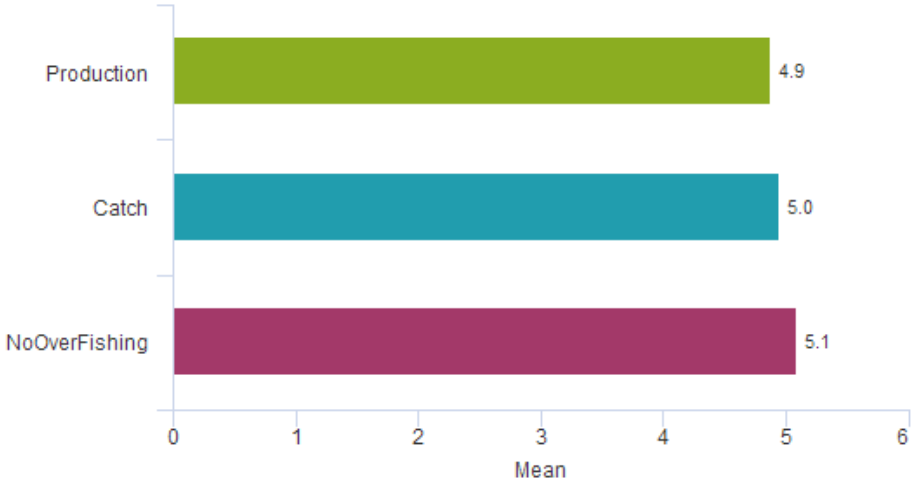
	Country					
	DE	ES	FR	IT	UK	**Total**
MeansALot	5.3	5.4	5.2	5.3	5.3	**5.3**
ImportantToMe	5.4	5.5	5.4	5.4	5.3	**5.4**
Thinking	4.6	5.0	4.7	5.0	4.9	**4.8**
Concerned	4.7	4.8	4.7	5.0	4.7	**4.8**
Consequences	3.7	4.9	4.6	4.8	4.7	**4.5**
Total	**4.7**	**5.1**	**4.9**	**5.1**	**5.0**	**5.0**

MeansALot/Country: p-value= < 0.01; Fisher= 6.8. The relationship is very significant.
ImportantToMe/Country: p-value= 0.0; Fisher= 3.6. The relationship is significant.
Thinking/Country: p-value= < 0.01; Fisher= 21.2. The relationship is very significant.
Concerned/Country: p-value= < 0.01; Fisher= 12.1. The relationship is very significant.
Consequences/Country: p-value= < 0.01; Fisher= 126.6. The relationship is very significant.
Table 10. Health concern crossed with country.

The three statements for the environmental concern also have a very high value of Cronbach's Alpha (Figure 32). The mean value for this construction is five, as for the construction related to health concern. With regard to country specificities, respondents from Italy seem to be more concerned about environmental issues than those from other countries (Table 11). Salmon consumers from Germany are not very concerned by the way in which the salmon they eat on a typical day has been produced (F=8.8; p-value=<0.01).



Cronbach's Alpha: 0.9
Figure 32. Environmental concern.

	Country					
	DE	ES	FR	IT	UK	**Total**
Production	4.7	4.8	5.0	5.0	4.9	**4.9**
Catch	4.8	4.9	5.0	5.2	5.0	**5.0**
NoOverFishing	5.1	4.9	5.2	5.3	5.0	**5.1**
Total	**4.9**	**4.9**	**5.0**	**5.1**	**5.0**	**5.0**

Production/Country: p-value= < 0.01; Fisher= 8.8. The relationship is very significant.
Catch/Country: p-value= < 0.01; Fisher= 14.6. The relationship is very significant.
NoOverFishing/Country: p-value= < 0.01; Fisher= 16.2. The relationship is very significant.
Table 11. Environmental concern crossed with country.

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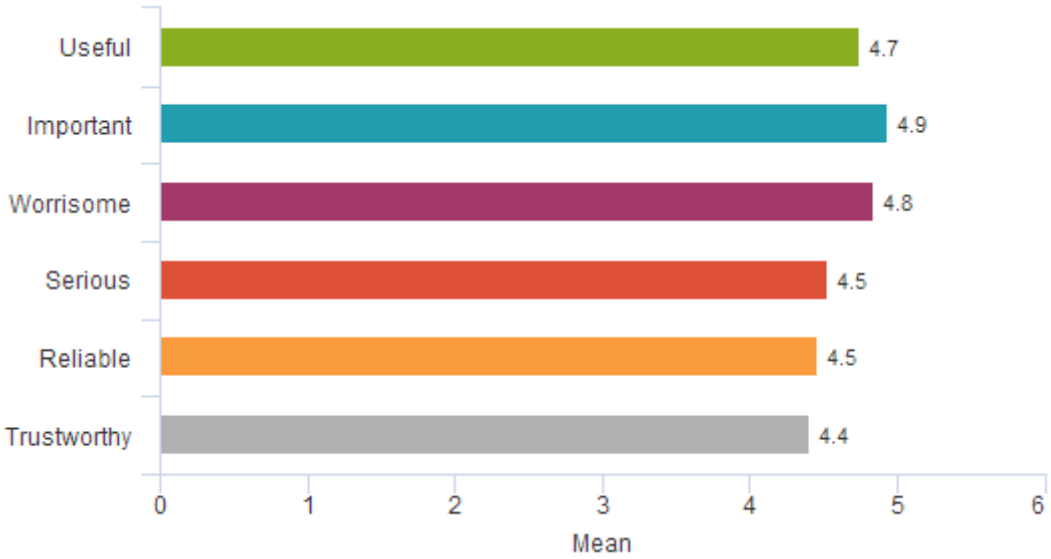
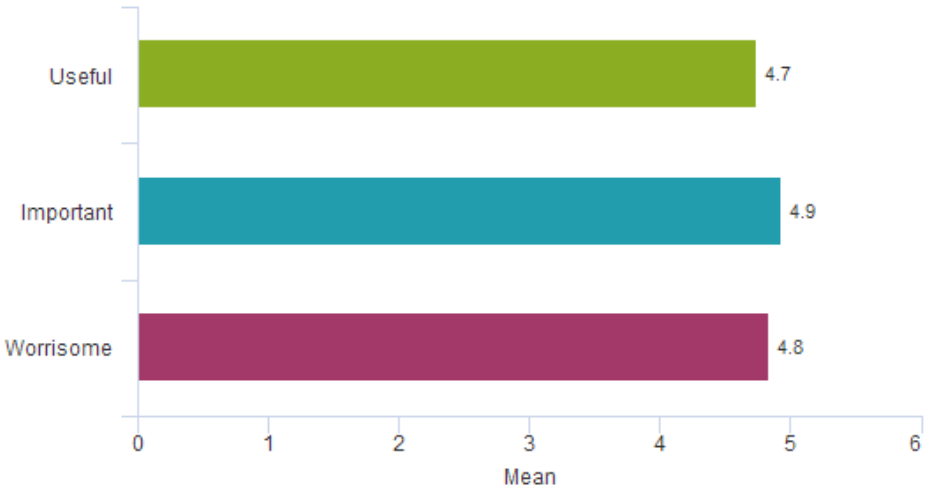
3.2.6. Perception of the stimuli

Overall the messages were perceived as credible. The Cronbach's Alpha for all the six statements is equal to 0.9 (Figure 33). When separated in two categories, one related to the importance of information and the other one related to the credibility of source, the Cronbach's Alpha still has very good values (Figure 34 and Figure 36).



Cronbach's Alpha: 0.9
Figure 33. Credibility of stimuli.

The mean registered for the general importance and usefulness of the messages is equal to 4.8. As it can be observed in Figure 35, there is no very significant difference in the perceived importance of information depending on the type of stimuli. This result is consistent with the fact that the contents of messages presented as official and unofficial were exactly the same.



Cronbach's Alpha: 0.9
Figure 34. Importance of information.

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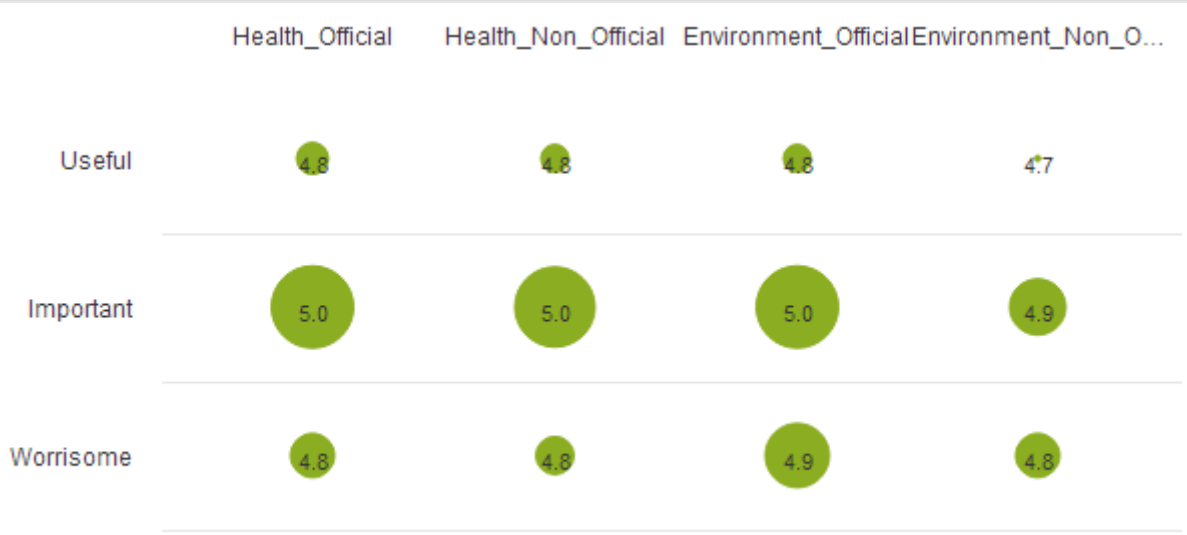
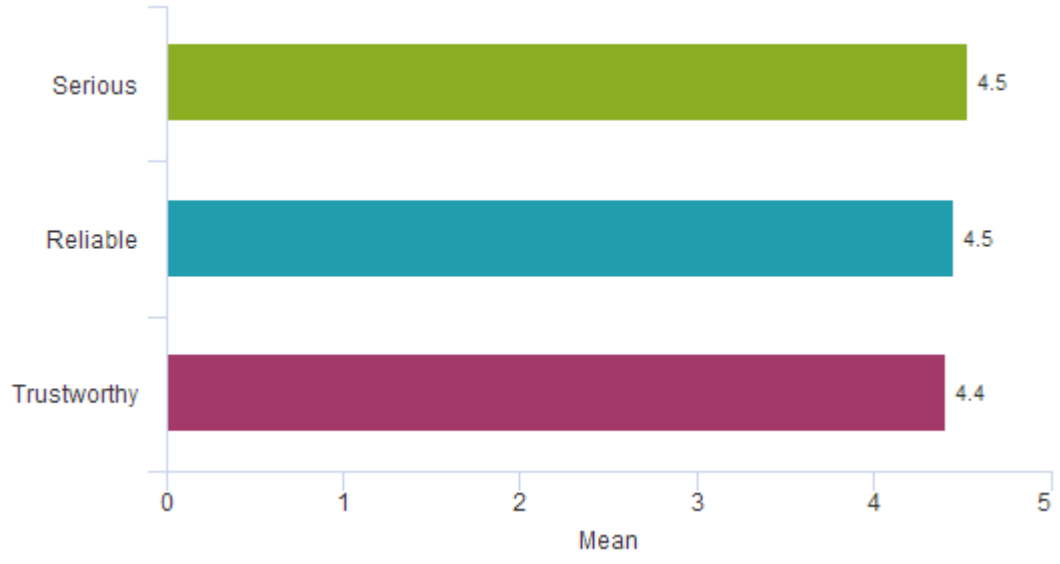


Useful/Stimuli: p-value= 0.2; Fisher= 1.7. The relationship is not significant.
Important/Stimuli: p-value= 0.1; Fisher= 2.0. The relationship is weakly significant.
Worrisome/Stimuli: p-value= 0.3; Fisher= 1.4. The relationship is not significant.
Figure 35. Importance of information crossed with type of stimuli.

With regard to the credibility of information source, the general mean is lower than for the importance of information (Figure 36). This time, it is due to the type of stimuli, namely to their sources. For the messages coming from official sources of information, the credibility of sources is highly superior to the credibility of messages coming from blogs (Figure 37). The most important gap is observed for the item "trustworthy": the score for official source regarding health issues is 4.6, while for the unofficial one it's only 4.2.



Cronbach's Alpha: 1.0
Figure 36. Credibility of sources.

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Serious/Stimuli: p-value= < 0.01; Fisher= 27.1. The relationship is very significant.
Reliable/Stimuli: p-value= < 0.01; Fisher= 29.1. The relationship is very significant.
Trustworthy/Stimuli: p-value= < 0.01; Fisher= 27.3. The relationship is very significant.
Figure 37. Credibility of sources crossed with type of stimuli.

The perceived credibility of information also depends on consumer's involvement. In the following figure (Figure 38) the evolution of perceived credibility depending on involvement is presented. The involvement construction was composed of five items; therefore, the maximum score for it could be equal to 30 (5*6). Defined around the mean (standard deviation=1), 3 classes of involvement were formed: less than 18, from 18 to 21 and 22 and over. People that have the score lower than 18 are the less involved, consistently, those having 22 or more – are the most involved.

Useful/InvolvementTotal: p-value= < 0.01; Fisher= 23.6. The relationship is very significant.
Important/InvolvementTotal: p-value= < 0.01; Fisher= 32.6. The relationship is very significant.
Worrisome/InvolvementTotal: p-value= < 0.01; Fisher= 24.0. The relationship is very significant.
Serious/InvolvementTotal: p-value= < 0.01; Fisher= 26.1. The relationship is very significant.
Reliable/InvolvementTotal: p-value= < 0.01; Fisher= 28.5. The relationship is very significant.
Trustworthy/InvolvementTotal: p-value= < 0.01; Fisher= 28.9. The relationship is very significant.
Figure 38. Credibility of stimuli crossed with involvement.

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All the relations obtained after crossing credibility and involvement are very significant. It means that more people are involved – more they perceive the article credible. This effect is a little bit surprising, as it was expected that involved people have more knowledge and they would find that the arguments presented in articles are not trustworthy.

3.2.7. Impact of the stimuli on attitudes

In the following figure (Figure 39) the mean scores for the attitudes after the presentation of the stimuli are presented. The general mean value decreased from 4.3 to 3.9. For the item "healthy", the score decreased from 5 to 4.4, for "safe" from 4.6 to 3.9, for "nutritious" from 5.1 to 4.8, for "good for environment" from 3.8 to 3.2, "for "ethical" from 4.1 to 3.6, for "sustainable" from 4.0 to 3.4. For "cheap" there is no difference before and after the manipulation, which is quite expected because this variable was of control, as well as the variable "tasty". However, the latter register a slight decrease from 5.1 to 4.9. It must be due to the fact that presenting negative information about the healthy side of salmon creates ideas that it's not tasty anymore. The differences between the attitudes before and after the presentation of the stimuli are presented in Figure 40.

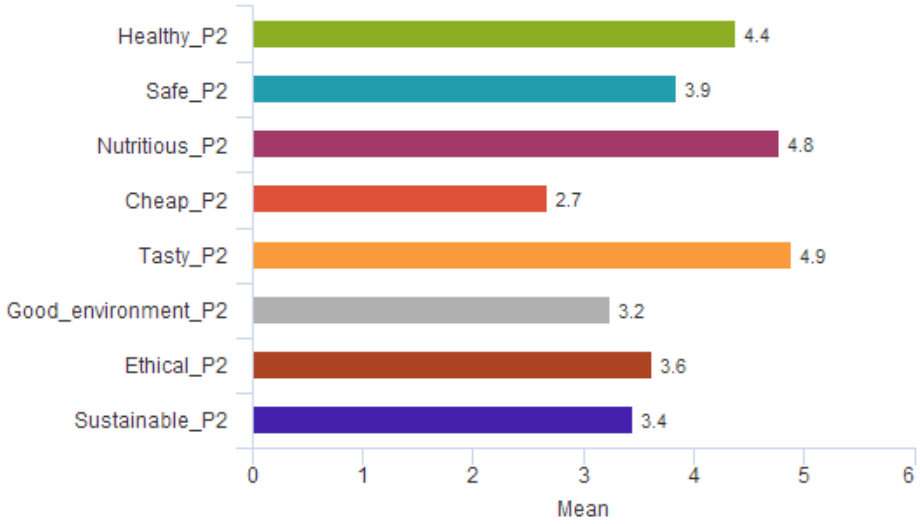

Figure 39. Post-manipulation attitudes.

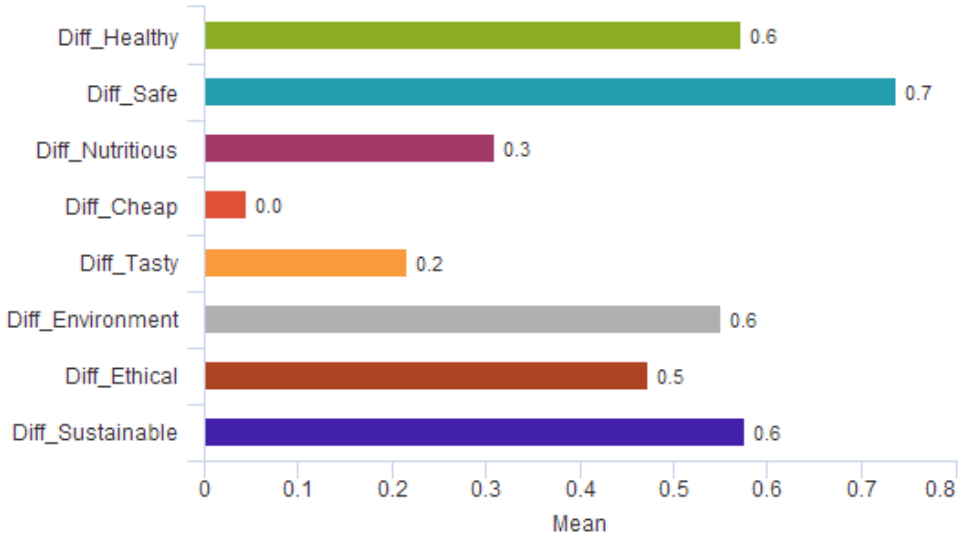

Figure 40. Changes in attitudes.

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With regard to the impact of stimuli's type on the changes in attitudes, articles presenting the health issues linked to salmon consumption have more impact on items related to health, while the articles about environmental issues have more impact on environmental items (Table 12). The impact that articles related to health have on all the items is greater than the impact caused by environmental articles. Moreover, the articles about health issues have an important impact on items related to environment and vice versa. As can be observed from the following table, the difference of impact between official and unofficial sources of information is not very relevant. Thus, the relations are not significant which means that information provided either by official or unofficial sources of information have the same impact even if the source credibility is perceived as higher for the official one. However, when crossing the changes in attitudes with the credibility scores (Figure 41), important variations can be highlighted. Like for involvement measure, categories for the total credibility have been created based on the frequency of each score: less than 24, from 24 to 25, from 26 to 27, from 28 to 29 and 30 and more. Respondents scoring 30 and more for the perceived credibility of stimuli, register a post-manipulation score for "safe" item which is 1 point lower than their pre-manipulation score. The respondents that perceived the stimuli of lower credibility (less than 24), changed their score for "safe" item only by 0.4 points (F=41.9; p-value=<0.01). For the items "cheap" and "tasty" the relation with the credibility of the stimuli is not significant.

Changes in attitudes	Stimuli				
	Health_official	Health_non_official	Environment_official	Environment_non_official	**Total**
Diff_Healthy	**0.9**	**0.9**	**0.2**	**0.3**	**0.6**
Diff_Safe	**1.1**	**1.0**	**0.4**	**0.5**	**0.7**
Diff_Nutritious	**0.4**	**0.4**	**0.2**	**0.2**	**0.3**
Diff_Cheap	0.1	0.0	0.1	0.0	**0.0**
Diff_Tasty	**0.3**	0.2	0.2	0.2	**0.2**
Diff_Environment	**0.4**	**0.4**	**0.7**	**0.7**	**0.6**
Diff_Ethical	0.4	**0.4**	**0.6**	**0.6**	**0.5**
Diff_Sustainable	**0.5**	**0.4**	**0.7**	**0.7**	**0.6**
Total	**0.5**	**0.5**	**0.4**	**0.4**	**0.4**

Diff_Healthy/Stimuli: p-value= < 0.01; Fisher= 89.8. The relationship is very significant.
Diff_Safe/Stimuli: p-value= < 0.01; Fisher= 92.1. The relationship is very significant.
Diff_Nutritious/Stimuli: p-value= < 0.01; Fisher= 17.2. The relationship is very significant.
Diff_Cheap/Stimuli: p-value= 0.6; Fisher= 0.7. The relationship is not significant.
Diff_Tasty/Stimuli: p-value= < 0.01; Fisher= 4.1. The relationship is very significant.
Diff_Environment/Stimuli: p-value= < 0.01; Fisher= 29.0. The relationship is very significant.
Diff_Ethical/Stimuli: p-value= < 0.01; Fisher= 9.6. The relationship is very significant.
Diff_Sustainable/Stimuli: p-value= < 0.01; Fisher= 30.4. The relationship is very significant.

Table 12. Changes in attitudes crossed with type of stimuli.

Involvement has a positive impact on the difference between the attitudes before and after facing the stimuli (Figure 42). As it was specified in the previous part, it's surprising that respondents that are more involved – are also the most impacted. However, the relations are weakly significant for the statements "eating salmon is safe" (F=2.0; p-value=0.1) and "eating salmon is nutritious" (F=2.5; p-value=0.1). The statement related to safety has a very important change in attitudes, while the item "nutritious" doesn't suffer much change (compared to other statements).

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Diff_Healthy/CredibilityTotal: p-value= < 0.01; Fisher= 24.9. The relationship is very significant.
Diff_Safe/CredibilityTotal: p-value= < 0.01; Fisher= 41.9. The relationship is very significant.
Diff_Nutritious/CredibilityTotal: p-value= < 0.01; Fisher= 6.5. The relationship is very significant.
Diff_Cheap/CredibilityTotal: p-value= 0.7; Fisher= 0.6. The relationship is not significant.
Diff_Tasty/CredibilityTotal: p-value= 0.4; Fisher= 1.2. The relationship is not significant.
Diff_Environment/CredibilityTotal: p-value= < 0.01; Fisher= 30.9. The relationship is very significant.
Diff_Ethical/CredibilityTotal: p-value= < 0.01; Fisher= 23.3. The relationship is very significant.
Diff_Sustainable/CredibilityTotal: p-value= < 0.01; Fisher= 31.8. The relationship is very significant.
Figure 41. Changes in attitudes crossed with source credibility.

Diff_Healthy/InvolvementTotal: p-value= < 0.01; Fisher= 7.8. The relationship is very significant.
Diff_Safe/InvolvementTotal: p-value= 0.1; Fisher= 2.0. The relationship is weakly significant.
Diff_Nutritious/InvolvementTotal: p-value= 0.1; Fisher= 2.5. The relationship is weakly significant.
Diff_Cheap/InvolvementTotal: p-value= 0.0; Fisher= 3.4. The relationship is significant.
Diff_Tasty/InvolvementTotal: p-value= 0.4; Fisher= 1.2. The relationship is not significant.
Diff_Environment/InvolvementTotal: p-value= < 0.01; Fisher= 11.3. The relationship is very significant.
Diff_Ethical/InvolvementTotal: p-value= < 0.01; Fisher= 5.1. The relationship is very significant.
Diff_Sustainable/InvolvementTotal: p-value= < 0.01; Fisher= 7.1. The relationship is very significant.
Figure 42. Changes in attitudes crossed with involvement.

Almost all the relations between the health concern score and the obtained difference in attitudes are very significant (Figure 43). Thus, people having a higher health concern decreased their attitudes more

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importantly. Respondents that have an environmental concern equal to 27 or more changed their attitude towards the statement "eating salmon is healthy" with 0.7 points. For the respondents with a low health concern (less than 23), the score for this item decreased with only 0.4 points. Moreover, the same impact of the health concern score is observed on items related to environmental aspects of salmon consumption.

As it can be noticed from the Figure 44, individuals with higher environmental concern, decrease their attitudes more significantly than those with a lower environmental concern score. Like for the previous crossed analysis, the environmental concern score is in relation with both: environmental items and health items.

Unsurprisingly, consumers which are more concerned about their health and prove a higher interest for environment issues, represent the most motivated consumers to be more attentive when choosing fish and to pay additionally for fish products obtained through non-damaging catching methods or for organic labelled farmed fish (Mauracher *et al*., 2013; Stefani *et al*., 2012)

Diff_Healthy/HealthConcernTotal: p-value= < 0.01; Fisher= 12.4. The relationship is very significant.
Diff_Safe/HealthConcernTotal: p-value= < 0.01; Fisher= 12.1. The relationship is very significant.
Diff_Nutritious/HealthConcernTotal: p-value= < 0.01; Fisher= 4.7. The relationship is very significant.
Diff_Cheap/HealthConcernTotal: p-value= 0.0; Fisher= 3.4. The relationship is significant.
Diff_Tasty/HealthConcernTotal: p-value= 0.6; Fisher= 0.8. The relationship is not significant.
Diff_Environment/HealthConcernTotal: p-value= < 0.01; Fisher= 11.2. The relationship is very significant.
Diff_Ethical/HealthConcernTotal: p-value= < 0.01; Fisher= 7.1. The relationship is very significant.
Diff_Sustainable/HealthConcernTotal: p-value= < 0.01; Fisher= 9.8. The relationship is very significant.
Figure 43. Changes in attitudes crossed with health concern.

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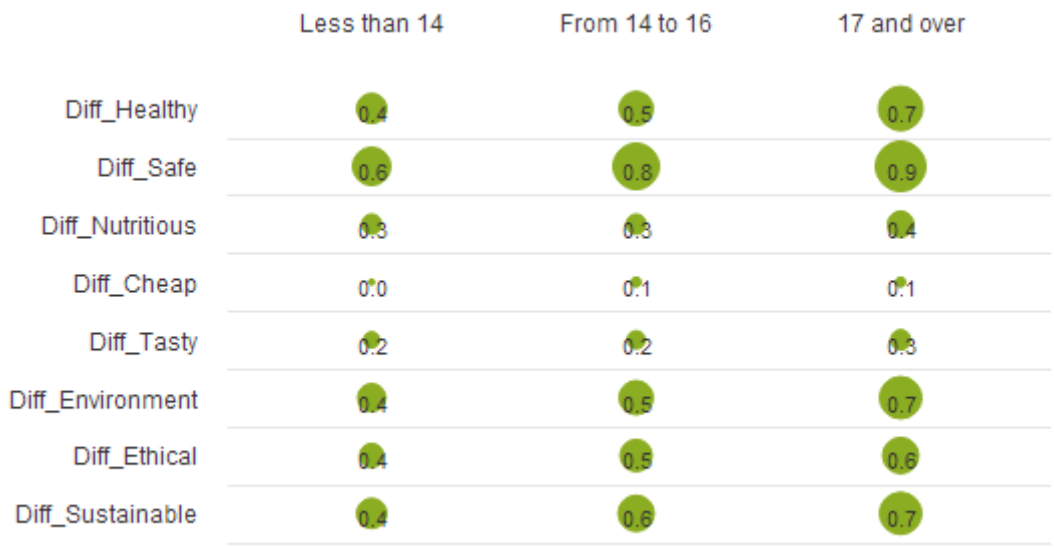

Diff_Healthy/EnvironmentalConcernTotal: p-value= < 0.01; Fisher= 6.8. The relationship is very significant.
Diff_Safe/EnvironmentalConcernTotal: p-value= < 0.01; Fisher= 8.5. The relationship is very significant.
Diff_Nutritious/EnvironmentalConcernTotal: p-value= 0.0; Fisher= 2.8. The relationship is significant.
Diff_Cheap/EnvironmentalConcernTotal: p-value= 0.3; Fisher= 1.4. The relationship is not significant.
Diff_Tasty/EnvironmentalConcernTotal: p-value= 0.4; Fisher= 1.3. The relationship is not significant.
Diff_Environment/EnvironmentalConcernTptal: p-value= < 0.01; Fisher= 12.0. The relationship is very significant.
Diff_Ethical/EnvironmentalConcernTotal: p-value= < 0.01; Fisher= 6.7. The relationship is very significant.
Diff_Sustainable/EnvironmentalConcernTotal: p-value= < 0.01; Fisher= 11.4. The relationship is very significant.
Figure 44. Changes in attitudes crossed with environmental concern.

3.2.8. Wall of pictures: implicit measure of attitudes

With regard to the implicit measure of attitudes, 55% of respondents have chosen the picture representing salmon fillet in a heart shape (Figure 45). The majority of verbatim related to this picture precise the fact that salmon is good for health in general and especially for heart health: "Salmon is good for your heart health"; "It's healthier than meat. It has benefits for the heart. I love salmon"; "It's a heart. Salmon is great for omega 3 fatty acids, which is great for the body". Burger and Gochfeld (2009) and Grieger *et al.* (2012) obtained very similar in their studies when asking about health benefits of fish consumption.

Another picture which was chosen by an important number of respondents (31%) is representing a bear eating fresh salmon from the river. This picture revealed associations about the healthiness of wild salmon: "It represents wild salmon, as it should be consumed"; "The salmon should be more natural"; "Wildlife depends on spawning salmon".

The picture representing 10 healthy products was chosen by 23.4% of respondents. The main argument for selecting this picture is the fact that salmon is a part of a healthy diet. Specific verbatim for this picture are: "These foods represent the food groups that people should eat from as they provide valuable nutrients. Also, salmon goes very well with broccoli…"; "I selected this picture because it's a representation of what I should be eating for a healthy life"; "Picture of healthy foods of which oily fish like salmon is a part"; "Fish is very nutritious as it is a good source of protein. It's low in fat, and contains DHA, EPA fats which are very good for health".

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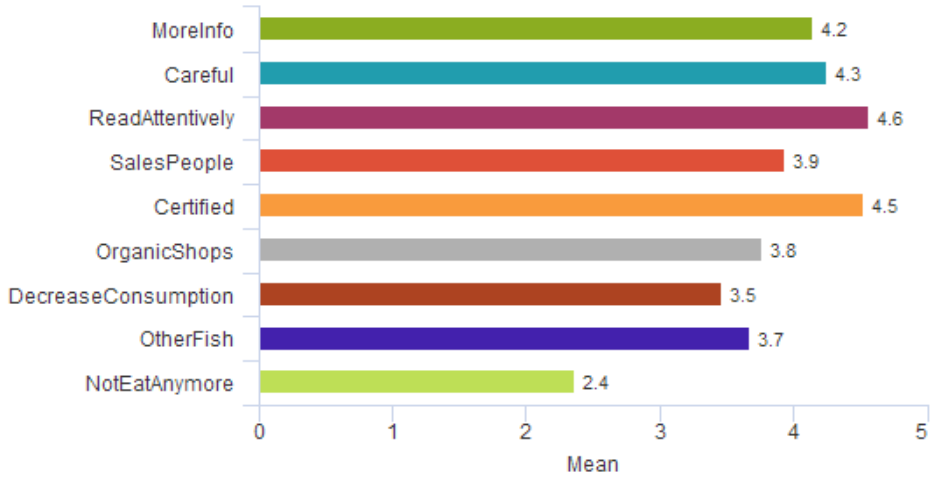
Figure 45. The most chosen pictures in wall of pictures question.

The less chosen picture is presented in the Figure 46. Only 3.4% of respondents associate fish consumption with something not tasty: "Not a fan of the taste"; "Nasty taste".

Figure 46. The less chosen pictures in wall of pictures question.

3.2.9. Intentions

Further, the analysis of the article impact on intentions was effectuated. The highest scores are obtained for the statements: "After reading this article I will read more attentively the information presented on the salmon packaging/etiquette" (4.6) and "…choose more often certified/labelled salmon" (4.5) (Figure 47). The statements that obtained the lowest scores are: "…not eat salmon anymore" (2.4) and "…decrease my consumption of salmon" (3.5). The mean value for all the 9 statements is 3.9; it means that respondents are closer to somehow agree with all the possible future intentions. The Cronbach's Alpha for this construct is 0.8. These statements can be divided in three categories: intentions related to information seeking (first four statements), intentions related to certification seeking ("…choose more often certified/labelled salmon" and "…buy more often salmon in organic sections/shops") and intentions related to diet change (last three statements). The mean values for each of these constructs are presented in Figure 48.



Cronbach's Alpha: 0.8

Figure 47. Intentions

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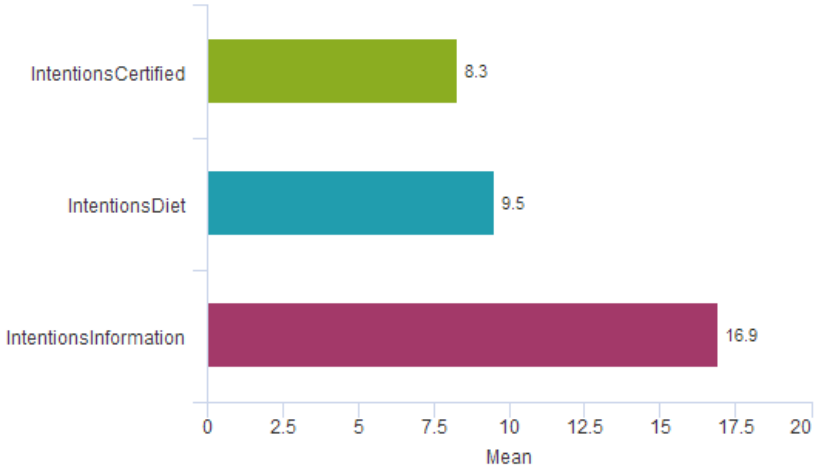

Figure 48. Intentions on three major categories.

Figure 49 presents another way of looking at the intentions. Thus, almost 30% of respondents have a very high total score for intentions (39 and over), which can be translated as responding at least "somehow agree" at all the nine statements. Respondents having the total score lower than 31 (26%) somehow disagreed with all the proposed statements. Individuals having between 31 and 38 points as a score for intentions represent almost 45% from the total. Thus, the majority of respondents will consider making some changes in their future way of buying, choosing and consuming salmon.

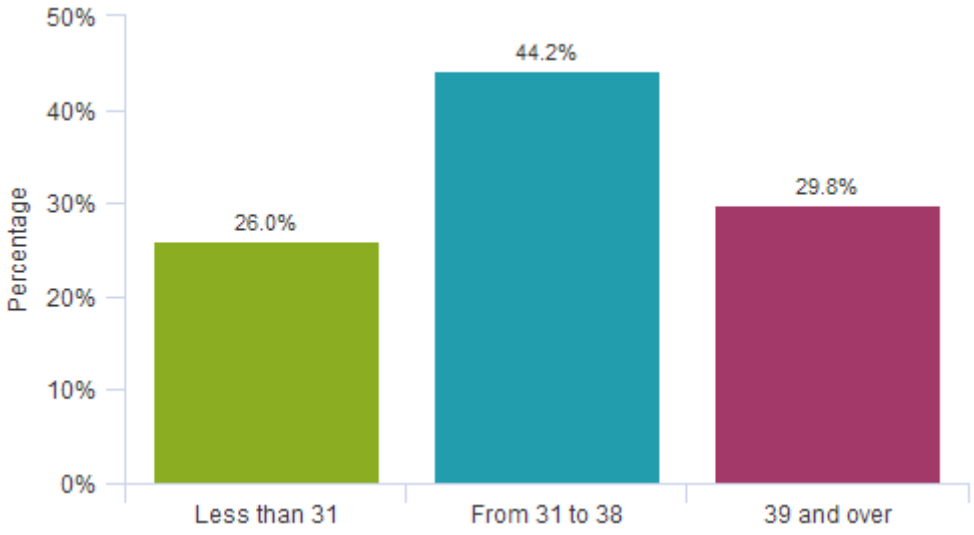

Figure 49. Frequencies of intention scores.

With regard to the type of stimuli, there is no significant difference in intentions (Figure 50). It means that the aim to change the diet habits or to pay more attention to the information presented on packaging is not impacted by the topic of negative message (health or environment) or by its source.

Figure 51 presents the cross results between the intentions and changes in attitudes. Consistently higher changes in attitudes determine bigger scores for the future intentions. This fact is especially observable for the statement "after reading this article I will decrease my consumption of salmon". ($F=75.2$; p-value=<0.01). Both, health concern (Figure 52) and environmental concerns (Figure 53) have very significant relations with the intentions scores.

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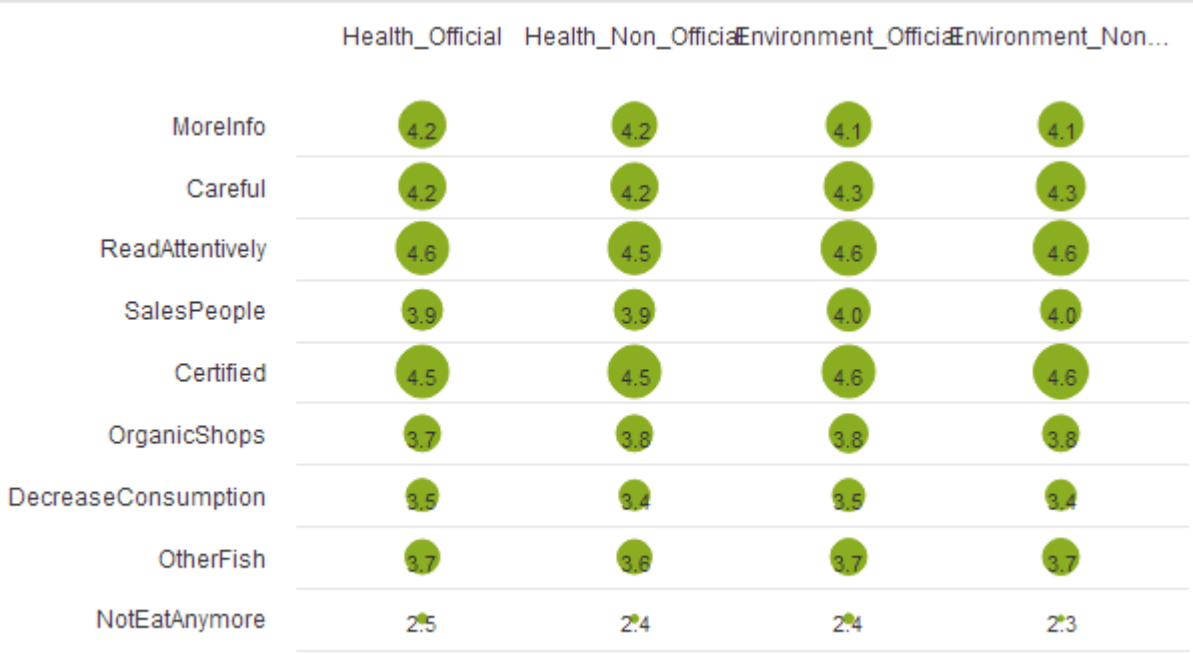
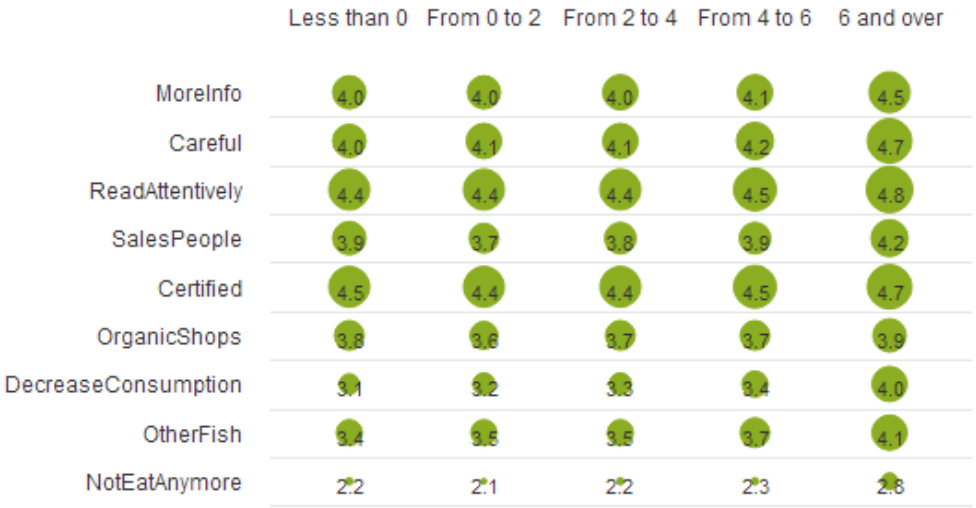


MoreInfo/Stimuli: p-value= 0.1; Fisher= 2.8. The relationship is weakly significant.
Careful/Stimuli: p-value= 0.1; Fisher= 2.1. The relationship is weakly significant.
ReadAttentively/Stimuli: p-value= 0.7; Fisher= 0.3. The relationship is not significant.
SalesPeople/Stimuli: p-value= 0.4; Fisher= 1.2. The relationship is not significant.
Certified/Stimuli: p-value= 0.3; Fisher= 1.4. The relationship is not significant.
OrganicShops/Stimuli: p-value= 0.7; Fisher= 0.3. The relationship is not significant.
DecreaseConsumption/Stimuli: p-value= 0.3; Fisher= 1.3. The relationship is not significant.
OtherFish/Stimuli: p-value= 0.3; Fisher= 1.5. The relationship is not significant.
NotEatAnymore/Stimuli: p-value= 0.0; Fisher= 3.3. The relationship is significant.

Figure 50. Intentions crossed with type of stimuli.



MoreInfo/TotalChanges: p-value= < 0.01; Fisher= 24.6. The relationship is very significant.
Careful/TotalChanges: p-value= < 0.01; Fisher= 48.1. The relationship is very significant.
ReadAttentively/TotalChanges: p-value= < 0.01; Fisher= 24.5. The relationship is very significant.
SalesPeople/TotalChanges: p-value= < 0.01; Fisher= 18.5. The relationship is very significant.
Certified/TotalChanges: p-value= < 0.01; Fisher= 10.2. The relationship is very significant.
OrganicShops/TotalChanges: p-value= < 0.01; Fisher= 9.3. The relationship is very significant.
DecreaseConsumption/TotalChanges: p-value= < 0.01; Fisher= 75.2. The relationship is very significant.
OtherFish/TotalChanges: p-value= < 0.01; Fisher= 51.0. The relationship is very significant.
NotEatAnymore/TotalChanges: p-value= < 0.01; Fisher= 40.1. The relationship is very significant.

Figure 51. Intentions crossed with changes in attitudes.

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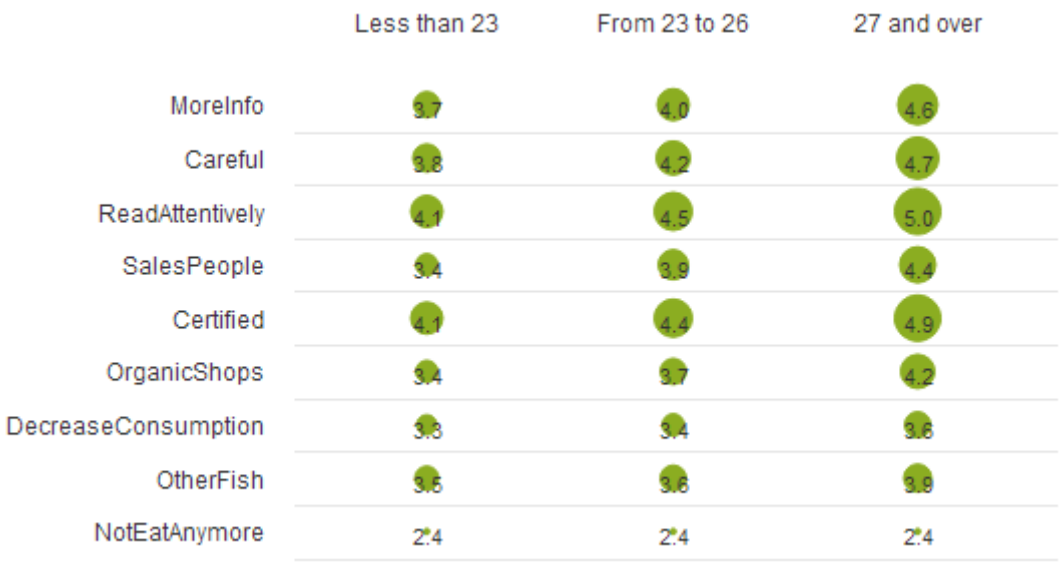
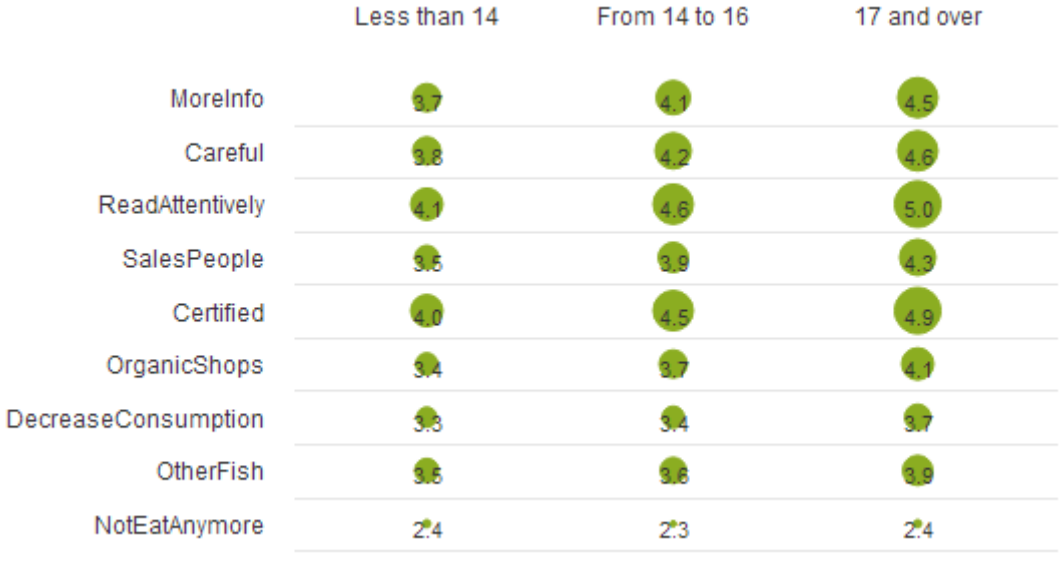


MoreInfo/HealthConcern: p-value= < 0.01; Fisher= 97.4. The relationship is very significant.
Careful/HealthConcern: p-value= < 0.01; Fisher= 83.9. The relationship is very significant.
ReadAttentively/HealthConcern: p-value= < 0.01; Fisher= 105.4. The relationship is very significant.
SalesPeople/HealthConcern: p-value= < 0.01; Fisher= 81.1. The relationship is very significant.
Certified/HealthConcern: p-value= < 0.01; Fisher= 81.2. The relationship is very significant.
OrganicShops/HealthConcern: p-value= < 0.01; Fisher= 61.0. The relationship is very significant.
DecreaseConsumption/HealthConcern: p-value= < 0.01; Fisher= 18.1. The relationship is very significant.
OtherFish/HealthConcern: p-value= < 0.01; Fisher= 15.1. The relationship is very significant.
NotEatAnymore/HealthConcern: p-value= 0.0; Fisher= 3.2. The relationship is significant.

Figure 52. Intentions crossed with health concern.



MoreInfo/EnvironmentalConcern: p-value= < 0.01; Fisher= 66.6. The relationship is very significant.
Careful/EnvironmentalConcern: p-value= < 0.01; Fisher= 74.0. The relationship is very significant.
ReadAttentively/EnvironmentalConcern: p-value= < 0.01; Fisher= 106.8. The relationship is very significant.
SalesPeople/EnvironmentalConcern: p-value= < 0.01; Fisher= 56.5. The relationship is very significant.
Certified/EnvironmentalConcern: p-value= < 0.01; Fisher= 102.2. The relationship is very significant.
OrganicShops/EnvironmentalConcern: p-value= < 0.01; Fisher= 50.4. The relationship is very significant.
DecreaseConsumption/EnvironmentalConcern: p-value= < 0.01; Fisher= 15.2. The relationship is very significant.
OtherFish/EnvironmentalConcern: p-value= < 0.01; Fisher= 17.2. The relationship is very significant.
NotEatAnymore/EnvironmentalConcern: p-value= 0.8; Fisher= 0.7. The relationship is not significant.

Figure 53. Intentions crossed with environmental concern.

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3.2.10. Rank of labelled products

After reading the article, respondents were also asked to rank four salmon fillets in order of their preference. The only difference between the different pieces of salmon is the presence/absence of the label and the type of label. The majority of respondents (42.3%) chose the salmon having an EU bio label as the most preferred product (Figure 54). The product having an MSC label was ranked on first position by 39.3%, while the salmon labelled ASC gathered only 13.5% of responses for the position of the most preferred product. Less than 5% of respondents placed the salmon without label on the first position.

With regard to the incidence of each labelled product depending on the type of stimuli that the respondents faced (Figure 55), the product having EU bio label was mostly chosen by the individuals who had to read the article about the negative impact of salmon consumption on health. The article about the negative environmental impact determined the respondents to prefer the salmon having an MSC label. The product without label was mostly chosen by the individuals who faced the health oriented information coming from official source of information.

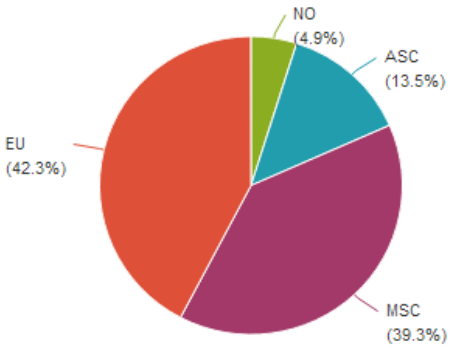
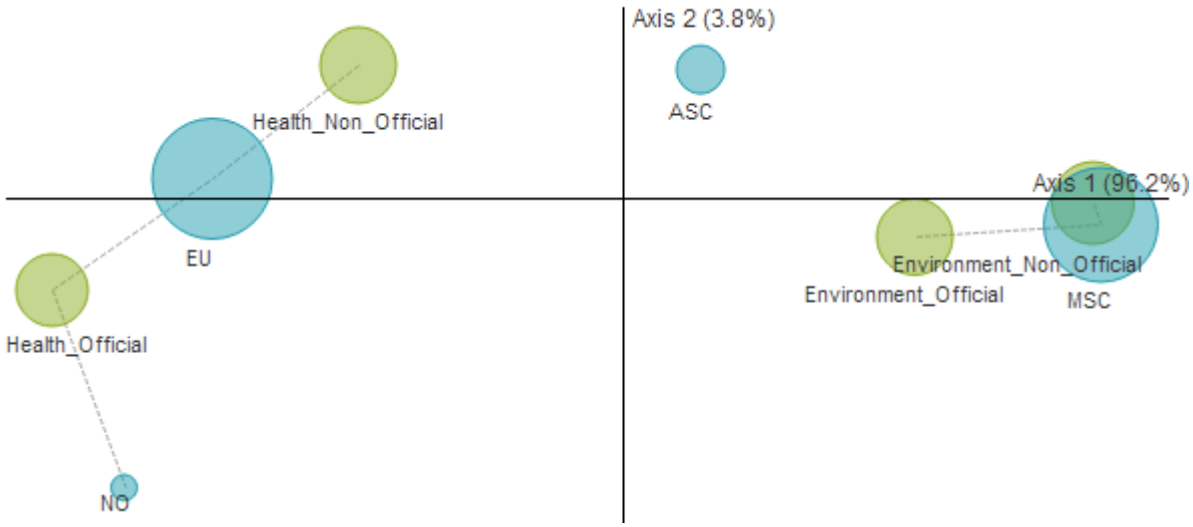


Figure 54. Frequencies of labels at rank 1.



Statistical results

The correspondence map renders **100.0%** of information, divided into **96.2%** horizontally (F1) and **3.8%** vertically (F2). The proximity or the distance between elements visualizes the associations over or under-represented.

p-value= < 0.01; Chi2= 53.9; dof=9. The relationship is very significant.

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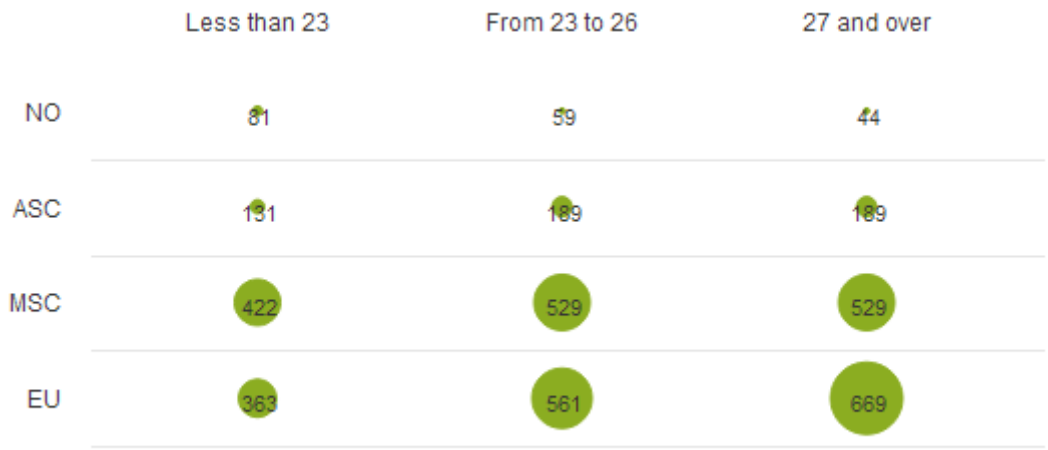
Figure 55. Frequencies of labels on rank 1 crossed with type of stimuli.

The relation between the chosen label and the involvement is weak as the MSC and EU bio label are chosen the more frequently across all the 5 categories of involvement. As it can be observed from the Figure 56, the product without label is mostly chosen (81 respondents) by the respondents registering the lowest health concern, while those registering the highest health concern picked the salmon with bio label. The ASC label is chosen the most frequently by the respondents having an environmental concern score above 17 (Figure 57). The product without label is chosen the most frequently (102 respondents) by individuals registering a low environmental concern.



p-value= < 0.0 ; Chi2= 51.5; dof= 6. The relationship is very significant.
Figure 56. Frequencies of labels at rank 1 crossed with health concern.

p-value= < 0.01 ; Chi2= 63.9 ; dof= 6. The relationship is very significant.
Figure 57. Frequencies of labels at rank 1 crossed with environmental concern.

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4. Conclusion

Over the last years, the amount of studies which analyse consumer behaviour towards fish have significantly increased. This topic received higher interest due to the major increase of fish consumption and (no less important) the decrease of world's natural fish stocks. Some studies took an interest in barriers of fish consumption because the recommended two portions of fish per week are rarely respected. Understanding the determinants of fish consumption is very important for "political and economic reasons related to aspects of nutrition and diet, food safety, sustainability and business of fish industry" (Carlucci *et al*., 2015, p.213).

Generally, researchers insist on consumers' perceptions regarding the benefits associated with fish consumption. Very few studies analysed the consumers' knowledge of risks related to fish consumption. Furthermore, in the context of actual marine pollution, it is important to identify if consumers' behaviour can be influenced by an article about fish contamination. That's why the purpose of this study was to investigate if negative information regarding fish consumption can affect consumer's perception and intention to eat fish. Furthermore, it examined if there is different impact according to the content of communicated message and the credibility of source of information.

In order to respond to those questions, survey data were collected through questionnaires with an experimental message design. Before reading the risk message, the respondents were asked about their fish consumption frequency and to rank on a six-points Likert scale their attitudes regarding salmon consumption. Measures of involvement, health and environmental concern also have been introduced. After having read the message, the respondents were asked again about their attitudes, the main objective being to observe the difference between the attitudes before and after facing the negative information. They were also asked about their future intentions regarding salmon consumption. The final step was to cross the responses regarding the change in attitudes and the type of stimuli in order to highlight the possible differences in perception.

According to the obtained results, the negative information about salmon consumption change consumers' attitudes, in fact it decreases the consumer's evaluation of positive attributes linked to salmon consumption. Thus the attitudes related to health aspects (healthy and safe) decrease by 13.5%, while the attitudes related to environmental aspects (good for environment, ethical, sustainable) decrease by 14.4%. The different message sources don't play a role in consumers' attitudes change or intentions. The majority of respondents are predisposed to be more attentive when choosing fish, which means that they will pay attention to the country of origin, production method and the possible amount of contaminants etc. According to Verbeke (2005) the perception regarding additional information is higher when this information concerns potential negative effects compared to potential positive effects. However, the intention to decrease salmon consumption is not very common, and the idea of stopping eating salmon is not accepted neither. Those results are in accordance with the findings of Verbeke *et al.* (2008): a risk message caused a strong decrease on fish attribute perception, while the intention to eat fish decreased by only 8%. Furthermore, 68% of Taiwanese women of childbearing age did not decrease their fish consumption even after being informed that the high level of mercury may be dangerous for unborn babies (Chien *et al*., 2010). The consumers have a very positive image about salmon consumption and a negative message can't totally "ruin" it.

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7. Appendix 1. Presentation of the stimuli.

France

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Consommation de saumon: entre surpêche et aquaculture dangereuse

Partager Tweeter Publier Imprimer

Le Mercredi 12 juillet 2017

Les populations de saumons sauvages sont menacées par diverses activités humaines. Des décennies de pollution de l'eau douce et de destruction de l'habitat ont produit leurs effets, tout comme la surpêche extensive et l'élevage irresponsable du saumon en mer. Selon des études scientifiques récentes, les populations de saumons pourraient faire face à des extinctions localisées dans moins de 5 ans.

Alors que la population de saumons sauvages diminue régulièrement, il y a une augmentation considérable de la production de saumons d'élevage. Malheureusement, tout en satisfaisant la forte demande du marché pour cette espèce, l'aquaculture a également un impact négatif sur l'environnement. L'utilisation intensive d'antibiotiques pour le saumon en aquaculture affecte négativement la faune à proximité de l'élevage. On dénote aussi de nombreux cas où les saumons d'élevage s'échappent de leurs cages, dans les eaux ouvertes, ce qui entraine une dégradation de l'écosystème.

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Consommation de saumon: entre surpêche et aquaculture dangereuse

Publiée le 12 juillet 2017 à 00:00 dans Actualité de la biodiversité

Les populations de saumons sauvages sont menacées par diverses activités humaines. Des décennies de pollution de l'eau douce et de destruction de l'habitat ont produit leurs effets, tout comme la surpêche extensive et l'élevage irresponsable du saumon en mer. Selon des études scientifiques récentes, les populations de saumons pourraient faire face à des extinctions localisées dans moins de 5 ans.

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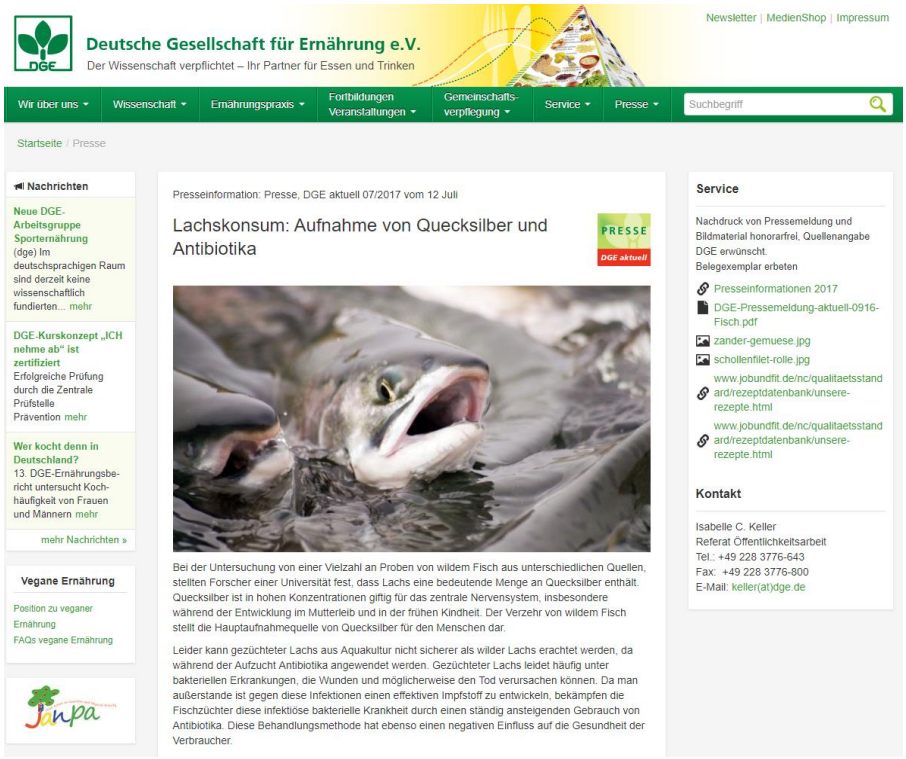

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Lachskonsum: Aufnahme von Quecksilber und Antibiotika

PRESSE DGE aktuell

Bei der Untersuchung von einer Vielzahl an Proben von wildem Fisch aus unterschiedlichen Quellen, stellten Forscher einer Universität fest, dass Lachs eine bedeutende Menge an Quecksilber enthält. Quecksilber ist in hohen Konzentrationen giftig für das zentrale Nervensystem, insbesondere während der Entwicklung im Mutterleib und in der frühen Kindheit. Der Verzehr von wildem Fisch stellt die Hauptaufnahmequelle von Quecksilber für den Menschen dar.

Leider kann gezüchteter Lachs aus Aquakultur nicht sicherer als wilder Lachs erachtet werden, da während der Aufzucht Antibiotika angewendet werden. Gezüchteter Lachs leidet häufig unter bakteriellen Erkrankungen, die Wunden und möglicherweise den Tod verursachen können. Da man außerstande ist gegen diese Infektionen einen effektiven Impfstoff zu entwickeln, bekämpfen die Fischzüchter diese infektiöse bakterielle Krankheit durch einen ständig ansteigenden Gebrauch von Antibiotika. Diese Behandlungsmethode hat ebenso einen negativen Einfluss auf die Gesundheit der Verbraucher.

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Lachskonsum: Aufnahme von Quecksilber und Antibiotika

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(AutorIn: B. Kerschner, Review: J. Wipplinger, C. Christof)

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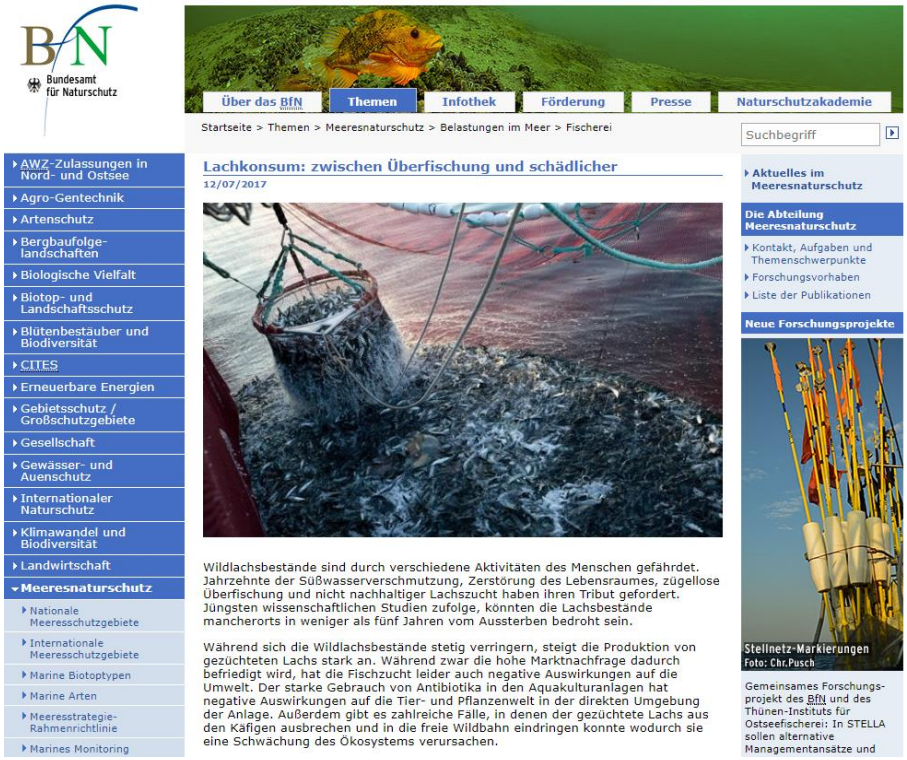

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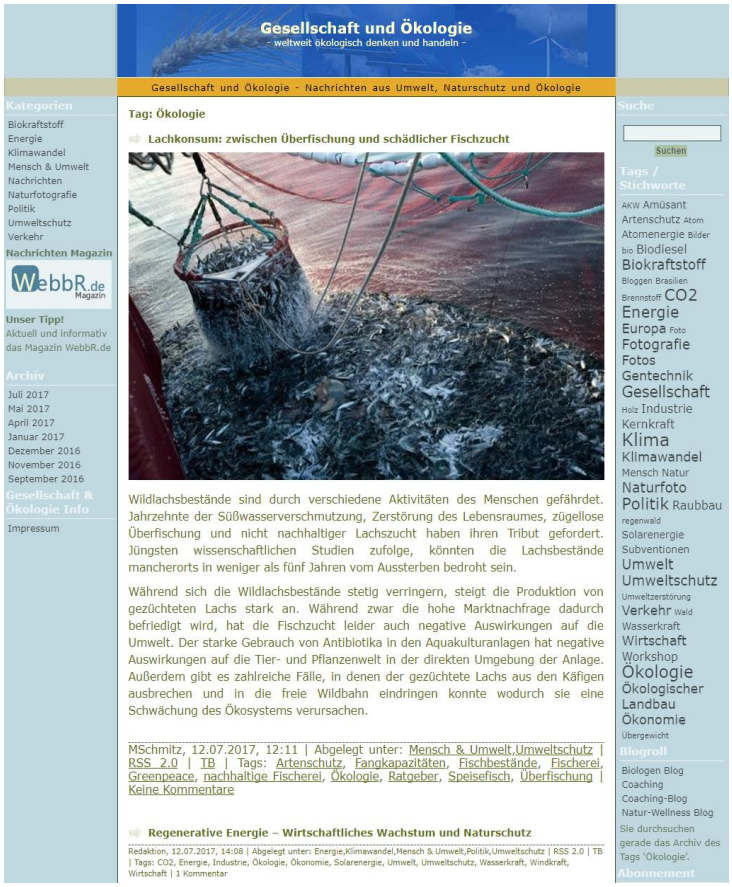

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Notizie » Consumo di salmone: tra la pesca eccessiva e i pericoli dell'allevamento

CONSUMO DI SALMONE: TRA LA PESCA ECCESSIVA E I PERICOLI DELL'ALLEVAMENTO

Le popolazioni di salmone selvatico sono sotto la minaccia di una vasta gamma di attività umane. Hanno pesato decenni di inquinamento delle acque dolci, distruzione degli habitat, pesca eccessiva e pratiche non sostenibili di allevamento di salmoni in mare. Secondo recenti studi scientifici, le popolazioni di salmone potrebbero essere oggetto di fenomeni di estinzione localizzata in meno di 5 anni.

Mentre la popolazione di salmone selvatico sta diminuendo costantemente, si assiste a un enorme aumento della produzione di salmone allevato. Purtroppo, pur soddisfacendo l'elevata domanda di mercato per questa specie, l'allevamento ittico ha anche un impatto negativo sull'ambiente. L'uso pesante di antibiotici negli allevamenti di salmone ha effetti negativi sulla fauna selvatica nelle vicinanze dell'allevamento. Si sono registrati anche numerosi casi di salmoni d'allevamento fuggiti dalle loro gabbie ed entrati nell'ambiente selvatico dove sono causa di degrado dell'ecosistema.

Aree Territorio 12/07/2017

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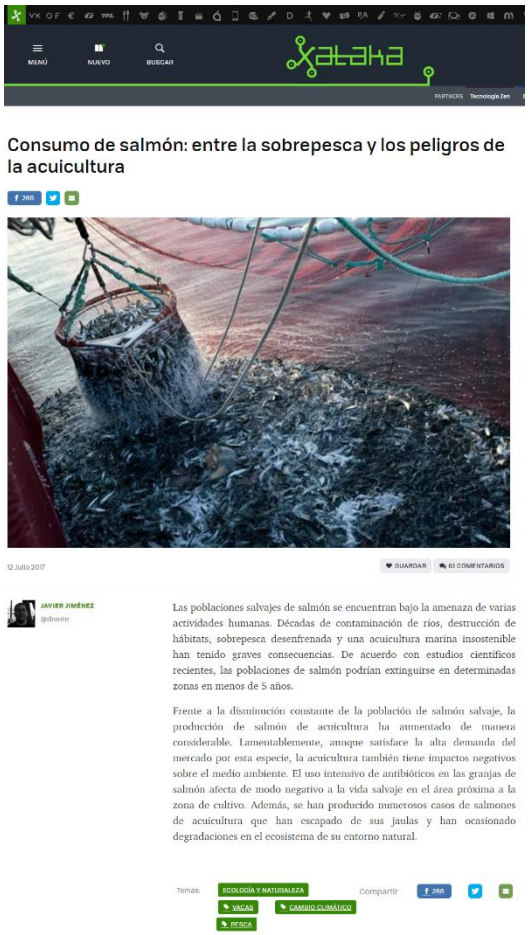

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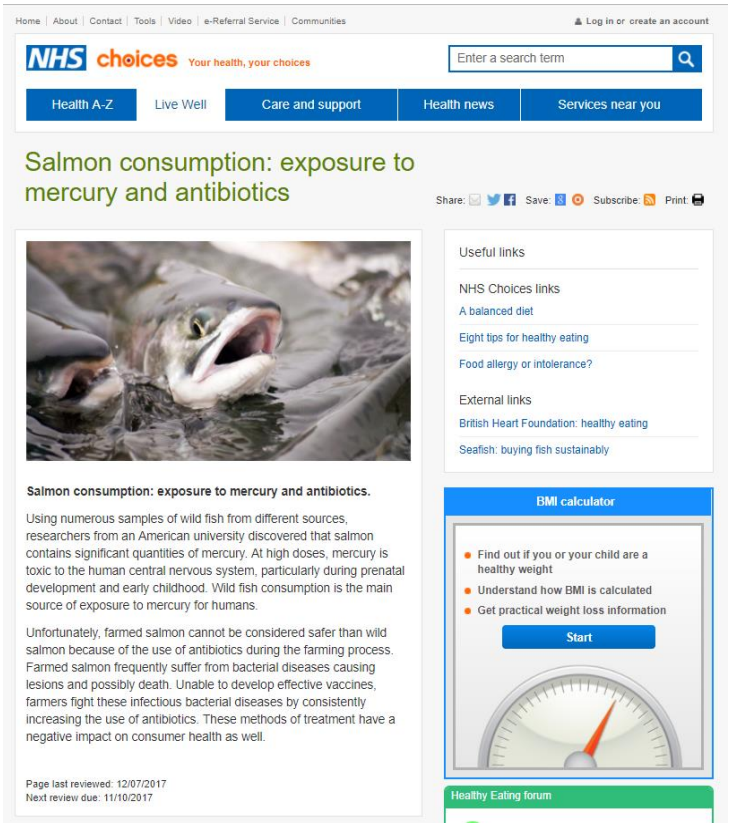

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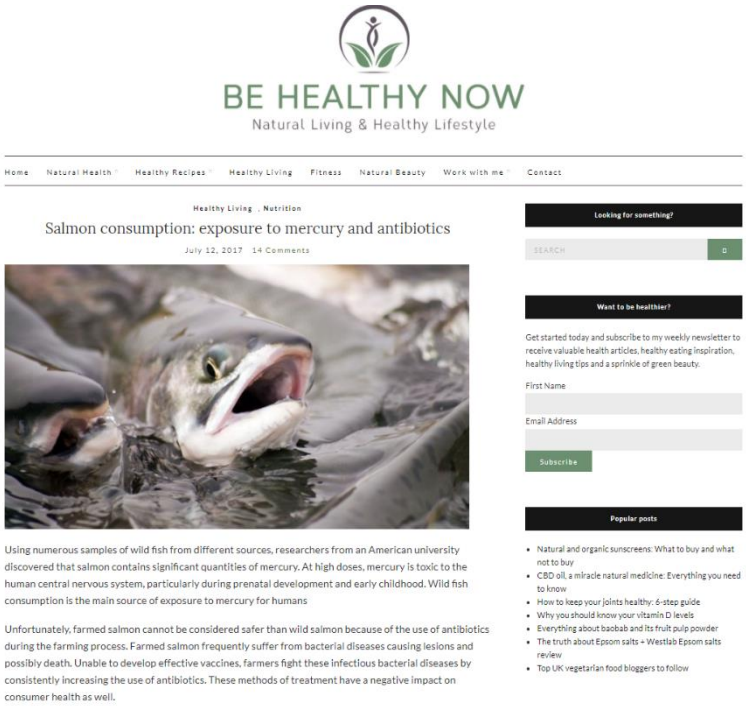

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Press release

Salmon consumption: between overfishing and dangerous farming

From: Environment Agency
Part of: Environmental quality
Published: 12 July 2017

Wild salmon populations are under threat from a variety of human activities. Decades of freshwater pollution, habitat destruction, rampant over-fishing and unsustainable marine salmon farming have taken their toll. According to recent scientific studies, salmon populations could face localized extinction in less than 5 years.

While the population of wild salmon is steadily decreasing, there is a huge increase in the production of farmed salmon. Unfortunately, while satisfying the high market demand for this species, fish farming also has negative impact on the environment. The heavy use of antibiotics on salmon farms negatively affects the wildlife in the vicinity of the farm. There were also numerous cases of farmed salmon escaping their cages and entering the wild environment where they cause ecosystem degradation.

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SALMON CONSUMPTION: BETWEEN OVERFISHING AND DANGEROUS FARMING

July 12, 2017 · by orionmcc · in Conservation Policy, Fisheries, Marine Conservation · 7 Comments

By Orion McCarthy

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Take Home Message: *Strong fishery laws such as the Magnuson-Stevens Act help to safeguard seafood resources and prevent overfishing. Other countries around the world should enact similar legislation encouraging scientific fisheries management to stem global overfishing. You can help stop overfishing by becoming an educated consumer and purchasing sustainable seafood.*

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8. Appendix 2. Questionnaire N° 1 (example for United Kingdom)

Introduction

Dear Madam, dear Sir,

We are international researchers working on PrimeFish, an EU-funded project in the Horizon 2020 framework involving sixteen research centers from all over Europe. The objective of our project is to consolidate and increase the economic sustainability and competitiveness of the European fish industry in local and global markets.

Your contribution is crucial to the success of our research. For this reason, we would greatly appreciate your commitment to participate in our survey which consists of 2 steps. This questionnaire (of 7-8 minutes) represents the first step of the survey. The second step will be the completion of another questionnaire (of 5-6 minutes) that we will send you in 7-14 days.

PLEASE ANSWER this first questionnaire ONLY IF you are available to answer the second step-questionnaire. If you answer only the first questionnaire, you will not receive any incentive: incentive is given at the end of the second step.

The data gathered within the project is completely anonymous and will be evaluated only by doctoral candidates, professors and researchers.

Thank you for your participation.

Kind regards,

S. Ganassali - sgana@univ-smb.fr

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Fish/salmon consumption

1. Do you consume fish in any form (fresh, frozen, smoked, canned, ready to eat, etc...) at home, at restaurants and other food outlets (canteens, bars, etc.)?
    a. Yes
    b. No

2. Please indicate how often you consume fish in any format (fresh, frozen, smoked, canned, ready to eat, etc...) at home, at restaurants and other food outlets (canteens, bars, etc.).
    a. Few times a year
    b. Once a month
    c. 2-3 times a month
    d. 1-2 times a week
    e. 3-4 times a week
    f. Almost every day

3. Do you consume fish in any form (fresh, frozen, smoked, canned, ready to eat, etc...) at home, at restaurants and other food outlets (canteens, bars, etc.)?
    a. Yes

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b. No (STOP)

4. Please indicate how often you consume salmon in any format (fresh, frozen, smoked, canned, ready to eat, etc...) at home, at restaurants and other food outlets (canteens, bars, etc.).
    a. Few times a year
    b. Once a month
    c. 2-3 times a month
    d. 1-2 times a week
    e. 3-4 times a week
    f. Almost every day

Socio-demographics

5. Please indicate your gender
    a. Male
    b. Female

6. Please indicate your age category
    a. Less than 18 years old
    b. 18 to 24 years old
    c. 25 to 34 years old
    d. 35 to 54 years old
    e. 55 to 74 years old
    f. More than 74 years old

7. Now, please indicate your age ☐

8. Please indicate where you live (country).
    a. United Kingdom
    b. Other

9. Please indicate in which of the following geographical areas you live
    a. North East
    b. North West
    c. Yorkshire and The Humber
    d. East Midlands
    e. West Midlands
    f. East of England
    g. London
    h. South East
    i. South West
    j. Wales
    k. Scotland
    l. Northern Ireland

10. Does the council area in which you live have a coastline?

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a. Yes
b. No

11. Please indicate in which kind of area you live.
    a. Rural (<5.000 inhabitants)
    b. Intermediate (5.000 – 50.000 inhabitants)
    c. Urban (>50.000 inhabitants)

12. What is the highest level of education that you have achieved?
    1. Lower secondary education or below
    2. Upper secondary education
    3. University or college qualification below a degree
    4. Bachelor's or equivalent level
    5. Postgraduate with master or doctoral degree

13. What is your current employment status?
    a. Full-time
    b. Part-time
    c. Self-employed
    d. Homemaker
    e. Retired
    f. Student
    g. Unemployed
    h. Other

14. How many persons live in your household (including you)?

15. How many children (<18 years old) live in your household?

16. What is your net household monthly income?
    a. Less than £ 1.000
    b. £ 1.000 to £ 1.599
    c. £ 1.600 to £ 2.199
    d. £ 2.200 to £ 2.999
    e. £ 3.000 to £ 4.999
    f. £ 5.000 or more
    g. I do not know/ do not want to answer

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Attitude towards salmon consumption

17. Below, attributes of fish consumption are displayed. For each characteristic, please select the point that best describes your perceptions when eating salmon.

Eating salmon is:					
Very unhealthy	Unhealthy	Somewhat unhealthy	Somewhat healthy	Healthy	Very healthy
Very unsafe	Unsafe	Somewhat unsafe	Somewhat safe	Safe	Very safe
Not nutritious at all	Not nutritious	Somewhat not nutritious	Somewhat nutritious	Nutritious	Very nutritious
Salmon is:					
Very expensive	Expensive	Somewhat expensive	Somewhat cheap	Cheap	Very cheap
Not tasty at all	Not tasty	Somewhat not tasty	Somewhat tasty	Tasty	Very tasty
Consuming salmon is:					
Very bad for environment	Bad for environment	Somewhat bad for environment	Somewhat good for environment	Good for environment	Very good for environment
Very unethical	Unethical	Somewhat unethical	Somewhat ethical	Ethical	Very ethical
A very unsustainable consumption behaviour	An unsustainable consumption behaviour	Somewhat an unsustainable consumption behaviour	Somewhat a sustainable consumption behaviour	A sustainable consumption behaviour	A very sustainable consumption behaviour

Involvement

18. Please indicate your opinion for the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
I'm interested in salmon (as food).						
I enjoy eating salmon.						
The (type of) salmon I buy reflects the sort of person I am.						
If I make a mistake when purchasing salmon, the consequences are important to me.						
Choosing a salmon is difficult.						

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Changes in salmon consumption

19. How has your salmon consumption changed over the past three years?
    a. Strongly decreased
    b. Moderately decreased
    c. Slightly decreased
    d. Stayed the same
    e. Slightly increased
    f. Moderately increased
    g. Strongly increased

20. Please rank 3 (1-being the most important, 3-the less important) of the following variables which have particularly affected your salmon consumption mostly during the past three years.
    a. Income
    b. Available time for cooking
    c. Fish prices
    d. Better health awareness
    e. Availability of fish
    f. Variety of fish choices
    g. Improved knowledge in selecting
    h. Improved knowledge in cooking fish
    i. A raising trend of eating fish
    j. Changes in the household composition
    k. Other

Environmental concern

21. Please indicate your opinion for the following statements:

It is important to me that the salmon I eat on a typical day…						
	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
has been produced in a way which has not polluted the sea or the other environments.						
has been caught in an environmentally-friendly way.						
is not threatened by over-fishing and loss species on the border of extinction.						

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Health concern

22. Please indicate your opinion for the following statements:

	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
It means a lot to me to have good health.						
Good health is important to me.						
I often think about my health.						
I think of myself as a person who is concerned about healthy food.						
I am very concerned about the health related consequences of what I eat.						

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9. Appendix 3. Questionnaire N° 2 (example for United Kingdom)

Introduction

Dear Madam, dear Sir,

Several days ago you took part in the first step of the survey conducted within PrimeFish project. As mentioned in the introduction of that questionnaire, the survey is composed of 2 steps, this questionnaire being the second step. Please read attentively the article that will be presented on the next page and answer the questions which follow.

Thank you for your participation.

Kind regards,

S. Ganassali - sgana@univ-smb.fr

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Socio-demographics

1. Please indicate your gender
    a. Male
    b. Female

2. Please indicate your age category
    a. Less than 18 years old
    b. 18 to 24 years old
    c. 25 to 34 years old
    d. 35 to 54 years old
    e. 55 to 74 years old
    f. More than 74 years old

3. Please indicate where you live (country).
    a. United Kingdom
    b. Other

4. Please indicate in which of the following geographical areas you live
    a. North East
    b. North West
    c. Yorkshire and The Humber
    d. East Midlands
    e. West Midlands
    f. East of England
    g. London
    h. South East

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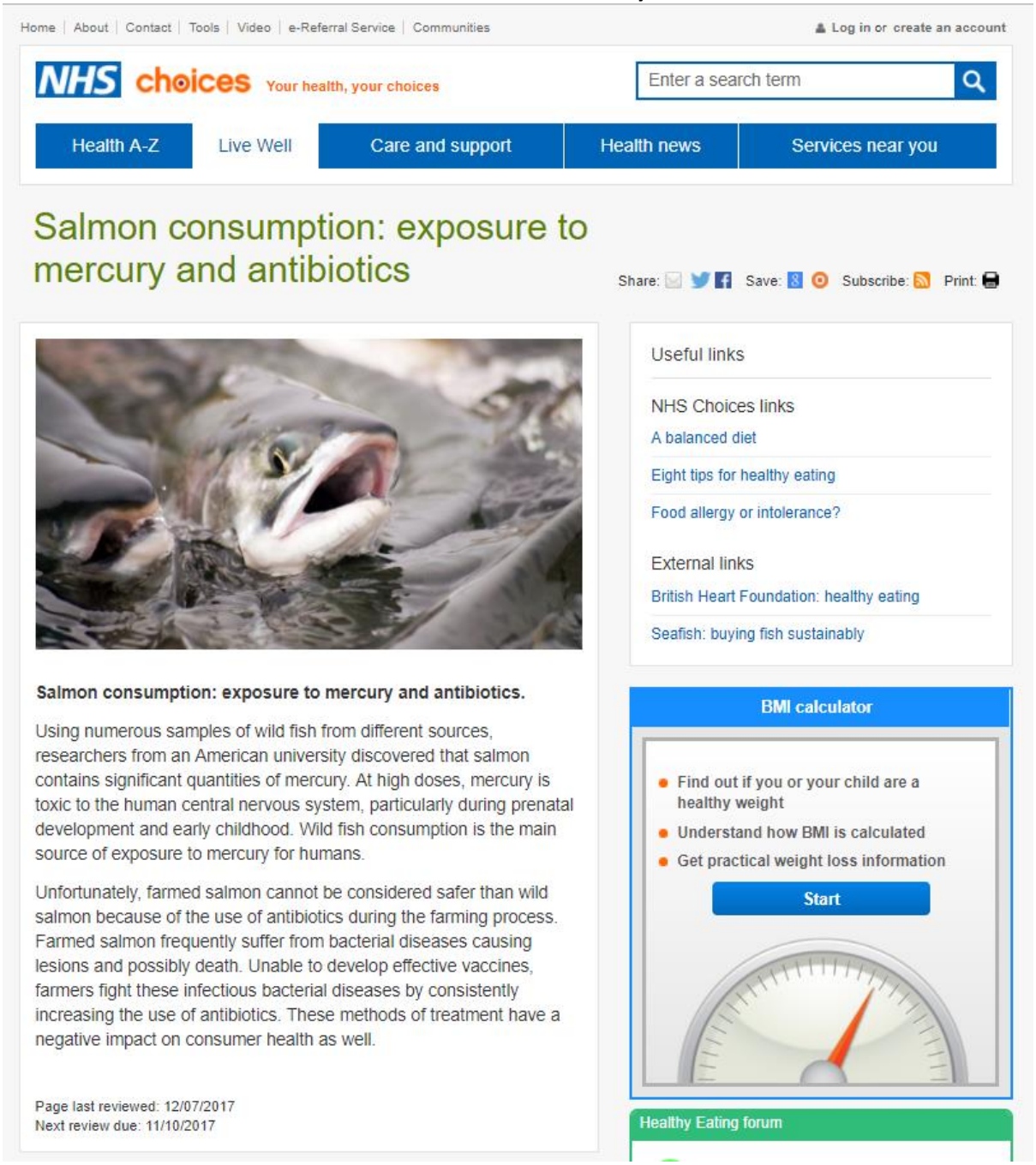
i. South West
j. Wales
k. Scotland
l. Northern Ireland

The message below recently appeared on the website of "National Health Service".

Please read it attentively.



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Salmon consumption: exposure to mercury and antibiotics

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Salmon consumption: exposure to mercury and antibiotics.

Using numerous samples of wild fish from different sources, researchers from an American university discovered that salmon contains significant quantities of mercury. At high doses, mercury is toxic to the human central nervous system, particularly during prenatal development and early childhood. Wild fish consumption is the main source of exposure to mercury for humans.

Unfortunately, farmed salmon cannot be considered safer than wild salmon because of the use of antibiotics during the farming process. Farmed salmon frequently suffer from bacterial diseases causing lesions and possibly death. Unable to develop effective vaccines, farmers fight these infectious bacterial diseases by consistently increasing the use of antibiotics. These methods of treatment have a negative impact on consumer health as well.

Page last reviewed: 12/07/2017
Next review due: 11/10/2017

Useful links

NHS Choices links

A balanced diet

Eight tips for healthy eating

Food allergy or intolerance?

External links

British Heart Foundation: healthy eating

Seafish: buying fish sustainably

BMI calculator

- Find out if you or your child are a healthy weight
- Understand how BMI is calculated
- Get practical weight loss information

Start

Healthy Eating forum

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 635761

Opinion about the article

5. Please indicate your opinion with regard to the article you have read:

	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
It presents useful information						
It presents important information						
It presents worrisome information						
The institution providing the information is serious						
The institution providing the information is reliable						
The institution providing the information is trustworthy						

Attitude towards salmon consumption

6. Below, attributes of fish consumption are displayed. For each characteristic, please select the point that best describes your perceptions when eating salmon.

Eating salmon is:					
1	2	3	4	5	6
Very unhealthy	Unhealthy	Somewhat unhealthy	Somewhat healthy	Healthy	Very healthy
Very unsafe	Unsafe	Somewhat unsafe	Somewhat safe	Safe	Very safe
Not nutritious at all	Not nutritious	Somewhat not nutritious	Somewhat nutritious	Nutritious	Very nutritious
Very expensive	Expensive	Somewhat expensive	Somewhat cheap	Cheap	Very cheap
Not tasty at all	Not tasty	Somewhat not tasty	Somewhat tasty	Tasty	Very tasty
Very bad for environment	Bad for environment	Somewhat bad for environment	Somewhat good for environment	Good for environment	Very good for environment
Very unethical	Unethical	Somewhat unethical	Somewhat ethical	Ethical	Very ethical
A very unsustainable	An unsustainable	Somewhat an unsustainable	Somewhat a sustainable	A sustainable	A very sustainable

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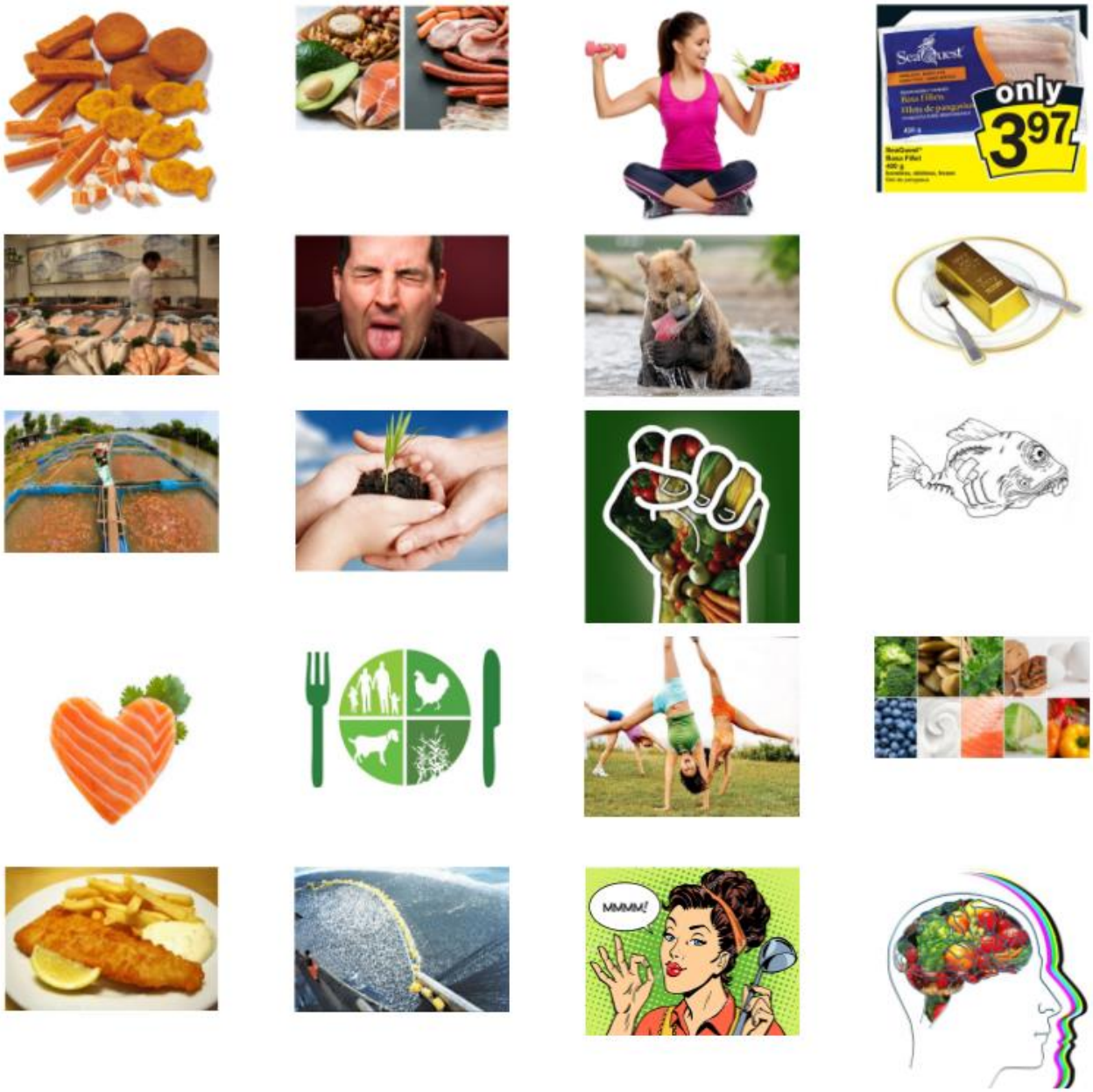
consumption behaviour	consumption behaviour	consumption behaviour	consumption behaviour	consumption behaviour	consumption behaviour

Pictures

7. Please choose 3 images that best represent your attitudes regarding the consumption of salmon.



8.

[Selected image 1] ➔ Please explain why you have selected this image and what it represents to you

[Selected image 2] ➔ Please explain why you have selected this image and what it represents to you

[Selected image 3] ➔ Please explain why you have selected this image and what it represents to you

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Intentions

9. Please indicate your opinion for the following statements:

After reading this article I will…						
	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
search for more information about the presented issues on salmon						
be more careful regarding my salmon consumption						
read more attentively the information presented on the salmon packaging/etiquette						
ask more often the salespeople information about the production of the salmon						
choose more often certified/labelled salmon						
buy more often salmon in organic sections/shops						
decrease my consumption of salmon						
prefer more often other fish species in the detriment of salmon						
not eat salmon anymore						

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Ranking the preferred products

Before you continue, please consider the following definitions:

EU certified organic food label indicates that the products come from organic farming. In organic agriculture, artificial fertilizers and chemical pesticides are not used.

MSC label is an international label for sustainable wild fish. It states that the fish has been caught in a manner that respects the environment and fish populations.

ASC label is an international label for sustainable fish from aquaculture. It states that the fish is produced in an environmentally friendly manner and in good working conditions.

10. Now, please rank the following salmon products in order of your preference (1 - being the most preferred, 4 - the less preferred).

11. [Selected salmon 1] ➔ Please explain why you consider this salmon as the best option.

Final important information about the article you have read

Thank you for participating in this survey. We would like to inform you that the negative message that you have previously read was formulated for the purposes of this research and does not fully correspond to reality.

In order to get trustworthy information, please follow the links below:

For health matters: http://www.efsa.europa.eu

For environmental matters: https://www.eea.europa.eu

Click on "Save" to submit your responses!