European consumer perceptions and barriers for fresh, frozen, preserved and ready-meal fish products

Filiep Vanhonacker, Zuzanna Pieniak and Wim Verbeke
Department of Agricultural Economics, Ghent University, Ghent, Belgium

Abstract

Purpose – This study aims to investigate consumers' perceptions and barriers in relation to fresh, frozen, preserved and ready-meal fish products in a geographically diverse selection of European countries.

Design/methodology/approach – Cross-sectional data were collected through a consumer survey ($n = 3{,}213$), conducted in June 2008 in the Czech Republic, Germany, Greece, Italy, Portugal, Romania, Sweden and the UK. Items measured were self-reported consumption frequencies, consumer perceptions of different fish product categories, and perceived barriers for increased fish consumption levels. Country specificities are discussed.

Findings – The overriding healthy perception consumers have about fish was confirmed, and contributed very strongly to the general perception consumers have about fish. Fresh fish was perceived the most healthy fish product, followed by frozen, preserved and ready-meal fish products. Perception scores were highest correlated with self-reported fish consumption in the Mediterranean countries. With the exception of Romania, perceived barriers only poorly explained self-reported consumption frequencies of the different fish product categories. This finding is related to the possible influence of habit and tradition with regard to eating fish, to the absence of measures related to motivations or drivers to consume fish, or to the possibility that some of the perceived barriers reinforce each other. In the Mediterranean countries, fish consumption frequency is on a very high level, independently of perceived barriers and motivational aspects, and part of the traditional Mediterranean diet.

Originality/value – The strength of this study pertains to its international scope and geographical spread. Further, consumer perceptions and perceived barriers in relation to fresh, frozen, preserved and ready-meal fish products have rarely been studied in parallel. Findings are relevant to support efforts on national and international level to stimulate or modify fish consumption, and to explore opportunities to trade fish products.

Keywords Consumers, Fish (Food), Fresh, Frozen, Perception, Preserved, Ready-meal, Food products, Europe

Paper type Research paper

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Introduction

Fish is generally perceived as a healthy food product by nutritionists, food scientists, food and health policy makers and consumers (Verbeke *et al.*, 2005; Pieniak *et al.*, 2009). Still, the majority of the European consumers do not meet the dietary recommendations of eating two portions of fish per week, of which one should be fatty fish (Kris-Etherton *et al.*, 2003; Pieniak *et al.*, 2008a). This turns research into consumer attitudes and behaviour in relation to fish consumption a relevant issue from a policy, a public health, and a food product marketing perspective. This study has the aim to investigate and compare barriers to fish consumption in different regions in Europe, and for different fish product categories. Within Europe, strong variations exist in terms of fish consumption levels, habits and traditions. According to FAO-figures, in 2008 fish consumption varied from about 55 kg per capita per year in Portugal to less then 5 kg per capita per year in Bulgaria (FAO, 2008). The countries with the highest fish consumption levels are typically those that are (partly) surrounded by oceans or seas, and that have as such direct access to fish resources. This concerns mainly the Scandinavian countries (Northern Europe), the Mediterranean countries (Southern Europe) and the Baltic States. Nevertheless, fish consumption habits and preferences between these regions also differ considerably. For instance, the Southern European countries have a clear preference for whole, fresh fish, whereas in Northern Europe, consumers are more averse to whole fish and are more open to processed products with an added value. For this reason this study has not only included different regions within Europe, but has broadened the discussion to different fish product categories in terms of level of processing. It also anticipates on changes and evolutions in consumption habits and food demand, such as the increased demand in Europe for innovative fish products and convenience preparations, e.g. sushi, filets, individual portions and mixtures of fried fish (Josupeit, 2004; Olsen *et al.*, 2007). This ties in with the general tendencies in food demand towards more convenience (Bruhn, 2008; Grunert, 2006), despite a less positive image of convenience food products (e.g. Kennedy and Archer (1998) for frozen products). The shift in food demand is associated with the tendency to more busy lifestyles, to young and busy singles, and to dual-income couples with no children. As a consequence, an increased market share of products that are simple and quick to prepare, such as ready-to-cook, partly cooked or even ready-to-eat dishes, and also frozen fish appeared. Ready-to-eat dishes, further termed ready-meals, offer a possibility of quick purchase, preparation and consumption.

New product categories and product innovations not only address changing lifestyles, they also respond to some barriers that prevent people from consuming more fish. The price of fish for instance is very frequently indicated as the main barrier. Fish is perceived as a more expensive food product category as compared to meat products (Verbeke and Vackier, 2005; Leek *et al.*, 2000; Olsen, 2001). Price perception even emerged among the main barriers for fish consumption, across countries and user groups with a different fish consumption profile (Brunsø *et al.*, 2009). The interpretation of price however varied between regions. Price was deemed a strong barrier in some countries in Eastern and Central Europe, and in the Baltic States. Other countries, like Scandinavian countries, France or Spain, considered fish also as a more expensive food product, though consumers were willing to pay for a quality and healthy product. Other barriers documented in literature pertain to the presence of

bones (Leek *et al.*, 2000; Olsen, 2001; Verbeke and Vackier, 2005), smell when cooking fish (Brunsø *et al.*, 2009), contamination risk (Verbeke and Vackier, 2005), variation in quality (Myrland *et al.*, 2000), perceived difficulties in and time-consuming character of the purchase, preparation and cooking of fish (Leek *et al.*, 2000; Myrland *et al.*, 2000; Nielsen *et al.*, 1997; Scholderer and Grunert, 2000), the limited product availability (Myrland *et al.*, 2000), and the perceived difficulty in evaluating the quality of fish (Brunsø, 2003; Scholderer and Grunert, 2000; Verbeke *et al.*, 2007; Verbeke and Vackier, 2005). Brunsø *et al.* (2009) have indicated that attitudinal barriers for fish consumption were similar for groups where fish consumption levels differed considerably. Differences between countries and user groups were discussed in terms of preparation skills and the use of quality cues. Heavy users were very skilled in evaluating fish quality, while light users made seemingly irrational assumptions.

Notwithstanding these possible barriers, consumers mainly eat fish for its healthy and nutritional properties and its taste. In this perspective it is relevant to investigate the perceptions of consumers with respect to different fish product categories. Information on these issues is not widely available in literature and mostly based on single country studies. Fresh fish is in general perceived as the more healthy alternative to frozen and processed fish products (SEAFISH, 2010). Compared to frozen fish, it is perceived superior in terms of taste, appearance, texture and shelf life (SEAFISH, 2010). However, this favourable perception does not necessarily translate into purchasing behaviour, for example because of some barriers mentioned before.

Insights in the perceptions consumers have about different fish product categories will be relevant for further promotion of fish consumption. Country-peculiarities will assist in supporting the development of national generic campaigns.

Material and methods

Research approach and sampling

Quantitative descriptive data were collected through a cross-sectional consumer survey in eight EU-countries: Czech Republic (CZ), Germany (DE), Greece (GR), Italy (IT), Portugal (PT), Romania (RO), Sweden (SE), and the UK (UK). These countries have been selected to represent the different geographical regions in Europe: Germany and the UK representing Western Europe, Sweden representing Northern Europe, Romania representing Eastern Europe, Czech Republic representing Central Europe, and Greece, Italy and Portugal representing Southern Europe. This selection also allows to include and compare countries with different fish consumption levels, habits and traditions, that have not been investigated extensively before.

Total sample size was 3,213 respondents, around 400 in each of the eight countries. Gender distribution, with a 65/35 female-male ratio, represented the selection of the person mainly responsible for food purchasing within the household. All participants were fish consumers and samples are representative for living environment and age, within the range of 18 to 70 years (Table I). Greek and Czech respondents were slightly younger, Swedish respondents were somewhat older as compared to the other countries. Participants were randomly selected from the representative IPSOS Access Panel. This panel consists of individuals who agreed to participate in online surveys. All contact and questionnaire administration procedures were managed electronically. Data collection was performed in June 2008.

	DE	SE	IT	UK	GR	RO	PT	CZ	Total sample
Gender (%)									
Female	65.1	65.1	65	64.9	65	65	65	65	65
Male	34.9	34.9	35	35.1	35	35	35	35	35
Age (%)									
18-24 years	13.3	13.6	13.7	13.7	12.0	15.0	14.0	18.0	14.2
25-34 years	19.2	20.4	24.5	22.8	22.0	23.0	22.0	23.0	22.1
35-44 years	26.2	22.6	22.1	23.9	22.0	19.0	21.0	18.0	21.8
45-54 years	17.8	17.9	16.5	17.6	35.3	20.0	19.0	20.0	20.5
55-70 years	23.5	25.5	23.2	22.0	8.7	23.0	24.0	21.0	21.4
Number of people in household (%)									
1	23.2	25.0	10.8	21.4	11.6	8.5	15.4	7.5	15.4
2	40.9	40.6	30.2	37.3	25.1	25.3	28.8	27.7	32.0
3	16.0	15.7	24.6	19.2	24.9	32.8	24.5	21.1	22.2
4	13.1	11.7	20.9	14.6	29.2	24.1	22.2	31.9	21.0
5 +	6.8	7.0	13.5	7.6	9.2	9.3	9.0	11.8	9.1
Living environment (%)									
Rural	29.9	22.9	12.4	22.1	6.3	7.7	19.9	24.5	18.2
Small town	40.2	50.6	62.3	53	31	40	41.7	44.7	45.4
Urban	29.9	25.4	24.3	24.4	61.5	52.1	38	30.3	35.8
Don't know	0	1	1	0.5	1	0.2	0.4	0.5	0.6

Note: $n = 3{,}213$

Table I.
Socio-demographic profile of the sample

Questionnaire content

Participants were asked to complete a self-administered, structured, electronic questionnaire. The items of interest relate to self-reported consumption frequencies, to perceptions about different fish product categories, and to perceived barriers for increased fish consumption levels.

Fish consumption frequency was measured on five-point scales, with the following response categories: more than once a week (1), once a week or more than once a month (2), once a month (3), less than once a month (4), and never (5). Higher values thus associated with less frequent fish consumption. Frequencies were registered for fish as a generic category, and for fresh fish, frozen fish, preserved fish, and fish-based ready meals. Fish as a generic category was defined as sea and freshwater fish, fresh fish was further specified as unprocessed products, preserved fish was accompanied with examples such as preserved in cans, glass, etc, and ready meals were explained by fish-based catering, sushi, etc.

Perceptions were also registered separately for fish as a generic category, and for fresh fish, frozen fish, preserved fish, and fish-based ready-meals. General consumer perception about each of the product categories was probed, as well as the perception in terms of some specific product attributes. Respondents were asked to score the general perception on a four-point interval scale, where 1 corresponded with very good perception, 2 with fairly good perception, 3 with not particularly good perception, 4 with poor perception. Additionally, they could opt for "no opinion". The perception in terms of some product attributes were evaluated on five-point semantic differentials, with the positive verbatim corresponding with response category 1, and the negative

verbatim corresponding with response category 5. Attributes were: good for health versus poor for health, good quality/price relationship versus bad quality/price relationship, quality guaranteed versus quality not guaranteed, and widely available versus seldom available. The respondents also had the choice to opt for a "no opinion" option. The "no opinion" options will be considered as missing values in the calculation of mean values in the result section.

Finally, the respondents were provided with a list of barriers. Respondents were asked, for each product category separately, the following question: To what extent do the following elements constitute a barrier to you for eating [product category] more often?. Respondents could answer on a five-point interval scale that ranged from no barrier at all (1) to a very big barrier (5). Barriers were: the price of the products; the risks of contamination (microbiological contamination – for example, salmonella; and chemical contamination – for example, mercury, dioxin); the environmental risks (bad for the ecosystem, animal welfare, etc.); the risks of depleting fish stocks; the smell; the bones; the unavailability of the products; bad taste; preparation difficulties; preparation time; the difficulties in evaluating the quality. For reasons of very high and significant correlations, environmental risks and risks of depleting fish stocks on the one hand, and preparation difficulties and preparation time on the other hand, were aggregated, and will be referred to as "environmental risks" (averaged aggregate of environmental risks and risks of depleting fish stocks) and "preparation difficulties" (averaged aggregate of preparation difficulties and preparation time) in the result and discussion section.

Data analyses

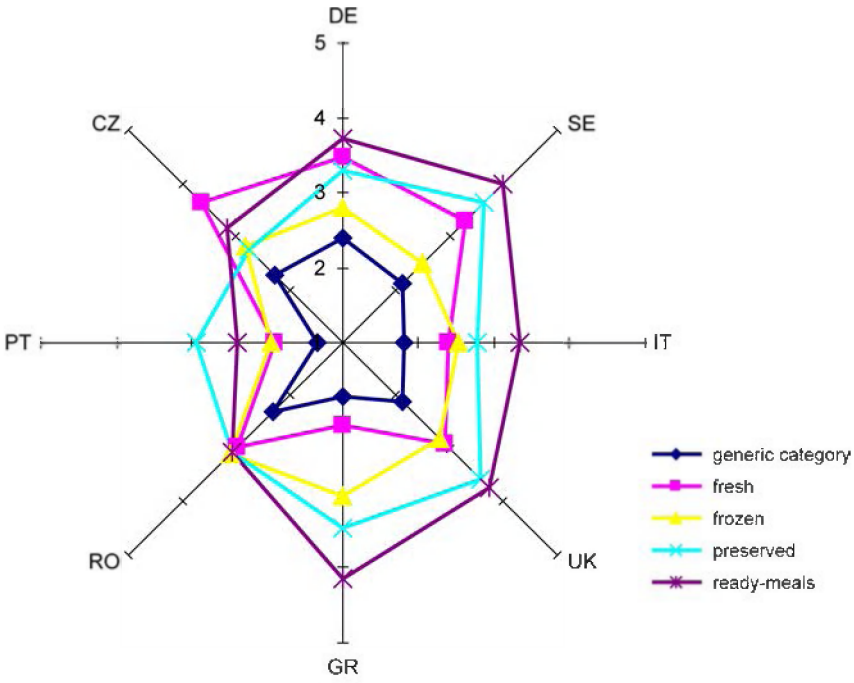
Descriptive statistical indicators (frequencies, means and standard deviations (SD)) were computed. Mean values or standard deviations were presented in table format or in spider diagrams. Given the large sample sizes and very low numbers of missing responses, pairwise deletion was used to treat missing values. All statistical calculations were performed in SPSS 15.0 (SPSS, Inc.).

Results and discussion

Fish consumption frequency

In all eight countries, the highest consumption frequency was indicated for fish as a generic food category (Figure 1). This is logical given that it can be understood as the aggregate of any kind of fish product. Portugal denoted the highest self-reported fish consumption frequency, followed by Greece, Italy, UK, Sweden, Czech Republic, Romania and Germany. This ranking matches reasonably well with FAO consumption data (FAO, 2008), in which Portugal is the country with the highest fish consumption within Europe. Romania, Czech Republic and Germany are among the EU-countries with low fish consumption levels, which ties in with our results. Deviations pertain to the German self-reported fish consumption frequency, which was expected to be higher than that of Romania and Czech Republic, and to the Swedish self-reported fish consumption frequency, which ranked higher than fish consumption in Greece, Italy and UK in FAO data.

The three Mediterranean countries were distinct from the other countries for the high share of fresh fish in their fish diet. In Greece, the fish diet seemed to be mainly composed of fresh fish, whereas Portuguese and Italian consumers reported a more



Note: Mean values on a five-point frequency scale (a lower score corresponds with a higher consumption frequency)

Figure 1.
Consumption frequency of fish products with a different level of processing

equal contribution of fresh and frozen fish in their fish diet. Swedish and German consumers reported a dominance of frozen fish in their fish diet, while in the UK, fresh and frozen fish were more in balance. Romanian consumes reported, on average, a similar consumption frequency of the different product categories, while Czech consumers were the only ones to report preserved fish as most frequently consumed fish product category, in combination with the lowest reported consumption frequency of fresh fish. Apart from Czech Republic, there is a tendency for a lower consumption frequency of preserved and ready-meal fish products as compared to fresh and frozen fish products.

Consumer perceptions about fish products

Figures 2-9 present the perception scores for the different fish product categories per country. Similar general tendencies were found in the different countries, sometimes stronger or weaker, and with some exceptions. Consumer perceptions about fish as a generic product category seemed to be deduced most strongly from the perceptions consumers have about fresh fish, and to a lesser extent from frozen fish. The general perception was in line with the health and quality perceptions. Fresh fish was perceived as very healthy, yet as the least available as compared to other fish product categories. Fresh fish further received the most positive scores in terms of general perception and quality perception, though less strongly differentiated from other product categories as compared to the health perception. Preserved and ready-meal

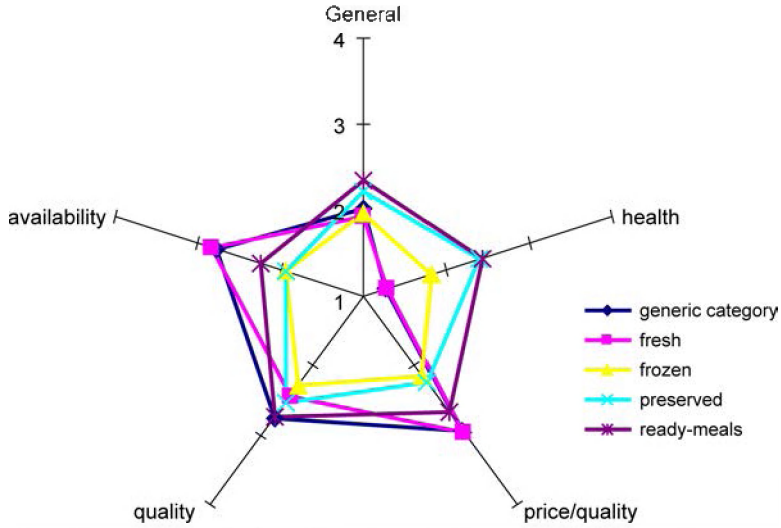


Figure 2.
Perceptions about fish product categories among German consumers

Note: General perception is registered on 4-point scales, the other attributes are measured on 5 point scales

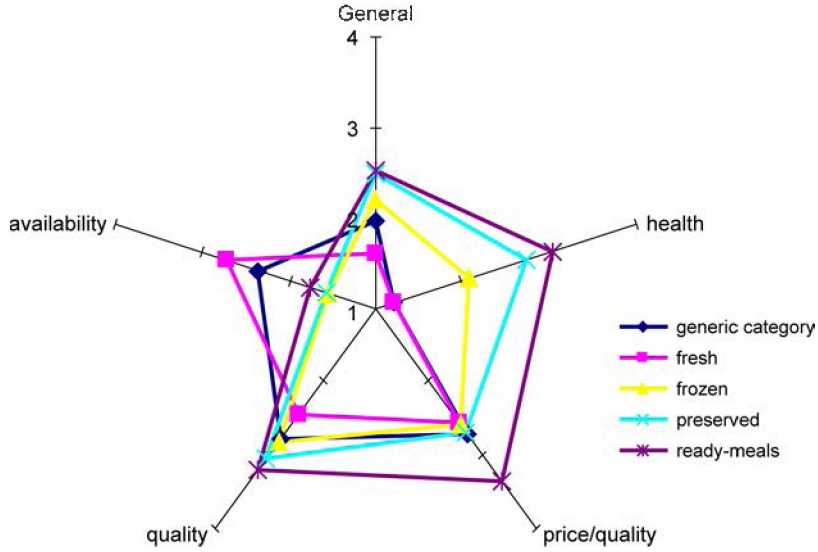
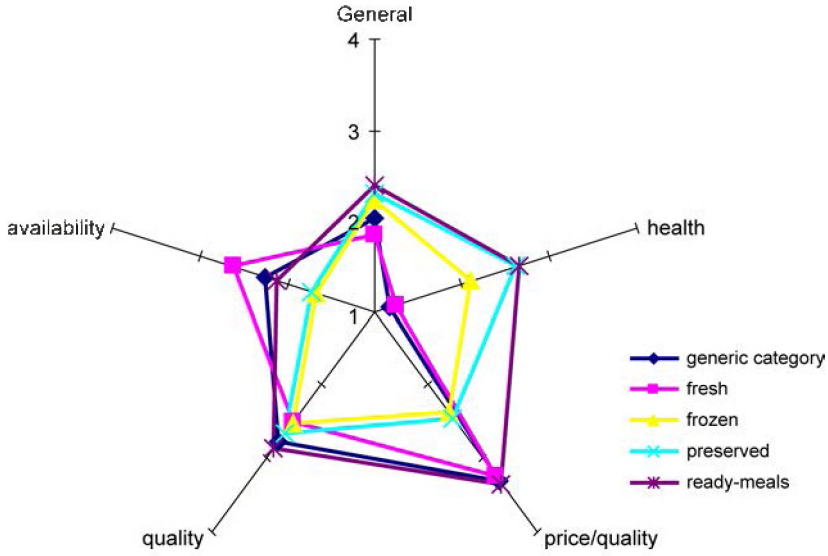


Figure 3.
Perceptions about fish product categories among Swedish consumers

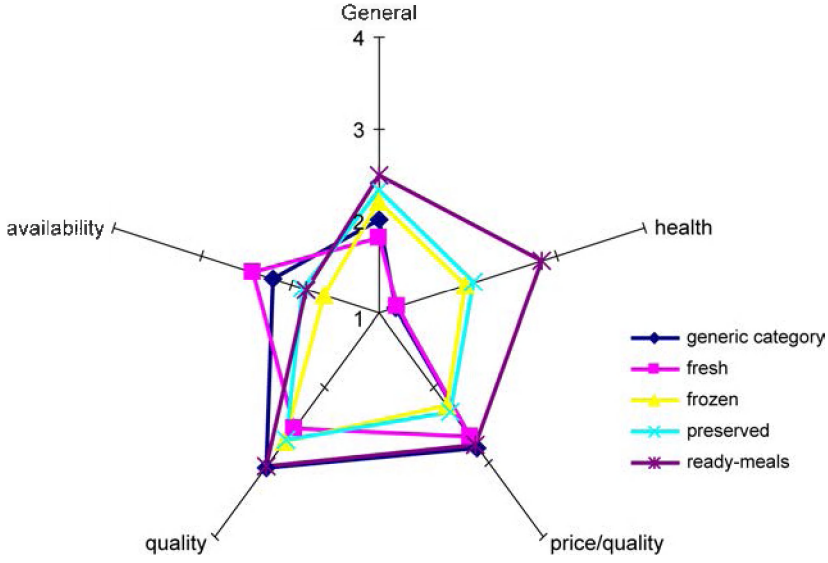
Note: General perception is registered on 4-point scales, the other attributes are measured on 5 point scales

fish products were in general perceived to be less healthy and were attributed a lower general perception score. Ready-meal fish products were believed to have the least positive price-quality ratio. Frozen and preserved fish products were perceived to be best available.



Note: General perception is registered on 4-point scales, the other attributes are measured on 5 point scales

Figure 4.
Perceptions about fish product categories among Italian consumers



Note: General perception is registered on 4-point scales, the other attributes are measured on 5 point scales

Figure 5.
Perceptions about fish product categories among UK consumers

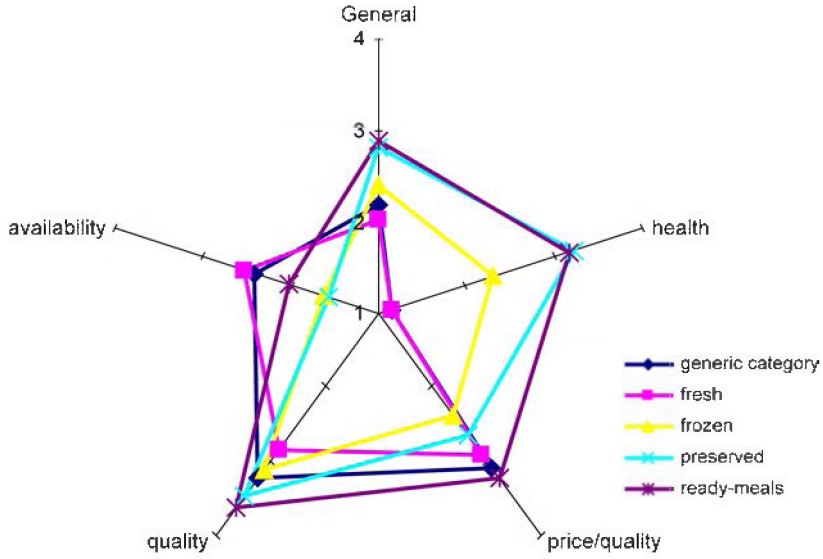


Figure 6.
Perceptions about fish product categories among Greek consumers

Note: General perception is registered on 4-point scales, the other attributes are measured on 5 point scales

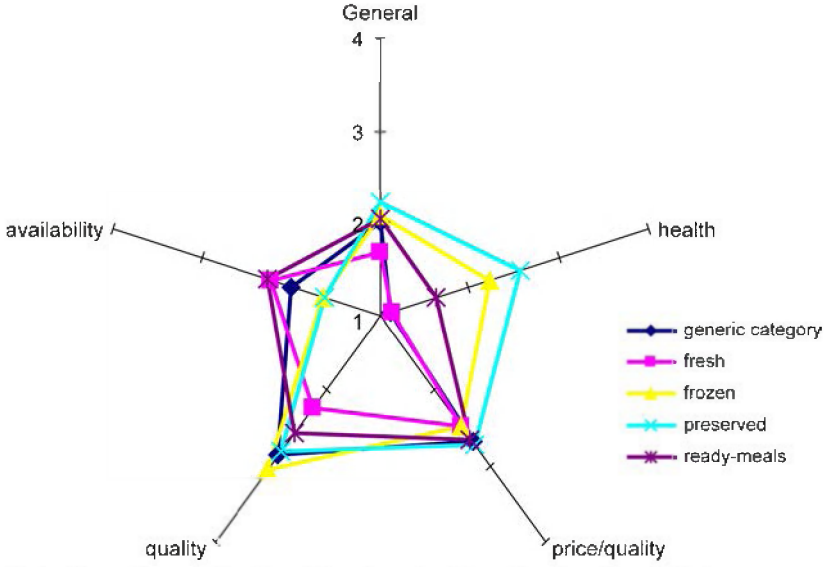
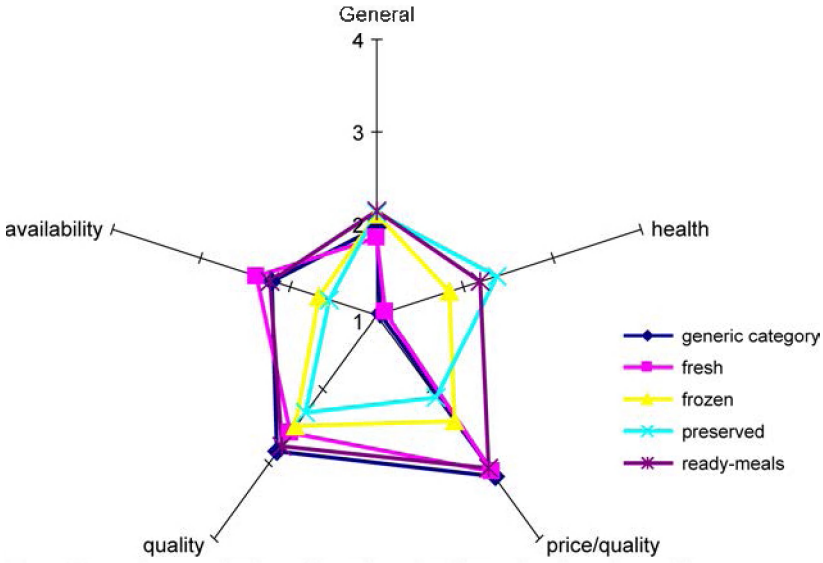


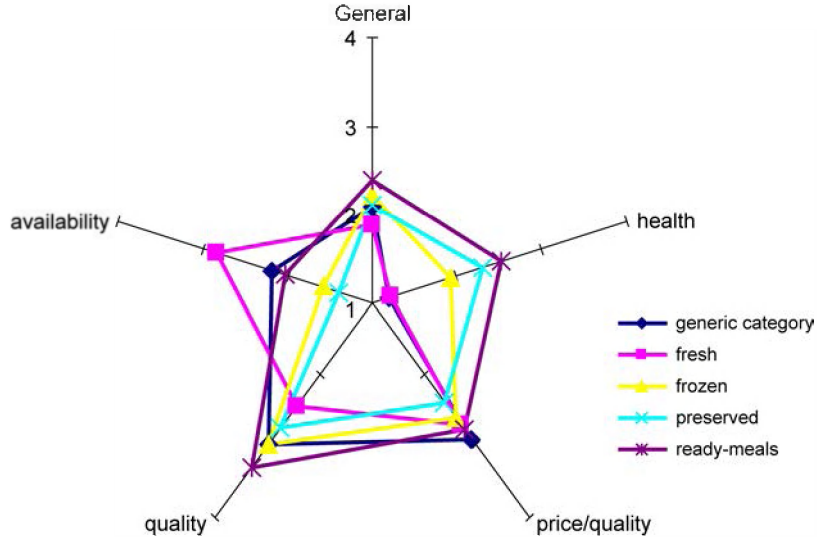
Figure 7.
Perceptions about fish product categories among Romanian consumers

Note: General perception is registered on 4-point scales, the other attributes are measured on 5 point scales



Note: General perception is registered on 4-point scales, the other attributes are measured on 5 point scales

Figure 8.
Perceptions about fish product categories among Portuguese consumers



Note: General perception is registered on 4-point scales, the other attributes are measured on 5 point scales

Figure 9.
Perceptions about fish product categories among Czech consumers

The next paragraph will discuss some country specificities that deviate from the general tendencies discussed above, and that will be linked to the self-reported consumption frequencies discussed in the previous section. In Germany, the highest self-reported consumption frequency of frozen fish products was reflected in the

perception scores. Besides the most positive perception about fresh fish in terms of health, frozen fish was attributed the best perception scores on the other attributes examined in the study. German consumers perceived fresh fish as more expensive and less available. In Sweden, the dominance of frozen fish in the fish diet was not that well reflected in the perception scores. Swedish consumers were especially positive to fresh fish, though perceived that category to be less available. Preserved fish, and especially ready-meal fish products, were attributed the least positive perception scores, with the exception of perceived availability. In Italy, fresh fish, together with ready-meals, were perceived to be pronouncedly more expensive as compared to frozen and preserved fish, with an average score at the negative connotation side of the scale (i.e. mean value above 3 on a five-point scale). Further, in spite of the highest self-reported consumption frequency of fresh fish, this product category was perceived to be the least available. For the UK the least positive health perception was found for ready-meal fish products, despite the high popularity of, e.g. sushi in this country. Greek consumers appeared to be quite averse towards preserved and ready-meal fish products, reflected in low scores on the general, health and quality image. Fresh fish was clearly most positively evaluated, though experienced as more expensive and somewhat less available as compared to the other fish product categories. With respect to the Romanian data, it was remarkable, given the low fish consumption figures, to notice that perception scores on all attributes were positive. Different from other countries, frozen fish products received lower perception scores in terms of health and quality as compared to other fish product categories. The opposite was found for ready-meal fish products. The better perception of these products in terms of health and quality was also associated with a lower perceived availability, an inverse relationship that was also found for fresh fish in most of the countries. Portuguese consumers were typified by an extremely positive health perception about fresh fish. It was further remarkable that preserved fish products were attributed more positive perception scores in terms of quality, availability and price, as compared to other fish product categories, and compared to other countries. This possibly relates to the popularity of pilchards in Portugal, which are very often available in cans. Besides a perceived higher price of fresh and ready-meal fish products, Portuguese consumers were very positive with respect to fish as a food product. Finally, the most remarkable issue about Czech consumers was the pronounced lower perceived availability of fresh fish.

Barriers for fish consumption

In general, fish was perceived as a rather expensive product, corroborating findings from previous studies (e.g. Brunsø *et al.*, 2009) (Table II). The Mediterranean countries, thus countries with the highest self-reported fish consumption frequency, considered the price of fish products more strongly as a barrier, as compared to the other countries. This could be explained by the fact that the fish diet in these countries mainly consists of fresh fish, the product category which is perceived to be more expensive. The Mediterranean countries, together with Romania, also perceived the risk of contamination as a stronger barrier as compared to the other countries. For the Mediterranean countries, this finding was opposite to earlier findings from Pieniak *et al.* (2008b), who reported that risk perception of food poisoning from eating fish was negatively associated with fish consumption. Mediterranean countries (and Portugal in particular) were also among the countries with the higher barrier scores for environmental risks. The difference with most

	Generic category		Fresh fish		Frozen fish		Preserved fish		Ready-meals	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Price										
DE	3.45	1.19	3.56	1.25	2.97	1.37	2.77	1.35	3.17	1.38
SE	3.09	1.27	3.11	1.39	2.73	1.37	2.55	1.41	3.19	1.43
IT	3.61	1.08	3.71	1.13	3.24	1.25	3.03	1.34	3.76	1.24
UK	3.37	1.29	3.56	1.30	2.72	1.38	2.82	1.41	2.98	1.45
GR	3.57	1.35	3.67	1.36	2.93	1.41	2.72	1.48	3.44	1.43
RO	2.99	1.38	3.12	1.44	2.81	1.52	2.87	1.50	3.05	1.53
PT	3.78	1.11	3.89	1.17	3.42	1.31	3.20	1.40	3.79	1.21
CZ	3.03	1.13	3.12	1.28	2.83	1.24	2.57	1.25	2.77	1.31
Contamination risks										
DE	3.11	1.27	3.28	1.26	3.01	1.35	2.99	1.32	3.12	1.35
SE	3.08	1.27	3.09	1.31	2.83	1.37	2.84	1.44	2.92	1.41
IT	3.59	1.25	3.60	1.22	3.25	1.32	3.26	1.35	3.46	1.29
UK	2.90	1.26	2.93	1.25	2.54	1.25	2.75	1.25	2.66	1.31
GR	3.77	1.26	3.91	1.20	3.85	1.37	3.99	1.33	4.14	1.16
RO	3.61	1.45	3.58	1.48	3.49	1.53	3.57	1.46	3.59	1.53
PT	3.36	1.22	3.38	1.31	3.36	1.30	3.25	1.45	3.29	1.30
CZ	2.95	1.38	2.99	1.35	2.87	1.38	2.79	1.39	3.10	1.40
Environmental risks [a]										
DE	3.35	1.07	3.38	1.14	3.34	1.15	3.24	1.21	3.27	1.23
SE	3.42	1.16	3.36	1.25	3.31	1.30	3.18	1.40	3.24	1.37
IT	3.28	1.13	3.31	1.14	3.11	1.19	3.09	1.21	3.18	1.22
UK	3.10	1.07	3.17	1.11	3.02	1.18	3.05	1.20	2.99	1.29
GR	3.27	1.17	3.36	1.19	3.29	1.25	3.38	1.24	3.46	1.24
RO	3.16	1.29	3.09	1.33	3.01	1.41	3.01	1.40	3.02	1.43
PT	3.56	1.06	3.60	1.08	3.44	1.17	3.41	1.22	3.41	1.19
CZ	2.70	1.25	2.72	1.26	2.67	1.24	2.61	1.30	2.64	1.31
Smell										
DE	2.59	1.38	2.73	1.41	2.63	1.39	2.53	1.41	2.65	1.45
SE	2.06	1.29	2.14	1.33	2.10	1.37	2.26	1.47	2.20	1.44
IT	2.75	1.40	2.80	1.40	2.53	1.34	2.63	1.46	2.75	1.44
UK	2.57	1.37	2.67	1.31	2.27	1.28	2.54	1.33	2.42	1.33
GR	3.31	1.63	3.13	1.58	2.27	1.57	3.41	1.50	3.51	1.49
RO	3.18	1.65	3.13	1.64	3.13	1.64	3.04	1.64	3.06	1.67
PT	3.41	1.49	3.40	1.50	3.21	1.57	3.25	1.59	3.28	1.54
CZ	2.79	1.47	2.81	1.46	2.72	1.51	2.61	1.52	2.79	1.51
Bones										
DE	3.19	1.45	3.16	1.47	2.86	1.45	2.77	1.46	2.91	1.47
SE	2.35	1.36	2.28	1.38	2.03	1.30	2.02	1.34	2.10	1.37
IT	2.71	1.38	2.75	1.34	2.51	1.31	2.43	1.37	2.67	1.39
UK	3.21	1.41	3.07	1.40	2.61	1.38	2.70	1.43	2.56	1.31
GR	2.72	1.47	2.65	1.44	2.61	1.46	2.46	1.50	2.86	1.55
RO	3.31	1.50	3.14	1.54	2.99	1.58	2.82	1.59	3.03	1.61
PT	2.75	1.34	2.71	1.37	2.61	1.36	2.58	1.45	2.76	1.42
CZ	2.78	1.38	2.74	1.41	2.63	1.42	2.38	1.41	2.60	1.46

(*continued*)

Table II.
Barrier scores for the different fish product categories, per country

	Generic category		Fresh fish		Frozen fish		Preserved fish		Ready-meals	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Unavailability products										
DE	2.83	1.20	2.97	1.21	2.55	1.25	2.46	1.29	2.51	1.28
SE	3.00	1.25	2.98	1.33	2.51	1.38	2.35	1.40	2.40	1.44
IT	3.00	1.18	3.06	1.20	2.70	1.23	2.59	1.34	2.86	1.34
UK	3.03	1.17	2.98	1.16	2.47	1.24	2.50	1.25	2.40	1.38
GR	2.92	1.25	2.95	1.33	2.47	1.42	2.63	1.41	2.64	1.41
RO	3.06	1.41	2.93	1.42	2.73	1.46	2.74	1.50	2.78	1.47
PT	3.16	1.18	3.32	1.25	3.04	1.27	2.91	1.42	3.05	1.36
CZ	2.89	1.26	3.01	1.27	2.55	1.24	2.25	1.26	2.58	1.22
Bad taste										
DE	2.80	1.49	2.91	1.45	2.96	1.42	2.93	1.45	2.98	1.42
SE	2.59	1.64	2.44	1.59	2.49	1.56	2.77	1.64	2.77	1.58
IT	3.12	1.57	3.00	1.50	2.96	1.48	2.94	1.48	3.07	1.47
UK	3.03	1.46	2.92	1.38	2.80	1.42	2.82	1.42	2.87	1.25
GR	3.43	1.59	3.24	1.60	3.52	1.51	3.72	1.41	3.71	1.39
RO	3.13	1.75	3.10	1.70	3.10	1.68	3.10	1.65	3.06	1.70
PT	3.79	1.53	3.73	1.49	3.65	1.51	3.60	1.53	3.60	1.51
CZ	2.92	1.53	2.88	1.49	2.96	1.47	2.85	1.52	3.00	1.46
Preparation difficulties [b]										
DE	2.60	1.21	2.67	1.26	2.32	1.27	2.22	1.24	2.23	1.24
SE	2.32	1.24	2.26	1.26	2.11	1.24	1.93	1.22	1.85	1.19
IT	2.61	1.17	2.62	1.22	2.34	1.13	2.15	1.24	2.35	1.33
UK	2.77	1.15	2.75	1.19	2.17	1.14	2.30	1.21	2.10	1.17
GR	2.57	1.25	2.56	1.30	2.45	1.24	1.98	1.25	1.95	1.30
RO	2.19	1.25	2.19	1.27	2.21	1.35	2.10	1.35	2.32	1.42
PT	2.72	1.17	2.76	1.20	2.57	1.20	2.36	1.28	2.45	1.26
CZ	2.33	1.16	2.36	1.19	2.21	1.16	1.85	1.09	2.11	1.17
Difficulties in evaluating the quality										
DE	3.09	1.25	3.17	1.31	2.95	1.36	2.90	1.39	3.04	1.36
SE	2.77	1.26	2.72	1.33	2.82	1.40	2.84	1.44	2.96	1.47
IT	3.24	1.26	3.28	1.33	3.13	1.33	3.02	1.41	3.22	1.39
UK	2.92	1.13	2.87	1.15	2.70	1.20	2.73	1.20	2.83	1.29
GR	3.35	1.31	3.28	1.39	3.46	1.41	3.58	1.42	3.69	1.41
RO	2.94	1.45	2.89	1.48	2.96	1.54	3.00	1.56	3.03	1.57
PT	3.36	1.22	3.38	1.31	3.36	1.30	3.25	1.45	3.29	1.43
CZ	3.33	1.19	3.23	1.27	3.29	1.35	2.99	1.38	3.25	1.33

Notes: [a]Averaged aggregate of environmental risks and risks of depleting fish stocks; [b]Averaged aggregate of preparation difficulties and preparation time. Mean values and standard deviations on five-point interval scales that range from "no barrier" (1) to "very big barrier" (5)

Table II.

other European regions, however, was less pronounced, as compared to other barriers. The exception pertains to consumers from Czech Republic, who did not perceive environmental risks as a barrier. The smell of fish was not considered as a strong barrier in this study. Only in Romania, Greece and Portugal, mean scores just on the negative connotation side of the scale were found. In Greece and Portugal this could perhaps be explained by the high consumption levels of fresh fish which cause bad smell during

storage. In Romania, given the limited fish consumption, this could be considered a direct barrier for purchase. Bones received the lowest barrier scores in the countries with the highest self-reported consumption frequencies. In absolute values, bones were not considered a strong barrier for higher fish consumption in any of the countries, which could relate to the higher share of processed (boneless) fish products in the fish diet of countries with lower fish consumption levels. The same could be concluded for the availability of fish products. Mean scores in each of the countries were located around the mid-point of the five-point scale. Remarkably bad taste received the highest barrier scores in Portugal and Greece, the two countries with the highest self-reported fish consumption frequencies. On the contrary, Swedish consumers did not experience taste as a barrier at all. Also in other countries, mean scores were not strongly pronounced. With regard to preparation difficulties, all mean scores were below the mid-point of the scale in each country, indicating a low perceived barrier. Finally, regarding the difficulty in evaluating the quality of fish, the highest barrier scores were again found for Portugal and Greece. Possible explanations pertain to a more frequent confrontation with the problem, or to the higher share of fresh fish in the fish diet. Nevertheless, this finding was opposite to literature findings, in which perceived difficulty in fish quality evaluation was negatively correlated with fish consumption levels, in single country studies (e.g. Verbeke and Vackier, 2005) as well as in studies that include more countries with different fish consumption levels (e.g. Brunsø *et al.*, 2009). Furthermore, Vanhonacker *et al.* (2010) associate this barrier with a consumer segment termed "uncertain fish consumers".

It is remarkable that there was no single dominant barrier. This suggests that the list of barriers is either not complete, that other issues are at the base of a consumption that is in most countries, clearly below the recommendations from public health authorities, or that some of the perceived barriers reinforce each other. Surprisingly, the highest barrier scores were registered for the countries with the highest fish consumption frequencies. Possible explanations for the apparent inverse relationship between fish consumption frequency and barrier scores could be fish consumption traditions and habits. Eating fish is strongly habitual (Pieniak *et al.*, 2008b; Verbeke and Vackier, 2005). Countries or regions with lower fish consumption frequencies mostly do not have the same traditions and habits of consuming fish, as do countries or regions with higher fish consumption frequencies. A notable exception seems to be Romania, where especially perceived contamination risks seem to prevent Romanians to consume more fish. In contrast, Honkanen *et al.* (2005) stated that a higher importance of habit degrades the impact of attitudes, such as barriers. This could explain the higher barrier scores in the Mediterranean countries. Also Myrland *et al.* (2000) and Trondsen *et al.* (2003) have stressed the relevance of habit in fish consumption, indicating the positive relationship between high fish consumption as a teenager and as an adult. Another explanation could pertain to motives that were not investigated in this study. Possibly stronger motives could counterbalance perceived barriers. Additionally, higher awareness or knowledge related to fish consumption (e.g. risk of contamination, environmental issues) among consumers with higher fish consumption frequency could explain higher scores on barriers.

Regarding fresh fish, a very similar picture as compared to fish as a generic food category resulted, with regard to the mutual ranking of the barriers in the different countries as well as to the mean values. A similar ranking of the barriers was also found for frozen, preserved and ready-meal fish products; though mean values differed

to some extent from fresh fish and fish as generic food category. As such, lower barrier scores were found for the more processed fish product categories in terms of preparation difficulties, product price and availability, and bones. The lower perceived barriers combined with a lower consumption frequency of especially preserved and ready-meal food products suggest that barriers alone do not explain fish consumption levels. Possibly the less healthy perception consumers have about these product categories contributes to the seemingly contradictory relationship between barriers and fish consumption frequency. In literature, health was already indicated as a highly explanatory determinant of fish consumption, independent of fish consumption level (Brunsø *et al.*, 2009).

In Germany, neither sensory issues – such as bones, smell and taste – nor barriers related to perceived behavioural control, were considered barriers for a higher fish consumption frequency. The highest mean score, i.e. the strongest perceived barrier, was found for environmental risks, and for price in the case of the generic and fresh fish category. In the UK, price was considered the main barrier in relation to an increased consumption of fish in general, and of fresh fish more specific. No other barriers were considered for the other fish product categories. In Sweden the highest barriers corresponded with environmental risks, and corroborates with the higher concern about ethics in Northern located countries. With the exception of price for ready-meal fish products, the list does not seem to include any further barrier that prevents Swedish consumers to increase their fish consumption. In Italy, price seemed to be the strongest barrier for consuming more fish. It ranked first in the list for fresh and ready-meal fish products, and for fish as a generic food category. In addition, Italian consumers appeared to be somewhat concerned about the contamination risk, especially with respect to the generic and fresh fish product category. Further barriers were related to environmental risks and difficulties in evaluating quality. Greek consumers were well concerned about the contamination risk of fish consumption, independent of the fish product category. Further price was highlighted as a barrier for fresh fish consumption, despite (or due to) the fact that their fish diet was largely composed of fresh fish. Greek consumers appeared to be rather averse towards ready-meal fish products, supported by the number of issues they considered as a barrier (mean value above 3). This is in line with their reported low consumption of this fish product category, and the reported perception scores. Greek consumers further seemed to be environmentally concerned, and indicated difficulties in evaluating the fish quality as a barrier for higher fish consumption. The results for Portugal were in line with Italian and Greek results, though even more pronounced. Mean values for the different barriers were unexpectedly high for a country with such high fish consumption. Price, contamination risks, environmental risks, as well as sensory issues such as smell and a bad taste ranked high in the list, with mean values well above the mid-point of the scale. If the limited fish consumption frequency of Romanian consumers originates from barriers in the list, it seemed to be for a large part, related to perceived contamination risks from fish consumption. Problems with pollutants in the Black Sea could be at the base of this. Romanian consumers further express very little variation in perception between the different fish product categories, which corresponds with a very similar reported fish consumption frequency for the different product categories. Environmental risks, sensory issues, such as bones and smell of fish, were also indicated to some extent as a barrier for fish consumption. Price

to the contrast ranked quite low in the barrier list. Finally Czech consumers did not seem to relate their rather limited fish consumption to the barriers included in this study. Different from other countries, and more according to what could expected from literature findings (Brunsø *et al.*, 2009; Vanhonacker *et al.*, 2010; Verbeke and Vackier, 2005), they indicated difficulties in evaluating the quality of fish as main barrier for each fish product category.

Conclusions

The present study has concentrated on consumer perceptions about fish, and their perceived barriers to consume more fish. Studies on consumer perceptions about fish and discussions on barriers to consume fish are already widely documented in literature, however, mainly in relation to fish as a generic food category, or in relation to a specific fish species. In addition, many of the studies available in literature are single-country studies, or studies in a limited number of countries. The present research adds to the current knowledge base given that it has investigated and compared different fish product categories (fish as a generic product category; fresh fish; frozen fish; preserved fish; ready-meal fish), in eight countries covering the different geographical locations of Europe. The findings of this study are mainly descriptive, and provide insights for future research, with a specific focus. In that perspective, this study has for example not discussed differences within countries. Information on consumer perceptions and perceived barriers is relevant to stimulate fish consumption among European consumers, and appeals to public health authorities, policy makers and marketers.

The overriding healthy perceptions consumers have about fish was confirmed in this study, and seemed to contribute very strongly to the general perception about fish as a food product. Fresh fish was perceived the most healthy fish product, followed by frozen fish, preserved fish and ready-meal fish products. Perceptions seemed to be highest correlated with self-reported fish consumption in the Mediterranean countries, which were the countries with the highest reported fish consumption levels in this study. With the exception of Romania, perceived barriers only poorly corresponded with the self-reported consumption frequencies of the different fish product categories. This has been related in the discussion to the possible influence of habit and tradition with regard to eating fish, or to the absence of strong motivations or drivers to consume fish in this study. In the Mediterranean countries, the fish consumption frequency is on a very high level, independently of perceived barriers and motivational aspects. Clearly, eating fish is strongly habitual and a part of the traditional Mediterranean diet.

In this perspective, it seems reasonable to invest in further communicating to consumers about the possible benefits of fish in a healthy diet, and the importance of fish intake. Preferences, deduced in this study from self-reported fish consumption frequencies, for fish product categories differed between countries, and should be taken into account on national levels in efforts to stimulate or modify fish consumption, and exploring opportunities to trade fish products.

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Corresponding author
Filiep Vanhonacker can be contacted at: Filiep.Vanhonacker@ugent.be