

1 **Influence of packaging attributes on consumer**
2 **evaluation of fresh cod**

3
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10
11 **Abstract**

12 Packaging attributes have an important role in attracting consumer attention, creating expectations
13 and influencing food choice. In this study, conjoint and cluster analysis were used to investigate the
14 importance of visual attributes (packaging shape and colour) and informational attributes (freshness
15 indicators, shelf life and freshness statements, convenience and taste information) for fresh cod. The
16 consumer segments were profiled using individual consumer characteristics. A conjoint analysis of a
17 nationwide representative sample of 503 Norwegian consumers revealed that the informational
18 attributes were more important than the visual attributes. The most important factors for consumers
19 when choosing cod fillets were two freshness attributes (with a total relative importance value of
20 45%). Cognitive freshness information was found to be more important than affective information. A
21 cluster analysis of the part-worth utility scores revealed three clusters: packaging, quality and
22 convenience. The packaging segment was the largest (with approximately 50% of the consumers)
23 and the consumers in this segment preferred the visual attributes of shape and colour. The results of
24 an ANOVA performed on the measurements of the individual characteristics revealed significant
25 differences among the segment profiles. The findings of this study can be used by the seafood
26 industry to design packaging for cod products that better match consumers' needs and expectations.

27
28 **Keywords:**

29 **Conjoint; packaging attributes; cluster analysis; cod**
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33 1 Introduction

34

35 Previous research has shown that packaging plays an important role in attracting consumer
36 attention, formulating consumers' evaluation of quality and value and influencing their food choice
37 (Karimi, Mahdieh, & Rahmani, 2013; Silayoi & Speece, 2007). These studies also tested the packaging
38 effects of various fresh products, such as fresh produce/sweet cherries (Koutsimanis, Getter, Behe,
39 Harte, & Almenar, 2012), fresh apples (Endrizzi, Corollaro, Demattè, Aprea, Charles, Franco, &
40 Gasperi, 2015) and fresh meat (Grunert, 1997). However, a recent review of consumer purchasing
41 behavior towards fish and seafood (Carlucci, Nocella, De Devitiis, Viscecchia, Bimbo, & Nardone,
42 2015) shows that packaging attributes seems not to have received enough attention by researchers.
43 Furthermore, no study has investigated the specific influence of food packaging attributes on
44 consumers' evaluations of fresh cod.

45 Food products use a wide range of packaging attributes by combining colours, designs, shapes,
46 functionalities, technical features, symbols and messages (Nancarrow, Wright, & Brace, 1998). In a
47 review of the main drivers that lead to packaging design, Azzi, Battini, Persona, & Sgarbossa (2012)
48 identified various attributes related to ergonomics, logistics, sustainability, safety and marketing. In
49 the context of food packaging, Silayoi and Speece (2004) divided packaging attributes into two main
50 categories: visual attributes and informational attributes. Visual attributes consist of graphics,
51 colours, placements, photos, sizes and shapes of packaging, whereas informational attributes relate
52 to information provided on and technologies used in the packaging. Information attributes on food
53 packaging typically consist of labelling and brand information (Silayoi & Speece, 2004), such as the
54 product's technical characteristics, ingredients and serving size, as well as information related to
55 recommended uses, cooking instructions, instructions for proper disposal and shelf life (Harcar &
56 Karakaya, 2005).

57 Following Silayoi and Speece (2007), this study examines shape and colour as the primary
58 visual attributes while information regarding taste (Carlucci et al., 2015), convenience (Olsen,
59 Scholderer, Brunso, & Verbeke, 2007) and freshness (statements/shelf life) are used as the primary
60 informational attributes. The first goal of this study is to evaluate the relative importance of the
61 visual and informational packaging attributes of fresh cod through a conjoint study. The identification
62 of these attributes might help the industry design a package that closely matches consumers' needs
63 and expectations (Deliza & MacFie, 1996) and contribute to higher product satisfaction and choice of
64 fresh cod among Norwegian consumers.

65 When developing, testing and profiling the important packaging attributes of, for example,
66 cod, it is important to note that not all consumers evaluate and value packaging in the same way

67 (Golan, Kuchler, Mitchell, Greene, & Jessup, 2001; Verbeke, 2008). To address this challenge, the
68 second goal of this study is to segment the consumers based on preference for different packaging
69 attributes using cluster analysis (Hair, Anderson, Tatham, & William, 1998). These segments are
70 validated (predicted) against the survey responses regarding the individual characteristics of
71 consumers, specifically consumption and preferences, health and seafood involvement, knowledge
72 about quality, willingness to pay and demographics. Although segmentation and cluster analysis has
73 become increasingly popular in consumer sciences (DeSarbo and DeSarbo, 2013), the interaction
74 between visual and informational attributes of fresh products has received limited attention. Thus,
75 this study contributes to the existing literature by exploring how the combination of visual and
76 informational attributes influence consumer preference for fresh products. .

77 2 Theoretical framework

78

79 In the following, this study discusses, defines and reviews how and why visual and
80 informational attributes and personal characteristics may influence consumer evaluation of fresh
81 cod.

82 2.1 Visual attributes

83

84 Several studies of food products have considered shape and colour to be important visual packaging
85 attributes (Ares & Deliza, 2010; Marshall, Stuart, & Bell, 2006; Silayoi & Speece, 2007). Packaging
86 shape consist of different features such as size, relative height, shape angularity and rectangular
87 ratios (Raghubir, & Greenleaf, 2006; Zhang, Feick, & Price, 2006). For example, several studies
88 suggest that angular shapes tend to stimulate consumer's association with their traits and emotions
89 that express energy, toughness, and strength, whereas rounded shapes tend to stimulate
90 associations with friendless, harmony and approachability (Becker, van Rompay, Schifferstein, &
91 Galetzka, 2011; Zhang et al., 2006). However, shape need to be adapted to physical characteristics
92 with the product, the demand from the retailing outlets and consumer's expectations and
93 preferences (e.g., fresh versus frozen seafood). We are aware of one study, which have tested
94 consumers evaluation of different packing formats of pre-packed fresh seafood. Mueller Loose,
95 Peschel, and Grebitus (2013) found that packaging shape had small effect for oysters. The present
96 study includes and tests the three most relevant packaging techniques for fresh seafood in the
97 Norwegian context; modified atmosphere packaging (MAP), vacuum packaging and skin packaging.
98 Skin packaging is the most innovative and novel packing method, and only used on meat products in
99 the Norwegian market. Novel packaging grabs consumers' attention and increases the probability of
100 an involuntary attention response (Labrecque, Patrick, & Milne, 2013). Thus it may represent a new

101 possibility for packaging that can help differentiate cod products from salmon and other fish
102 products.

103 Past research shows that colour affects consumer attention, affect, emotion, and perception of
104 products in different ways (Grimes & Doole, 1998; Labrecque & Milne, 2012). Colour is used on
105 packaging in order to stimulate associations towards luxury, exclusivity, nature, hygiene, quality,
106 security, trust etc. (Ampuero & Vila, 2006; Labrecque & Milne, 2012). Colour is suggested to
107 influence evaluations of food such as fish (Alfnes, Guttormsen, Steine, & Kolstad, 2006) and meat
108 (Greibitus, Jensen, Roosen, & Sebranek, 2013). However, research on the effect of different colours
109 has lacked a clear consensus. Some researchers feel that human responses to colours are stable and
110 applicable to everyone, whereas others assert that responses and preferences to colours vary across
111 culture, gender and age, among others (Singh, 2006). Black is a colour that often provide associations
112 toward high quality, luxury and premium products across products, individuals and culture (Gimes &
113 Doole, 1998; Labrecque & Milne, 2012). White is associated with simplicity, cleanness, clear and
114 hygiene, and gold and silver stimulate feelings and emotions toward power, wealth, prestige, luxury
115 and high quality (Labrecque & Milne, 2012). Blue is often used on packages of seafood because it
116 gives associations toward water and ocean, but it also signalize intelligence, trust, communication
117 and competence (Labrecque & Milne, 2012). This study tests the effects of black in order to signal
118 premium quality and silver as the most widely used color for packing of fresh seafood in Norway.
119

120 2.2 Informational elements 121

122 A number of informational elements can be included on seafood packaging. Based on previous
123 research, the present study focused on taste, convenience and freshness (Carlucci et al., 2015; Olsen,
124 2004; Olsen et al., 2007).
125

126 2.2.1 Information about taste 127

128 As an attitudinal and informative construct, taste is categorized as a general sensory quality
129 in the same ways as texture, flavour, smell, temperature, appearance, filling and preparation
130 (Aikman, Crites, & Fabrigar, 2006). Several studies has found taste is the most important attributes
131 for consumer choice of food products (Cardello, & Schutz, 2003; Tepper, & Trail, 1998), included
132 choice of seafood (Carlucci et al., 2015; Olsen, 2004). As an informational cue, taste is mostly
133 promoted to increase expectations about premium quality (“good”, “excellent”, “tasty”), but also to
134 signalize differential values such as sweet, bitterness, natural, etc. Since cod has a neutral or mild

135 taste that makes it suitable for a wide range of culinary purposes (Otterå, Carlehög, Karlsen, Akse,
136 Borthen, & Eilertsen, 2007), the present study focused on the item ‘natural mild taste’. The term
137 ‘natural’ was included to emphasise that additives, spices or brine had not been used in the product.
138 To some degree, this information has been used by the industry to profile fresh cod in Norway.
139 However, there is no empirical evidence about the influence of this type of information on consumer
140 evaluation.

141

142 2.2.2 Product convenience

143

144 Consumer attitudes towards the saving of time and effort in the planning, buying or use of
145 products or services are considered the main elements in convenience orientation (Berry, Seiders, &
146 Grewal, 2002). Convenience is believed to be one of the most important determinants of food
147 choice (Steptoe, Pollard, & Wardle, 1995), including the choice of seafood in general (Carlucci et al.,
148 2015) included Norway (Olsen et al., 2007). Meal convenience is also suggested to be related to
149 different stages in the consumption process (Candel, 2001; Gofton, 1995): planning, acquisition/
150 purchasing, preparation, cooking, consumption/eating, and disposal. At each stage, convenience can
151 play a role, and may differ in its importance between different situational contexts. In addition,
152 studies have shown that many consumers feel insecure about preparation methods and perceive
153 seafood preparation as a difficult and time-consuming task (Birch & Lawley, 2012; Brunsø, Verbeke,
154 Olsen, & Jeppesen, 2009). Thus, “quick and easy”, as used in this study, is frequently used as an item
155 to assess perceived product convenience in consumer’s food surveys (Candel, 2001; Olsen et al.,
156 2007). Consumers expectations about how much time they want to consider as convenient differ
157 over time and between consumers. Most advertisements in Norwegian media use 15 and 20 minutes
158 as basis for a “fast dinner”. This study uses 15 minutes as an indicator of a convenient meal. Finally
159 “skin and boneless” was used to illustrate less time and energy for preparation. This is a statement
160 often used by producers on both fresh and frozen fish fillets to emphasise convenience.

161

162 2.2.3 Indicators of freshness

163

164 Previous literature refer to freshness as a multidimensional construct because consumers
165 evaluate freshness of fish based on both sensory attributes like smell, colour and appearance, and
166 non-sensory attributes like branding and labelling (Carlucci et al., 2015; Zhang, Lusk, Miroso, & Oey
167 2016;). Freshness is of ultimate importance in consumers’ evaluations of perceived quality and
168 satisfaction with fish in general and fresh fish in particular (Carlucci et al., 2015; Olsen, 2004).
169 Individuals that are more knowledgeable and experienced fish consumers are suggested to be more

170 confident in their ability to judge the freshness of fish by using intrinsic cues such as smell and
171 appearance, e.g. the colour of eyes and gills (Brunsø et al., 2009). Hence, less experienced consumers
172 need extrinsic cues, such as outlets, branding and labelling (e.g. best before date, days since
173 catch/harvest, geographical origin) to help reduce the perceived risk of making a wrong choice
174 (Carlucci et al., 2015). Thus, this study tests if consumers evaluate seafood products differently if the
175 information about freshness varied between four common informational cues Norwegian seafood
176 suppliers use in their promotion of fresh pre-packed cod. Those informational cues are presented in
177 the following.

178 Previous research has shown that the effect of information can be influenced by individual
179 differences in need for affect or cognition (Haddock, Maio, Arnold, & Huskinson, 2008). Affective
180 information refers to feelings or emotions associated with an attitude object and has become more
181 and more important for the differential advantage in food markets because most products are similar
182 with respect to quality, convenience and price (Schifferstein, Fenko, Desmet, Labbe, & Martin, 2013).
183 Cognitive information refers to beliefs or thoughts associated with an attitude object (Aikman et al.,
184 2006). Affect-based information is more effective among individuals in need of affect (Huskinson &
185 Haddock, 2004), whereas cognition-based information is more effective among consumers in need of
186 cognition (Petty, Briñol, Loersch, & McCaslin, 2009). Thus, this study includes a distinction between
187 cognitive information (“Filleted and packed within 6 hours”) and affective information (“Unique
188 freshness”) associated with pre-packed fresh cod. To our knowledge not study has investigates if
189 consumers prefer affective or cognitive statements about freshness of fish.

190 Information about shelf life can be important for how consumer evaluate products (Harcar &
191 Karakaya, 2005). Shelf life indicates the recommended maximum time for which products can be
192 stored (or used) under expected (or specified) conditions of distribution, storage and display.
193 Ragaert, Verbeke, Devlieghere, & Debevere (2004) found that shelf life was one of the most
194 important product attributes when purchasing minimally processed vegetables and packaged fruit.
195 Using factor analysis, their study also indicated that shelf life could be used as a proxy of credence
196 attributes (healthiness, nutritional value and freshness) during consumers’ purchasing decision-
197 making processes. Since all fresh, pre-packed seafood products sold within the European Union (EU)
198 are required to be labelled with a ‘use-by’ date (EU Directive 2000/13), all consumers purchasing
199 fresh, pre-packed cod will be presented with shelf life information. Previous research show that shelf
200 life information can have different impact on consumer acceptance depending on the product type.
201 Gerbitus, Jensen, & Roosen found no differences in preference for beef with 3, 5 and 14 days’ shelf
202 life among US and German consumers. For cod fillets Østli, Esaiassen, Garitta, Nøstvold, & Hough
203 (2013) found that consumers accepted a shelf life of approximately 11 days when no capture date

204 information was given. However, when capture date information was available, the accepted shelf
205 life decreased to approximately 7 days. Wansink & Wright (2006) showed a similar effect for yogurt.
206 Thus, this study uses 8 and 12 days shelf life, simulating the shelf life of fresh fish when stored under
207 different conditions (temperatures of 4°C and 0°C respectively).

208

209 2.3 Individual characteristics

210

211 Based on previous research, a number of individual characteristics that influence seafood
212 consumption were chosen to profile the segments (Olsen et al., 2007; Pieniak, Verbeke, Olsen,
213 Hansen, & Brunsø, 2010; Verbeke, 2008; Verbeke & Vackier, 2005). The profiling variables relate to
214 seven variables or constructs: 1) cod consumption and 2) preferences, 3) health involvement, 4)
215 seafood involvement, 5) knowledge about quality, 6) willingness to pay and 7) demographics.

216

217 2.3.1 Consumption and preference for cod

218

219 Consumption frequency was included in this study since it is a direct measurement of
220 behaviour and included in previous studies regarding seafood consumption (for a recent review, see
221 Carlucci et al., 2015). Consumption frequency has also been used in a number of studies to profile
222 different fish consumer segments (Brunso et al., 2009; Verbeke, Vermeir, & Brunsø, 2007)

223 Since sensory characteristics are product specific, most studies use attitudes toward eating
224 fish, satisfaction or general preferences as proxies for sensory perception of seafood (Carluzzi et al.
225 2012). Preferences, as general like or dislike, have been suggested as one of the most important
226 factors that influence the consumption of and loyalty toward seafood (Carluzzi et al., 2015),
227 including seafood among Norwegian consumers (Olsen, 2004).

228

229 2.3.2 Involvement in health and fish

230

231 Involvement refers to the personal relevance and importance attached to an object based on
232 inherent needs, values and interests (Zaichkowsky, 1985). Involvement in food (Marshall & Bell,
233 2004), fish (Olsen, 2001), or healthy eating are often related to food or fish consumption (Verbeke &
234 Vackier, 2005). Sapp and Jensen (1998) tested the health belief model for its ability to predict actual
235 dietary quality and behaviour. Of the 15 independent variables, product and health involvement
236 (consciousness) were the most important determinants. In the case of fish, involvement in both

237 health and fish influences frequency of product usage (Carlucci et al., 2015; Juhl & Poulsen, 2000;
238 Olsen, 2003).

239

240 2.3.3 Knowledge about quality

241

242 Many consumers find it difficult to evaluate food quality, especially for unbranded and highly
243 perishable food products such as fresh fish (Juhl & Poulsen, 2000). Cognitive capacity, experiences,
244 interests in information and objective and subjective knowledge differ among consumers (Verbeke et
245 al., 2007). Thus, individual differences in consumers' knowledge or capacity to evaluate food quality
246 have numerous consequences, e.g. in terms of behaviour, beliefs, attitudes and consumers' search
247 for and use of information sources during decision-making. The reason for this is that expected
248 quality influences a wide range of attitudes and behaviours from meal preparation methods to future
249 purchasing decisions (Brunsø, Fjord, & Grunert, 2002). Previous studies has shown that subjective
250 knowledge is found to be more strongly associated with behaviour than actual (objective) knowledge
251 (Pieniak, Verbeke, & Scholderer, 2010; Verbeke et al., 2007). Thus, this study include subjective
252 knowledge about fish quality as a profiling variable.

253

254 2.3.4 Willingness to pay

255

256 Fresh cod is among the most expensive commonly used fish products in Norway. The
257 introduction of pre-packed fresh cod has not only made cod more available but also helped introduce
258 cheaper products with fixed low prices. Economists, psychologists and marketing researchers use
259 different research techniques to measure willingness to pay (WTP) (Wertenbroch & Skiera, 2002). For
260 example, WTP can be measured either from actual market transactions or from survey data (stated
261 preferences). Transaction data have high external validity, but such data may be difficult to obtain,
262 especially for new products or concepts (Braidert, Hahsler, & Reutterer, 2006; Knetsch & Sinden,
263 1984). Thus, since the combination of packaging attributes does not exist in the marketplace (and
264 testing all the combinations are too expensive and time consuming), the present study utilised survey
265 data.

266 Survey-based techniques for measuring WTP can be divided into two types, direct and indirect
267 surveys. In direct surveys, respondents are asked to state how much they would be willing to pay for
268 a product. In indirect surveys, some sort of rating or ranking procedure for different products is used,
269 in order to estimate a preference structure from which WTP can be derived. Conjoint analysis is an
270 example of indirect surveying methods (Braidert et al., 2006). The main issue when choosing

271 between direct or indirect methods is whether one of the methods has a higher validity than the
272 other. Previous empirical studies generally failed to find any systematic differences between results
273 when using conjoint analysis and direct surveys to measure WTP (Miller, Hofstetter, Krohmer, &
274 Zhang, 2011; Sattler & Hensel-Börner, 2003). Based on this research, we chose to use a direct survey
275 approach to measure WTP as a profiling variable, and focus on other attributes in the conjoint
276 analysis.

277 3 Materials and methods

278 3.1 Data collection

279

280 In the present study, an online survey was used. Participants were selected based on the
281 following criteria: those who stated that they had eaten fish during the last year and those who were
282 involved in household purchasing decisions in general and fish purchasing in particular. A nationwide
283 representative sample of 503 Norwegian consumers (54% female, 46% male) was used, with an
284 average respondent age of 45.5 years. The data was collected by YouGov, which is a recognised
285 market research company with offices worldwide. YouGov currently includes a database of
286 approximately 30,000 Norwegian consumers. The study was conducted in December 2015, a period
287 of the year when fresh cod fillets are usually not heavily promoted in the Norwegian market.

288 A two-part consumer survey was used to gain insight into the influence of packaging attributes
289 on consumers' decision-making processes for fresh cod. In the first part, the importance of specific
290 packaging elements to consumers was evaluated in a conjoint study. To evaluate the visual
291 attributes, the consumers were presented with pictures of actual products with the different colours
292 (black and silver) and packaging technologies (MAP, vacuum and skin packaging). Under the pictures,
293 the different informational elements were presented. In the second part, the consumers answered
294 survey questions regarding their individual characteristics presented above.

295

296 3.2 Survey instrument development

297

298 In the present study, *fish consumption behaviour* was a self-reported item that was measured
299 as total fresh cod fillet consumption frequency, based on a nine-point scale ranging from 'never' (1)
300 to 'three or more times a week' (9). The scale was recalculated to cod fillet consumption per year.

301 *Preference* for fresh cod was measured on a seven-point scale ranging from 'dislikes' (1) to
302 'likes' (7).

303 “Importance” and “means a lot” are, both in psychology and consumer behaviour, the most-
304 used terms for assessing involvement (Boninger, Krosnick, & Berent, 1995; Zaichkowsky, 1985).
305 *Health involvement* was measured using two items from Pieniak et al. (2008), i.e. ‘Health is very
306 important to me’ and ‘Health means a lot to me’, and one item from Olsen (2003), i.e. ‘I do what I
307 can to stay healthy’. All of the items were scored on a seven-point Likert-scale ranging from ‘totally
308 disagree’ (1) to ‘totally agree’ (7). In addition, *fish involvement* was measured by the following three
309 items based on a seven-point Likert scale ranging from ‘totally disagree’ to ‘totally agree’: ‘Fish is an
310 important part of my diet’; ‘It means a lot to me to have fish for dinner’; and ‘I am very concerned
311 about eating fish for dinner’ (Olsen, 2001; Olsen & Ruiz, 2008).

312 Following Pieniak (2007), the present study measured *subjective knowledge* about quality with
313 three items based on a seven-point Likert scale ranging from ‘totally disagree’ to ‘totally agree’:
314 ‘Compared to the average person, I know a lot about how to evaluate the quality of fish’; ‘People
315 who I know consider me to be an expert in fish quality’; and ‘I have a lot of knowledge about how to
316 evaluate good- and bad-quality fish’.

317 In consumer surveys, *willingness to pay* (WTP) is often framed toward important or salient
318 attributes justifying consumers’ needs or value for products and/or services (Zeithaml, 1988). WTP in
319 the present study was framed toward three different freshness levels of the cod fillets: 12 hours, 2
320 days and 4 days. As previously explained, freshness is an important purchasing criterion for fish; thus,
321 testing willingness to pay for different freshness levels is important. Consumers received the
322 following information before stating their expectations for what the fish would cost at a local
323 supermarket: ‘Usually, this product is sold in supermarkets approximately five days after catch. The
324 price varies, but it is, on average, approximately 150 Norwegian kroner per kilo. How much are you
325 willing to pay for a packaged cod fillet that is “very fresh”’.

326

327 3.3 Conjoint analysis design

328 Conjoint analysis is a research technique used to evaluate factors that influence consumers’
329 product preferences, trade-offs and, therefore, purchasing decisions (Green, Krieger, & Wind, 2001).
330 More specifically, conjoint analysis studies the affinity of consumers towards specific configurations
331 of product attributes. When considering the attributes and levels, these should be carefully chosen
332 to best represent what would be realistic in the market (Gil & Sanchez, 1997). The relative
333 importance of each attribute can be identified and compared to other attributes of one or more
334 products. The results of the conjoint analysis can help identify the market segments between
335 consumers with similar affinities towards one or more product attributes (Hair et al., 1998). In this
336 study, individual consumer characteristics were used to profile different consumer segments, and the

337 packaging attributes used in the conjoint analysis were divided into two categories: visual and
 338 informational attributes.

339 Conjoint analysis was applied in the first step of the data analysis to determine how individual
 340 consumers evaluate the different attribute levels of the packaging of fresh cod. This approach
 341 allowed the estimation of individual attribute levels on the overall utility of fresh cod, especially for
 342 the specific configuration of attributes in the present study (Green & Krieger, 1991; Lee, Moskovitz, &
 343 Lee, 2007). This study was designed using Sawtooth SSI Web 8.4.6 software, and it consisted of six
 344 attributes in a $3 \times 3 \times 2 \times 2 \times 2 \times 2$ design. Table 1 shows the fourteen levels of information (choice
 345 sets) used in this study.

346

347 Table 1: Attributes and levels (choice sets) used in the conjoint analysis design

Category	Attributes	Levels
Visual	Shape of packaging	a) MAP b) Vacuum c) Skin
	Colour	a) Black b) Silver
Informational	Freshness statements	a) Filleted and packed within 6 hours (cognitive) b) Unique freshness (affective) c) Shelf life - 8 days d) Shelf life - 12 days
	Information about taste	a) Natural mild taste b) No information
	Convenience	a) Ready in 15 minutes b) Quick and easy c) Skin and boneless

348

349 In all, nine tasks were shown to the respondents, with each task consisting of three concepts
 350 (i.e. alternative products, see picture 1 for example). The consumers were asked to select the most
 351 attractive concept for each task (the question is in Norwegian on top of figure 1).

352

353 Figure 1: Example of one choice set (text is in Norwegian)

Hvilket av de følgende produktene er mest attraktivt for deg?

(1 / 9)

Produkt 1	Produkt 2	Produkt 3
		
Vekt: 400g Filetert og pakket innen seks timer Raskt og enkelt 12 dager fra slaktedato til siste forbruksdato	Vekt: 400g Unik ferskhet Skins og beinfri 8 dager fra slaktedato til siste forbruksdato Naturell mild smak	Vekt: 400g Filetert og pakket innen seks timer Ferdig på 15 minutt 12 dager fra slaktedato til siste forbruksdato
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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The composition of the tasks and concepts shown per respondent was determined by using a (i) full profile (ii) fractional factorial design: (i) in each concept, respondents were shown levels of every attribute tested, (ii) respondents were only shown a subset of the total number of possible combinations of levels and concepts (i.e. choice situations). Choice situations were chosen per respondent by using the random task generation method and implementing complete enumeration in the Sawtooth SSI Web 8.4.6 software.

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4 Results

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4.1 Conjoint analysis

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Attribute-level part worth and the relative importance of each attribute were estimated for each consumer. Table 2 shows that the cognitive freshness attribute of shelf life was the most important attribute (relative importance of 35.4%) for the consumers, followed by convenience (25.6 %), colour (16.9%), freshness statements (9.0%), shape of packaging (7.9%) and taste (5.0%).

374 Moreover, the informational attributes were more important (total relative importance 75.1%) than
 375 the visual attributes (24.9%).

376 The consumers found that short shelf life was more important than longer shelf life and that
 377 the fish being 'Skin and boneless' was more important than 'Ready in 15 minutes' and 'Quick and
 378 easy'. In addition, black packaging was the preferred colour among the consumers. Regarding the
 379 freshness statements, the cognitive information of 'Filletted and packed within 6 hours' was more
 380 important than the affective statement of 'Unique freshness'. Finally, skin packaging and the taste
 381 attribute of 'Natural mild taste' was preferred overall.

382

383 Table 2: Mean part-worth utilities and mean relative importance of the attributes

Attributes	Levels	Mean part-worth utility	Mean relative importance (%)
Shelf life	8 days	0.76 (1.01)	35.4
	12 days	-0.76 (1.01)	
Convenience	Ready in 15 minutes	-0.33 (0.70)	25.6
	Quick and easy	-0.38 (0.62)	
	Skin and boneless	0.71 (1.23)	
Colour	Black	0.36 (0.58)	16.9
	Silver	-0.36 (0.58)	
Freshness statements	Filletted and packed within 6 hours	0.19 (0.41)	9.0
	Unique freshness	-0.19 (0.41)	
Shape of packaging	MAP	-0.16 (0.67)	7.9
	Vacuum	-0.00 (0.67)	
	Skin	0.17 (0.49)	
Information about taste	Natural mild taste	0.10 (0.28)	5.0
	No information	-0.10 (0.28)	

384

385 4.2 Cluster analysis

386 Hierarchal cluster analysis, performed on the different packaging attributes presented above,
 387 provided three clusters with different patterns (Table 3).

388 Table 3: Mean part-worth utilities and importance of the attributes for the three clusters

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Attributes	Levels	Consumer Segments			ANOVA P-value
		Quality	Packaging	Convenience	
Shelf life	8 days	2.12	0.20	0.36	0.000
	12 days	-2.12	-0.20	-0.36	0.000
	Relative importance	67.5 %	13.8 %	10.9 %	
Convenience	Ready in 15 minutes	-0.24	-0.05	-1.53	0.000
	Quick and easy	-0.26	-0.15	-1.45	0.000
	Skin and boneless	0.51	0.2	2.98	0.000
	Relative importance	12.3 %	12.1 %	68.4 %	
Colour	Black	0.14	0.53	0.23	0.000
	Silver	-0.14	-0.53	-0.23	0.000
	Relative importance	4.5 %	36.7 %	7.0 %	
Freshness statements	Filleted and packed within 6 hours	0.33	0.21	-0.10	0.000
	Unique freshness	-0.33	-0.21	0.10	0.000
	Relative importance	10.5 %	14.5 %	3.0 %	
Shape of packaging	MAP	-0.08	-0.18	-0.28	0.099
	Vacuum	0.01	-0.08	0.22	0.002
	Skin	0.07	0.26	0.07	0.000
	Relative importance	2.4 %	15.2 %	7.6 %	
Information about taste	Natural mild taste	0.09	0.11	0.10	0.769
	no information	-0.09	-0.11	-0.10	0.769
	Relative importance	2.9 %	7.6 %	3.0 %	
N (% of sample)		141 (28.0 %)	281 (55.9 %)	81 (16.1 %)	

392

393 The segments were named according to the attributes with the highest importance for each cluster
394 (Table 3). The quality segment (n = 141) showed a very strong preference for the fish with the
395 shortest shelf life (relative importance of 67.5%). Freshness statements were also an important
396 attribute (10.5%) for this segment, especially with regard to 'Filleted and packed within 6 hours'. In
397 contrast, visual attributes and taste were of very little value for this particular segment. The
398 packaging segment, which was the largest segment (n = 281), preferred the two visual attributes of
399 colour and shape (total relative importance of 51.9%). In addition, black- and skin-packaged products
400 were the most important for this segment. The freshness attributes were also important for this
401 segment (total relative importance of 51.9%), in addition to convenience. The convenience segment,
402 which was the smallest segment (n = 81), placed emphasis on the convenience attributes (relative
403 importance of 68.4%). They found the 'Skin and boneless' products very important, whereas 'Ready
404 in 15 minutes' and 'Quick and easy' were less important. Overall, freshness and taste had very little
405 value for this segment. Finally, except for taste and MAP packaging, the results of the ANOVA
406 confirmed a significance between the cluster differences in the attribute part-worth utilities (Table
407 2).

408

409 4.3 Cluster profiling

410

411 The ANOVA, performed on the different measures, revealed the following three cluster profiles
 412 (Table 4). The ANOVA also revealed no significant difference between the segments for the
 413 willingness to pay for 2-day- or 4-day-old cod fillets, health orientation, income and gender.

414 Table 4: Cluster profiles with individual characteristics. Different letters within the same row indicate
 415 significant differences ($p \leq 0.05$)

		Quality	Segment Packaging	Convenience
Consumption	Consumption of fresh cod fillet (times/year eaten)	21.5a	21.3a	12.0b
	Share of pre- packed fresh fish	5.1b	5.9ab	6.9a
Preference	Preference fresh cod fillet	5.7a	5.3ab	4.9b
Involvement	Health involvement	5.7	5.6	5.6
	Fish involvement	5.4a	5.1ab	4.7b
Knowledge	Knowledge about quality	4.6a	4.2b	3.7c
Willingness to pay	Willingness to pay 12 hours	112.0ab	102.8b	122.3a
	Willingness to pay 2 days	93.0	106.4	102.3
	Willingness to pay 4 days	69.6	77.3	85.3
Demographics	Income	6.6	6.1	6.3
	Age	52.8a	44.9b	40.4c
	Gender	1.4	1.5	1.5

416

417 The quality segment had the highest consumption rate (21.5 times/year) and preference (mean
 418 liking 5.7) for cod fillets. They also ate the lowest amount of pre-packed fish (approximately 50%).
 419 This segment was the most involved with fish in general, the consumers were the oldest (mean age
 420 52.8 years) and they had the most knowledge about the quality of fish.

421 The packaging segment had (together with the quality segment) the highest consumption rate
 422 (21.3 times/year), but it was not significantly different in preference from the other two segments.
 423 They also had the lowest willingness to pay for 12-hour-old fish (102.8 Norwegian kroners). In
 424 addition, they were between the two other segments in terms of quality knowledge and age.

425 The convenience segment had the lowest consumption rate (12.0 times/year) and preference
 426 (mean liking 4.9) for cod fillets. They also had the least amount of knowledge about the quality of

427 fish. Moreover, they had the highest willingness to pay for 12-hour-old fish (122.3 Norwegian
428 kroners), and they ate the most pre-packed fish (approximately 70%). Finally, this segment, which
429 was the youngest (mean age 40.4 years), was not involved with fish in general.

430 5 Discussion

431

432 The first goal of this study was to evaluate the relative importance of the visual and
433 informational packaging attributes of fresh cod. The results show that informational attributes were
434 more important than visual attributes. In a similar study, Silayoi and Speece (2007) found that visual
435 and informational attributes had the same importance. However, they included more visual
436 attributes than informational ones in their study. In contrast, this study included more informational
437 attributes than visual ones, which may be one explanation for the results. The most important
438 factors for consumers when choosing cod fillets were the two freshness attributes (total relative
439 importance of 44.5%). The findings show that information about shelf life (number of days) was
440 much more important (relative importance of 35.4%) than statements about freshness (relative
441 importance of 9.0%). This supports Raegart et al. (2004), who found that shelf life is used as a proxy
442 for credence attributes, such as information about freshness in consumer decision-making process.
443 The consumers in this study found cognitive information about freshness ('Filleted and packed within
444 6 hours') more important than affective information ('Unique freshness'). This indicates that these
445 consumers had a low need for affect and a high need for cognition regarding information about
446 freshness (Haddock et al., 2008). This is also supported by the high importance of shelf life, which
447 was one of the cognitive freshness information items in the present study.

448 The second-most important packaging attribute was convenience (relative importance of
449 25.6%). The consumers were more attracted to a product that was 'Skin and boneless' rather than
450 'Quick and easy' to prepare. Previous studies have shown that bones are one of the main concerns
451 associated with fish consumption (Olsen, 2003; Verbeke & Vackier, 2005). Other studies (Brunsø et
452 al., 2009) show that in some countries (e.g. Belgium), time used in preparation is the biggest barrier
453 for fish consumption, whereas bones are more important in other countries (e.g. Spain). Thus, the
454 fact that boneless cod fillets were perceived as more important than time used in preparation might
455 be a result of the country in which the study was conducted.

456 Information about taste came out as the least important attribute. This is somewhat surprising
457 given that previous studies found taste as one of the most important informational attributes
458 (Tepper, & Trail, 1998; Cardello, & Schutz, 2003). A possible explanation is that the consumers
459 already know the taste of cod, and that we did not introduce any new flavors (i.e added spices or
460 brine) of cod in our study.

461 The second goal of this study was to segment the consumers based on preference for different
462 packaging attributes and validate the segments using individual characteristics of the consumers.
463 Using the visual and informational attributes for market segmentation purposes through cluster
464 analysis revealed three segments; the packaging, quality and convenience segment. Although
465 informational attributes were found to be the most important in this study in general, the packaging
466 segment, which was the largest (more than 50% of the consumers), preferred the visual attributes of
467 shape and colour. Freshness attributes were also important (total relative importance 28.4 %). In this
468 segment short shelf life and the cognitive freshness statement were of similar importance. This was a
469 different result compared with the entire sample, which preferred short shelf life to freshness
470 statements.

471 The quality segment and the convenience segment were mainly concerned about
472 informational attributes. More specifically, the quality segment preferred cognitive quality indicators
473 such as short shelf life and cognitive freshness statements. Meanwhile, the convenience segment
474 used convenience information and preferred fish that was skin and boneless.

475 As mentioned in the introduction section, pre-packed fillets of salmon have been available in
476 the Norwegian market for some time. Familiarity with a product can influence which information
477 cues consumers rely on when evaluating a product (Rao & Monroe, 1988). Thus, different levels of
478 familiarity with pre-packed salmon could explain why the different segments emphasised different
479 attributes.

480 The individual characteristics of the segments also differed. For example, the quality segment
481 was highly involved in fish, had high subjective knowledge and the consumers had a high
482 consumption and preference for cod. This is in accordance with previous research, which showed
483 that highly involved consumers with high subjective knowledge tend to consume fish more
484 frequently (Olsen, 2001; Verbeke et al., 2007). This was also the segment with the oldest consumers;
485 thus, they had the most experience dealing with fish. This was also reflected in the fact that they had
486 the most knowledge of how to judge quality, which is in line with previous research (Verbeke et al.,
487 2007). In addition, the quality segment bought both packaged and unpackaged fish.
488 The packaging segment had high consumption rate and preference for cod, and they were highly
489 involved in fish. However, this segment had the lowest willingness to pay for extremely fresh fish,
490 showing that they focused more on the packaging than on quality attributes. They were also
491 between the two other segments in terms of age and knowledge of how to judge the quality of fish.
492 This shows that lower subjective knowledge does not necessarily result in lower consumption,
493 something that has been shown in other studies (Altintzoglou, & Heide, 2016).

494 The convenience segment had the lowest frequency of cod consumption and the lowest
495 preference for cod. This segment had the youngest consumers, and they expressed lower
496 involvement in fish compared with the two other segments. Previous research has shown that
497 younger consumers are generally less involved in fish, and they perceive the inconvenient aspects of
498 fish as a barrier to consumption (Olsen, 2003). In this study, they had limited knowledge of how to
499 evaluate the quality of fish and the highest willingness to pay for extremely fresh fish. This may be
500 explained by their limited knowledge about quality evaluation. More specifically, as these consumers
501 were probably insecure about the quality of fish, they were willing to pay more for fresh fish to
502 reduce their risk of purchasing low-quality fish. Finally, this segment also purchased the most pre-
503 packed fish, which can be explained by the fact that pre-packed fish in Norway is mostly sold skinless
504 and boneless, both of which fit the segment profile.

505 This study did not show significant difference in health involvement between the segments.
506 Previous studies has shown a positive relationship between health involvement and consumption
507 (Olsen, 2003). The study did however show a significant relationship between fish involvement and
508 consumption, indication that this could be a better predictor for consumption, at least in the context
509 of this study.

510

511 5.1 Implications

512

513 The results of this study can be used by the seafood industry to design packaging for cod
514 products that better matches Norwegian consumers' needs and expectations. In general, freshness
515 seems to be the most important product attribute for consumers. Offering products of high quality
516 and freshness appears to be a good strategy for building a good image and increasing the sales of
517 cod.

518 This study identified three distinct clusters that can be targeted by the seafood industry, with
519 emphasis on different packaging attributes:

- 520 1. The packaging segment, the largest segment, had a high consumption rate of fresh cod
521 fillets. Thus, it seems to be the most promising segment to focus on for the seafood industry.
522 Visual packaging attributes were the most important for this segment. Accordingly, designing
523 attractive packaging could be a good strategy for targeting this particular segment. In
524 addition, these consumers were somewhat interested in the freshness indicators, and they
525 found the freshness attributes equally important. In this regard, both short shelf life and
526 cognitive freshness statements should be used on packaging. Finally, this segment had the
527 lowest willingness to pay for extremely fresh cod, and the consumers were willing to pay the

528 same amount regardless of whether the fish was packaged 12 hours or two days earlier.
529 Overall, compared with the other segments, this segment accepted less freshness for the
530 same price.

- 531 2. The convenience segment was less involved in fish, had less knowledge about quality and
532 consumed less cod fillets than the other segments. At the same time, they had a high
533 willingness to pay for extremely fresh cod, and they were very attracted to skin and boneless
534 fillets. Thus, these consumers should be targeted with products that are more convenient,
535 skin and, boneless and extremely fresh. It would also be interesting to gain more knowledge
536 about their general drivers for food consumption to tailor new cod products that are better
537 suited to their specific needs and preferences. Over time, this can help increase their
538 consumption of fresh cod.
- 539 3. The quality segment had the most knowledge, involvement with and consumption of fresh
540 cod fillets. Their main emphasis was on freshness indicators, especially short shelf life and, to
541 a lesser degree, cognitive freshness statements. They also had a high willingness to pay for
542 extremely fresh products. Therefore, this segment can be targeted with extremely fresh cod
543 products in which freshness is emphasised by both short shelf life and cognitive statements.
544

545 5.2 Limitations and future research

546

547 The results of this study should be interpreted in the cultural context in which it was conducted.
548 Malai and Speece (2005) argued that there could be several levels of cultural impact at work in
549 conditioning any response to marketing elements. As an example, people in different cultures are
550 exposed to different colours; thus, they develop colour preferences based on their own cultures
551 (Silayoi, & Speece, 2007). Previous research has also shown that perception of cues for a food
552 product can have both similarities and differences between countries (Grunert, 1997). Future
553 research on packaging attributes for fresh fish should be performed in a cross-cultural context to
554 validate and generalise the findings. Another limitation of this study is that the consumers could not
555 evaluate real products with different packaging attributes. Measurement refinements may also be
556 made in future research. For example do we find several ways to assess involvement (Mittal, 1995;
557 Zaichkowsky, 1985).

558 Research has shown that evaluation of a product can change from when a consumer assesses a
559 product concept to when evaluating a real product (Grunert et al., 2011; Saeed, Grunert, &
560 Therkildsen, 2013). Therefore, future research should be conducted in more-realistic environments,
561 with real products. Finally, several construct reliability issues can be discussed. For example was WTP

562 assessed with a direct measure without any commitment to pay. Future studies could use other
563 forms of assessment such as an incentive-aligned choice-based conjoint analysis (Ding, 2007) or in
564 real WTP situations (Voelckner, 2006).

565 6 Conclusions

566

567 In this study, informational attributes (freshness statements, information about taste and
568 convenience) were found to be more important than visual attributes (shape of packaging and
569 colour), especially for consumer evaluations and their choices of fresh cod in Norway. The most
570 important factors for consumers when choosing cod fillets were the two freshness attributes. In
571 addition, the consumers found cognitive freshness (shelf life and 'Filletted and packed within 6 hours')
572 information more important than affective or emotional information ('Unique freshness'). The
573 results of the cluster analysis revealed three distinct segments (packaging, convenience and quality)
574 that emphasised different packaging attributes. Furthermore, the segments were significantly
575 different in terms of the individual characteristics, consumption, preference, involvement,
576 knowledge, willingness to pay and demographics. This result underlines the importance of
577 segmenting consumers to be more efficient and effective when meeting the specific needs of the
578 target audience (Verbeke, 2008).

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580

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