Perception of oyster-based products by French consumers: the effect of processing and role of social representations

Gervaise Debucquet, Josiane Cornet, Isabelle Adam, Mireille Cardinal

Article publié dans Appetite 59 (2012), 844-852

Perception of oyster-based products by French consumers: the effect of processing and role of social representations

Gervaise Debucquet [a], Josiane Cornet [b], Isabelle Adam [b], Mireille Cardinal [b*]

[a] Audencia Nantes. School of Management, PRES LUNAM, LESMA (Laboratoire de recherche en Stratégie et Marchés des produits Agroalimentaires), 8 route de la Jonelière, BP31222, F-44312 Nantes 03, France

[b] Ifremer, Laboratoire Science et Technologie de la Biomasse Marine, F-44311 Nantes 03, France

* Corresponding author. Fax +33 2 40 37 40 71

E-mail address: Mireille.Cardinal@ifremer.fr

Abstract

The search for new markets in the seafood sector, associated with the question of the continuity of raw oyster consumption over generations can be an opportunity for processors to extend their ranges with oyster-based products. The twofold aim of this study was to evaluate the impact of processing and social representation on perception of oyster-based products by French consumers and to identify the best means of development in order to avoid possible failure in the market. Five products with different degrees of processing (cooked oysters in a half-shell, hot preparation for toast, potted oyster, oyster butter and oyster-based soup) were presented within focus groups and consumer tests, at home and in canteens with the staff of

several companies in order to reach consumers with different ages and professional activities. The results showed that social representation had a strong impact and that behaviours were contrasted according to the initial profile of the consumer (traditional raw oyster consumers or non-consumers) and their age distribution (younger and older people). The degree of processing has to be adapted to each segment. It is suggested to develop early exposure to influence the food choices and preferences of the youngest consumers on a long-term basis.

Keywords: oyster, processing, consumer perception, disgust, social representation

Introduction

Of the European countries that produce oysters, France is the leader with around 113,000 tons (FranceAgrimer, 2010) and ranks fourth at the world level after China, Japan and Korea. France has the characteristic to sell nearly all its production on the national market. Oysters (*Crassostrea gigas*) are a traditional product mainly consumed in their live form, and in spite of the producers' efforts to extend the period of consumption, they still remain a seasonal product for the French market, with a peak of consumption between Christmas and New Year's Day (Girard & Mariojouls, 2003). Therefore, in French food culture, oysters belong to the category of rare and luxury foods. A recent survey on household consumption (Panel Kantar Worldpanel) conducted in 2009 for France Agrimer (2010) showed that only 21% of households bought oysters at least once a year even though two thirds of the French population consume the product. This study also confirms a certain stability in consumption, as well as the importance of "cultural", "economic" and "demographic" factors in consumers' behaviour, as already observed by Girard & Mariojouls (2003). The consumer profile for fresh oysters is essentially a person over the age of 50, in an upper income bracket, living in the West of France and generally in a household of 2 people. On the contrary, non-consumers

of oysters, generally among the youngest, consider that this product is too costly and difficult to open, and the specific characteristics of oysters (live, raw and viscous) play a part in developing a certain aversion to this product. This difference in behaviour between young and senior purchasers may lead to a deficit in the recruitment of "new" consumers, and perhaps ultimately leading to critical questions regarding the future of oyster consumption. How can the continuity of oyster consumption be guaranteed down through the generations? This question highlights the importance of promoting the product with young people, but perhaps also of diversifying the range of oyster-based products. This search for new markets could also be an opportunity for processors to extend their range of seafood products.

However, to find the best ways to develop and to avoid possible failure in the market, it is necessary to take into account as early as possible the psychological barriers related to oyster consumption and to analyse the potential for processed oyster-based products through consumer perception. Understanding consumer reactions to new products is especially interesting in the case of oysters as they are known to cause extremely marked reactions. Many non-consumers are disgusted by oysters because of their appearance and the consumers' unwillingness to consume something alive and viscous. In the literature, "disgust" deals specifically with animal substances *versus* plant substances because of the moral dimension linked with their ingestion by eaters, as shown by Rozin and Fallon (1987). In other respects, Kolnai (1998) has identified these two physical characteristics, alive and viscous, as the most common and strongest sources of disgust. French consumers naturally ingest raw, live oysters thanks to French culture which allows them to "appropriate" these particular sensory qualities by classifying them in the category of rare, luxury and healthy food. The feelings of disgust are strongly reduced by the fact that when ingesting oysters a lot of other, generally positive, symbols are ingested at the same time. Fischler (1990) showed that food ingestion is not an ordinary action but one that always has a symbolic dimension.

Thus, when eating raw, live oysters, French consumers in general, and those traditionally seen as “oyster eaters” in particular, consider that they are "drinking the sea", conjuring up iodine and all the images of naturality, purity, lightness and freshness associated with this shellfish. In short, the social representations associated with oysters by consumers identify a healthy and refined food (Debucquet and Merdji, 2004). On the contrary, part of the population retains a very strong aversion towards oysters and their physical properties, all the more so if they did not eat raw oysters often and at a young age in their food education.

Processed oysters could thus be a way of removing these fears. In that case, however, it is necessary to analyse expectations and the associated overall perception. Many studies have indeed shown how information or the visual appearance of food influences flavour recognition or overall liking and generates expectations (Mojet and Koster, 2005; Kole, 2009; Delwiche, 2004); a contrast between expected and actual sensory qualities can induce a strong negative affective response focusing on the unexpected sensory qualities (Yeomans *et al*., 2008). In the case of oyster, the context of the first tasting or first “experience” (Faurion, 1996) contribute strongly to previous social representations associated with this kind of food and could influence the expected sensory qualities.

In this context, could processing overcome the impact of representations and sensory barriers associated with oyster in non-consumers? Or would deep-seated reasons still prevent consumption for non-consumers? On the other hand, would a traditional consumer of fresh oysters be ready to accept a processed product with the risk of losing certain attributes, such as “natural” and “authenticity”? From a theoretical perspective, this problematic leads to analysis of the phenomenon of anchoring as described by Moscovici (1961), that is, how the perception of new products and their sensory qualities are determined by previous representations and the social value associated with this food, which is called by Jodelet

100 (1994), the “already in mind”. As this topic has received little attention in the literature on
101 sensory and hedonic evaluation, this article will try to fill the gap.
102 The general objective of the paper was to analyse and understand the key drivers in oyster or
103 based-oyster products consumption with a twofold research objective: evaluating the impact
104 of processing and social representation on hedonic perception. To achieve these objectives, a
105 complementary approach was applied. A qualitative approach through individual interviews
106 and focus groups was carried out to catch the conscious and unconscious elements in the
107 consumer perception. Then consumer tests were performed on five oyster-based products in
108 two situations of consumption in order to reach a large range of population in term of ages
109 and professional activities (students and active workers in canteens and families with children
110 and teenagers at home). Products were collected from three seafood companies, partners in
111 the project. The range of products making it possible to illustrate the influence of the degree
112 of processing was composed of a frozen, cooked oyster in a half-shell (C) and four sterilized
113 products presented either in cans for soup (S) hot preparations for toast (T) or in glass jar for
114 oyster butter (B) and potted oyster (P). Oyster was entire in the case of C product, mixed in T,
115 B and P products and some pieces of oyster were present in S product. Table 1 gives the main
116 ingredients and characteristics of each product. A preliminary study with a trained panel
117 showed a wide range of sensory characteristics (Cardinal & Debucquet, 2010) : in appearance,
118 from smooth, light and homogeneous (P, B) to a more complex product with small pieces and
119 dark colour (T and S); in texture, from a liquid (S) to a paste with different degrees of fat
120 perception (B, P, C); in odour with specific marine notes such as seaweed (T) to vegetable (S)
121 or garlic (B, P) or onion and wine for C; in flavour, from marine notes such as seaweed (T, S)
122 to butter and garlic, especially for B and P. The final objective was to identify if in the range
123 of processed products presented, some of them were mainly adapted to a specific target of
124 consumers.

Study 1: Qualitative study - Individual interviews and focus-groups -

Method

After a first, exploratory stage with in-depth and individual interviews (10 people), four focus-groups of 8 people each (in total 32 people) were made up. During focus-groups, the five products were presented and tasted by the subjects but several projective exercises and open questions were introduced in order to induce spontaneous evocations and collect references to the unconscious, as suggested by Moliner (2001) as a means of accessing social representations. Each focus-group lasted on average 2 h 30. This qualitative stage aimed (1) at identifying the main factors involved in the consumption or non-consumption of oyster-based products, especially those related to previous social representations associated with oysters and to the recipe itself (the perceived compatibility of the ingredients with oysters, the impact of the degree of oyster processing on acceptability) and (2) to set up hypotheses to be tested in the questionnaire (study 2). Subjects were recruited in the Pays de Loire area and the sample was an equal distribution of age classes, gender, educational level and oyster consumers (C) *versus* non-consumers (NC). For the recruitment, consumers were informed that the session was a discussion on seafood products with a taste session (no information was delivered on the kind of the products) and therefore they were invited to tell what products they generally consumed and what products they never consumed. They did not know that the session focused on oyster.

In addition, a comparative test on taste perception was implemented during the focus-groups, inspired by the psychophysical experiment by Morrot *et al*. (2001) on odour perception. These authors investigated the interaction between the vision of colours and odour perception through lexical analysis of experts' wine tasting comments. A white wine artificially coloured

red with an odourless dye was described as a red wine in olfactory terms. Analysis showed that the odours of a wine are, for the most part, represented by objects that have the colour of the wine. In our experiment, subjects were offered two samples of the five oyster-based products. The first was a blind test (subjects were told that it was seafood products); for the second, the same five products were offered but they were presented as novel products prepared with oysters. This comparative test was not strictly a sensory test but a projective exercise (Donoghue, 2000) to stimulate verbalization. The aim of this part of the focus-group was in fact to evaluate the influence of previous representations associated with oysters on product perception, especially taste descriptors, and, at the same time, to compare perceptions and assessment of oyster consumers in comparison with non-consumers.

Data analysis

An analysis of themes, sub-themes and lexical universes was carried out with data collected during the focus-groups and individual interviews, and, more particularly, the comments of subjects at both stages of the comparative test.

Results : Impact of oyster representations on hedonic perception of processed products

The lexical analysis of the comments collected during the comparative test showed huge discrepancies both between the first test (blind test) and the second test (the subjects were informed that the products were oyster-based products) and between oyster consumers and non-consumers. The results showed that taste perception is not only dependent on the first sensory experience but also on the pre-existing representations associated with oysters. Taste perception and, more particularly, taste descriptors effectively changed considerably between the first and second tests:

- we observed that taste initially perceived as *"insipid"(10)*[1], mainly among the non-oyster consumers (NC) and mostly recruited from young subjects **became** in the second test *"strong"(7), " too strong"(5), "bitter"(3), "acid"(3),* that what was called *"an indefinable taste"(9)* **became** *"strange"(7), "doubtful taste"(4), "a bad aftertaste"(4),* and lastly that a texture initially perceived as *"soft"(3), "thick"(8)* or *"heavy"(7)* **became** *"jelly-like"(9),* and *"viscous"(11).* All in all, the lexical registers used after being told of the presence of oysters in the recipes showed that simply mentioning oyster revived the main sources of disgust produced by the consumption of raw oyster, that is: viscosity, stickiness and alive;
- on the other hand, the change in lexical register for taste, perceived first as *"good"* (9) or *"pleasant"(11)* and becoming *"not fine or exquisite enough"(5)*, *"not high-class enough"(6)* is mainly observed among the consumers (C). Moreover *"Taste of the sea"(11)* **became** for them *"good taste but not strong enough because we don't recognize the taste of oyster enough"(8)* or sometimes *"not natural enough"(7)*, *"chemical"(3)*, and lastly a *"delicious and creamy texture"(8)* **became** *"like boiled and over-cooked oysters"(6)*. All in all, these quotations highlight that all the dimensions confer oysters, in the mind of French oyster eaters, with the status of a refined, exceptional and natural dish.

Beyond these differences, the products were less appreciated during the second test by both oyster consumers and non-consumers as proved by highly negative comments and bigger amount of leftovers. The subjects were expecting to find oyster-based products *"less fatty", "less pasty"* and, in some opinions, *"the fatty texture suggests that it was fatty oysters or oysters with soft roe".* These last quotations confirm that oysters are perceived by most people as a diet and healthy food. In others words, in their mind, fat is not compatible with the representations associated with oyster, that is, hints of the sea, coast, iodine, and mineral salts.

[1] For the two groups (NC and C) constituted of 16 persons (2 focus-groups of 8 persons each), the number in bracket represents the number of citations of each term.

A second part of the focus-groups was dedicated to identifying the boundaries of acceptability as regards recipes and ingredients. As presented in the methodology part, a creativity exercise was implemented during the focus-groups in order to understand what kind of recipes would be accepted or rejected by consumers, according to the nature of the ingredients (meat, fish, fruits, vegetables, dairy products, etc.) and the level of processing of oysters.

- Concerning ingredients, the results demonstrated that the association between oysters and meat was rejected by almost everybody. This is an illustration of the impact of cultural habits on acceptability and more particularly of French habits. As oysters are commonly eaten in a raw, live form, the association with meat appears definitively dissonant because of the mixture of "substances", especially "land substances" and lives "sea substances": *"They are two different species, from land and sea. So, no! […]. And moreover, meat is a living substance, as are oysters… That is definitely incompatible!"*. The case of red meat provoked the greatest disgust, because of the blood: *"Red meat is not fully dead, it is still a little bit alive. Look at the blood!"*[2]. The risk arising from this quotation is clearly a symbolic risk and, very logically, white meat (such as pork or chicken) or "reified" meat like ham were better accepted in the recipe with oyster-based products. Lastly, vegetables, as more neutral ingredients, or fish, as ingredients from the same universe, did not raise any problems.
- Concerning the level of processing of oysters and therefore the texture of oyster-based products, the participants in the focus-groups stressed the need to clearly identify each ingredient with regard to the issues of mixing "substances". Consumers and non oyster consumers turned down products that were overly processed, of the paste- or blended-type, as they played a part in excessively denaturing the oysters and were perceived as industrial and suspicious products. While the ideal recipe for the oyster consumers was the cooked oyster in

[2] Historians have analysed the importance of the beliefs associated with red meat and blood, especially during the pre-scientific period (Darnon, 1999). A recent research project dedicated to the perception of food germs has shown that blood in red meat is still nowadays perceived as risky because of the survival of the belief in "spontaneous generation" among lay persons (Debucquet, Merdji, Fischler, 2007).

a half-shell, because it maintained a symbolic proximity to raw oysters (*"Great! They remain in their shell! They look fresh even if they have been frozen!"),* on the contrary, non-consumers looked for intermediary products, neither too mixed and without big pieces of oyster to keep a symbolic distance from the sources of disgust.

- Regarding sanitary risk, it is interesting to note that during the focus-groups and after presenting the processed oysters, none of the non-consumers spontaneously tackled this issue. Surprisingly, the processing of oysters removed all the fears and anxiety about sanitary risk because the "*oyster is dead"*, that is, in the subjects' minds, in biological and symbolical terms. On the contrary, more people among the raw oyster consumers were suspicious of processed oysters because the process was always perceived as a "denaturation" of the oyster, necessarily using additives and preservatives.

In conclusion, the results of the qualitative study revealed huge differences in the mechanisms of perception of oyster-based products between consumers and non-consumers. Our data suggest the importance of previous representations associated with raw oyster on processed oyster perception in terms of taste, recipe acceptability and risk perception.

Study 2: Quantitative study - Consumer test in real consumption situations -

In staff canteens

Method

Consumer panel

The French multinational corporation Sodexo, one of the largest food service companies in the world was a partner in the project and offered the opportunity to test products in different staff restaurants. The context of restaurant was particularly interesting because oysters are, in France, almost always consumed in the setting of a social and shared meal. The companies

were chosen according to their location and their field of activity in order to reach consumers with different profiles. Three cities that differ from one another in terms of distance from the sea were selected: Nantes, Tours and Lyon. Ifremer, a Marine Research Institute with a consumer population involved in marine questions and the Ecole des Mines , a school of Engineering mainly composed of young consumers, were the two companies chosen in Nantes to test products in their Sodexo restaurants. In Tours, the company selected was Sanofi, from the pharmaceutics sector, and finally Areva, a company working in the nuclear field, in Lyon made it possible to test people in the research department. The four self-service restaurants were different in terms of their mean numbers of daily customers and finally the number of participants in the consumer test was respectively for each restaurant, 155, 177, 87 and 62. The whole panel's characteristics included the four canteens are presented in Table 2. The amount of oyster eater in this population reached 76%.

Procedure

Tests were performed between December 2009 and April 2010. Products were prepared in each self-service restaurant according to industrial recommendations and were presented at the entry of the restaurant on a plate prepared for each customer. To lighten the test for consumers, the five products were presented on two successive days with a presentation of three products the first day (P, S, T) and two products (B, C), the second day. Products were presented simultaneously on the same plate and consumers tasted the products according to a balanced order in the questionnaire. As the tests lasted for two days, all consumers did not taste necessarily all the products. Each person was informed that the products were oyster-based products and was invited to test them during their lunch. Customers were free to take them or not. After acceptance, the same questionnaire was distributed in each restaurant to collect their opinion. They were invited to give a few negative and/or positive words after tasting each product and to rate their overall liking with a score from 0 to 10: dislike

extremely (0), like extremely (10) and to express their perception of naturality, not at all (0), quite natural (10). Personal information such as age, gender, educational level and consumer (C) or non-consumer (NC) of raw oyster was asked for at the end of the session. In the paper, NC refers to non-consumers of raw oyster, the traditional way of eating oysters in France.

Data analysis

Consumer data results were expressed as a mean ± standard deviation (SD). In consumer test, estimation of the effect of each variable (social and demographic characteristics, traditional oyster consumer) on overall liking was performed by analysis of variance on all consumer scores with products and each of these variables as independent factors. The main effects and interaction between factors were tested. The analysis of qualitative data (negative and/or positive words associated to each product after tasting) was only performed on questionnaires from the home tests where description was more detailed and richer than in restaurants.

Results : Overall liking and hedonic perception in staff canteens

The scores for overall liking and "naturality" attributed by consumers to each product are presented in Table 3. The general mean for overall liking scores for all consumers highlights a significant difference between the products. The cooked oyster in a half-shell obtained the highest score (6.9 ± 1.9) followed by soup (6.2 ± 2.4), potted oyster (6.1 ± 2.1), hot toast (5.9 ± 2.2) and finally oyster butter (5.7 ± 2.0), but no significant difference appeared between the last three products. Food habits related to raw oyster consumption had a significant effect ($p=0.03$) on overall liking as traditional raw oyster consumers gave higher scores to products compared to those of non-consumers. No interaction appears between the variables "usual oyster eater" and products which means a same general trend in overall liking for C and NC. Analysis of variance performed over all the consumer data of liking with products and gender

as independent factors did not show any significant difference between scores attributed by women or men ($p=0.43$). Educational level and age did not lead to a significant difference either, ($p=0.11$and $p=0.79$, respectively).

At home

Method

Consumer panel

145 consumers from 68 households on the Tastenet panel took part in the study. The Tastenet panel was composed of volunteers for consumer tests at home on fish and fish products selected by the French Research Institute Ifremer through the company's staff (friends, family, neighbours). The answers of all family members older than 11 years were taken into account. The majority of theses families lived in an urban area (Nantes). The main characteristics of this at home consumer panel are presented in Table 2.

Procedure

Consumer tests were performed between March and April 2010. Families were provided with the five oyster-based products (here, in their packaging) and a questionnaire for each product and each family member. There was a total freedom to choose the order of consumption of the 5 products as well as the time and the situation of consumption but it was recommended that the products be tested one by one on different days depending on the choice of the family and that the product be prepared according to the directions for use on the packaging. The consumption was organised with the family members previously identified in this home. The same questionnaire as at the self-service restaurants was presented.

322 Data analysis

323 The same kind of analysis was applied on overall liking data obtained in staff canteens and at
324 home. Qualitative information obtained from the open questions, especially the negative
325 and/or positive words associated with each product that respondents were asked to provide
326 after tasting, was analysed using textual analysis software called ALCESTE[3] version 2010.
327 This software makes it possible to treat corpora of discourses and to separate statements into
328 classes, using a downwards-hierarchical classification on the basis of co-occurrence of words
329 (Reinert 2002). The classification of the respondents' terms established by ALCESTE was
330 based on the idea that the words used by each respondent were chosen according to his or her
331 particular mental space that constitutes the person's framework of reference (Reinert 1993).
332 When data comes from a panel of respondents, it helps to analyse social representations, each
333 class of word used often unconsciously by respondents then resulting from an anchoring
334 process (Debucquet, 2011), in accordance with the theory of representations developed by the
335 French school of social psychology (Moscovici 1961; Jodelet 1994; Moliner 2001) which
336 shows how representations are embedded in a social and cultural context. This analysis was
337 performed on questionnaires from the home tests where description was more detailed and
338 richer. Moreover, Chi-square tests were carried out by ALCESTE software to identify
339 significant associations ($p<0.05$) of each class of words with oyster-based products,
340 sociodemographic profiles, and oyster consumers (C) or non-consumers (NC).
341

342 Results : Overall liking and hedonic perception at home

343 Even if our research is not focused on the consumption context effect, previous studies have
344 shown differences in overall liking between at home test and other situations, it is the reason
345 why results from at home are presented separately. The results of the consumer tests

[3] Analyse des Lexèmes Co-occurrents dans les Enoncés Simples d'un Texte (Analysis of co-occurent lexemes in simple wordings of a text)

346 performed at home showed the same order in overall liking as those obtained in staff canteens
347 but the scores attributed were generally lower, except for cooked oyster (Table 4). The highest
348 scores were attributed to cooked oyster and soup with a mean score of 6.9 (± 2.0) and 5.6 (±
349 2.6) respectively. No significant difference appeared between the other three products. A
350 higher perception of naturality was also associated with the preferred products. In this test,
351 even though oyster consumers, also called "oyster eaters", had better rated soup and potted
352 oyster, the difference in overall liking between "oyster eater" and non-oyster consumer was
353 not significant (p=0.29). As observed in the restaurants, gender and educational level did not
354 affect the overall liking scores. On the other hand, age had a significant effect $F_{4,4} = 4.5$,
355 p=0.001 and the youngest consumers generally attributed lower scores, especially to the soup,
356 hot toast and cooked oyster compared to the upper age class. It is also interesting to note the
357 frequency of refusal for each product (Table 4). Cooked oyster, hot toast and soup were the
358 products with the highest frequencies of non-consumption, respectively, 17.1 %, 14.5% and
359 13.0% of the whole panel compared to 4.8% and 4.1% respectively for potted oyster and
360 butter. Generally this refusal came from the youngest fraction of the population tested, in this
361 case, the children in the families and also from the non consumers of raw oyster (Table 4).
362 Once the consumption barrier had been removed and the product tested, consumers provided
363 their hedonic evaluation through a score for overall liking as well as the main descriptors
364 describing the positive and/or negative characteristics for each product. The results from the
365 ALCESTE data processing made up of positive and negative words collected through the
366 open questions in the questionnaire gave some explanations to the perception and overall
367 liking of each product. From the positive evocations provided by the subjects, 2655 specific
368 words were analysed and 74% of the statements classified into 3 classes (Table 5). The largest
369 class (Class 1 – 55.0 % of classified statements) focused on the taste of oyster as socially
370 perceived in France: a refined and exquisite taste, combined with the image of a festive, rare

371 and luxury food. The second (Class 2 – 37.0%) deals with the texture and appearance of the
372 products in relation to convenience issues (ease of preparation, easy to spread). The last, and
373 smallest (Class 3 – 8.0%), expresses the need to compare these unknown products with more
374 familiar fish products, such as fish soup and potted fish. Table 5 gives the significant
375 associations ($p<0.05$) between these classes and variables as products, socio-demographic
376 profiles and consumer type (C or NC). The butter was associated with class 1, the soup with
377 class 3 and the cooked oyster in a half-shell with class 2. Moreover, older people, men, "raw
378 oyster eaters" (C), and those introduced to oysters early (before the age of ten) were
379 significantly associated with class 1, young people, women, students, and those introduced to
380 oysters rather late (after the age of 20) with class 2, and lastly, people of intermediary age
381 introduced late to oysters with class 3. These results highlight the opposition between younger
382 and older generations regarding food issues (convenience and innovation as regards recipe
383 and way of consumption (aperitif, short meal with friends) *versus* search for taste and
384 authenticity) and specifically the influence of oyster consumption ("non-oyster eaters" *versus*
385 "traditional oyster eaters").
386 From the negative evocations provided by subjects, a larger corpus of 3099 specific words
387 was analysed and 61 % of the statements were classified into 4 classes (Table 6). The largest
388 class (Class 1 – 37.0% of the statements classified) contains a lexicon highlighting doubt,
389 fear, and anxiety towards the products as if exposure to oyster-based products would
390 reactivate all the fears associated with raw oyster consumption. Class 2 (29.0 %) focuses on
391 the dissonance resulting from the fatty and pasty characteristic of certain products, perceived
392 as sticky and sickly ("too much cream and butter"). In consumers' minds, oysters are a light,
393 healthy product with small quantities of fat. Class 3 (25.0 %) deals with the taste of the oyster
394 itself, oyster consumers conflicting with non-oyster consumers. The former were deeply
395 concerned about the tastelessness and weak oyster taste of the products whereas the latter

often judged the taste of oyster to be "too strong". Lastly, the smallest class (Class 4 – 9.0%) focuses on the disgust induced by the presence of big pieces of oyster in the processed products. Concerning the significant associations, the soup and hot toast were associated with class 1, the butter and potted oyster with class 2, the cooked oyster in a half-shell with class 3, and the potted oyster with class 4. These results are consistent with the sensory characteristics previously described by a trained panel (data not shown). Moreover, cooked oyster consumers, born inland and introduced very late to oyster consumption (after the age of 36) were significantly associated with class 1, the "raw oyster eaters" (C) from coastal areas and older people with class 2, young people and students with class 3 and lastly the non-oyster consumers (NC), neither raw nor cooked, with class 4. Once again, these results highlight the impact of previous representations on hedonic evaluation and overall liking, which translated into two opposite lexicons referring to two segments of population, "oyster eaters" and non-consumers.

DISCUSSION

We proposed in this paper to inquire on the key drivers in oyster or based-oyster products consumption and more specifically to focus on the impact of processing and social representation on hedonic perception. Theoretical and methodological issues will be discussed with regards to main results of the different studies.

Theoretical issues

To review the expected results briefly: it was anticipated that processing oysters would decrease disgust among non consumer of raw oysters (NC) and that, at the same time, social representations associated with raw oyster consumption would influence hedonic perception of oyster-based products both among consumers (C) and non consumer (NC). Analysis of

421 data from opened questions (study 2) revealed major differences between consumer (C) and
422 non consumer (NC) as expected. Indeed, significant associations ($p<0.05$) between lexical
423 classes, products, socio-demographic profiles and consumer type have been found. Consumer
424 (C), older people and those introduced to oyster early were associated with both a class
425 (positive associations) focused on refined and exquisite taste of some products and also a
426 class (negative associations) focused on the tasteless and weak oyster taste of others products.
427 On the other hand, non consumer (NC), young people and people introduced late to oyster
428 were associated both with a class (positive associations) focused on convenience issues but
429 also with a class (negative associations) focused on anxiety, fear and doubt, oyster-based
430 products consumption reviving unconsciously the main sources of disgust (live, viscous and
431 sticky properties) associated with raw oyster consumption. The comparative test (blind test *vs*
432 test with information) (Study 1) performed during focus-groups confirmed these results when
433 comparing statements of consumers and of non consumers. Our results match previous
434 research on how the congruence or not of expected and actual flavour has an influence on
435 hedonic evaluation (Yeomans *et al*., 2008). Expanding on what Faurion (1996) wrote,
436 "flavour is not an intrinsic property of a stimulus but the meeting of a food and an eater", our
437 research contributes to better understanding of how previous representations predetermined
438 hedonic evaluation. This issue of expected *versus* actual flavor seemed to be crucial but
439 covered different meanings according to the kind of consumers (C) versus (NC), in
440 accordance with the theory of social representations and especially the anchoring process
441 (Moscovici, 1961). Finally, our results match and enrich those of Desmet and Schifferstein
442 (2008), who described the impact of positive and negative emotions on food experience, taste
443 perception being namely influence by sensory attributes, experienced consequences,
444 anticipated consequences and personal or cultural meanings; here the impact of social

445 representations associated with oyster consumption, and more broadly speaking, the status of
446 this kind of food in culture have been highlighted.
447 If we consider now the overall liking of the processed products measured in restaurant and in
448 home (study 2), results showed the same order in the overall liking ranking, with significant
449 differences between cooked oyster (C) and soup (S), the two preferred products and potted
450 oyster (P), hot toast (T) and oyster butter (B), the three less preferred ones. The ranking of
451 products according to the criteria of "naturality perceived" is in the same order and identical
452 in both situations again and is congruent with the opposition observed in previous sensory
453 characterization. This result highlights the importance of the recipe and the nature of
454 ingredient on the perception; the more the recipe is natural the more the image of the product
455 appears congruent with the positive images associated with seafood and sea more widely, as
456 presented before and confirmed with the creativity exercise during focus-groups (study 1).
457 In accordance with these results, data collected through open questions in the questionnaire
458 (study 2) arose also the fat issue and mainly the incompatibility of fat with oyster. This result
459 gave an other illustration of the importance of social representations associated with oyster,
460 their status in French food culture, their health value, and their source (images of the sea). As
461 mentioned in introduction, oyster is perceived as a luxury and refined food, partly because of
462 its healthy properties, real but also assumed because of the positive imaginary associated with
463 seafood.
464 Regarding the relationship between consumer profile and overall liking, results of both tests
465 (at home and restaurant test) did not show any effect of gender and educational level.
466 Contrary to raw oyster consumption which can participate, according to the expression of
467 Bourdieu (1979) in a mechanism of "distinction", oyster-based products seem to have lost
468 their prestigious status because of the industrial process in itself and exactly like for triploid
469 oysters (Debucquet & Merdji, 2004). However some contradicting results have been observed

concerning the influence of others variables on overall liking and especially the type of consumer (C) vs (NC) and age. In restaurant test, food habits related to raw oyster consumption had a significant effect (p=0.03) on overall liking (scores of consumer (C) higher than scores of non-consumer (NC)) while no significant effect has to be noticed regarding home test. This difference could be attributed to a smaller panel size in home test compared to restaurant test. Conversely, age had a significant effect ($F_{4.4}$=4.5, p=0.001) on overall liking (scores of youngest consumers lower than oldest ones) while no significant effect has been noticed in restaurant test. The higher rate of under 25 years-old consumers, 27.6% at home vs 14.6% in staff restaurants, could explain this difference. Results from focus-group and opened questions in study 2 are consistent with the study of Girard & Mariojouls (2003) namely the relation between the type of consumer and age; oyster eaters being more frequent among people over the age of 50 while non consumer were more often recruited among the youngest.

This question arises more widely the issue of first exposure and first tasting and their impact on further sensory experiences as analyzed mainly with children (Loewen and Pliner, 1999). Individuals' memories of flavour from childhood are typically for foods that are remembered as very palatable or very unpalatable (Barker, 1983). During individual interviews and focus-groups, most of the non-consumers who felt a strong disgust for raw, live oysters were exposed rather late (in average, after 18 years old) to this kind of food unlike the consumers who were used to eating it from a young age, sometimes in the first years of their live even. Thus, it appears that the earlier the subjects were exposed to raw, live oysters, the less they considered them unpalatable and the more willing they were to taste these new oyster-based products.

Finally, these results bring up the question of the role of both first tasting and social representations, especially for non consumers having to face with a previous disgust for the

495 animal itself. Martins and Pliner (2005) have shown in the case of food from animal origin the
496 impact of beliefs on hedonic perception, as well as the impact of the assumed negative
497 consequences of eating such foods on acceptation or rejection. The frequency of refusal for
498 each product in home test (study 2) gave interesting information: cooked oyster (C), hot toast
499 (T) and soup (S) are products with the highest frequencies of non-consumption, respectively
500 17.1 %, 14.5% and 13.0% compared to 4.8% and 4.1% for potted oyster and butter.
501 Moreover, this refusal came from the youngest fraction of the population tested, children in
502 the families and also from non-consumer (C). These results seem to be relevant: disgust and
503 refusal is more associated with products close to the original form of animal (cooked oyster in
504 half-shell) or containing small pieces of oyster (hot toast and soup). These results highlight
505 here again the impact of processing, as a way to "reify" more or less strongly oyster, on the
506 acceptability of the oyster-based products.
507
508 ***Methodological issues***
509 This complementary approach, including a preliminary sensory analysis with a trained panel,
510 individual interviews and focus groups, and consumer tests made it possible to triangulate the
511 results. Qualitative results from individual and group interviews matched closely those of
512 consumer tests, particularly the open questions included in the questionnaire and scores of the
513 overall liking for the five oyster-based products. On the other hand, the preliminary sensory
514 approach made it possible to bridge some product characteristics, through descriptors, and
515 overall consumer liking, with the latter strongly dependent on the consumption or not of raw
516 oysters. For instance, a strong odour/taste of garlic or seaweed can be valued by non-
517 consumers and symmetrically rejected by consumers: for the former, it was an original and
518 new odour/taste that did not recall that of oyster, whilst for the latter, it was a "tasteless"
519 product because they did not recognize the "genuine taste of oyster".

One last methodological consideration could be the impact of the tests 'context on the overall liking. Initially, we choose two contexts for the tests, home test and staff canteens test, to reach various profiles of consumers in terms of age, gender and professional activities, active workers, students, teenagers living still in their family, etc. Even though the effect of the context was not a main objective of our research, we can note that the ranking of the overall liking of the 5 products was the same in both cases but the scores attributed at home were generally lower than those given in staff restaurants. Most of the studies where Standardised Situation Tests (SST) and Home Use test have been compared reported higher liking scores in SST than in HUT scores (Boutrolle, Arranz, Rogeaux, & Delarue, 2005; Kozlowska et al., 2003; Murphy, Clark, & Berglund, 1958). However, in a few cases, the reverse has been observed (Daillant-Spinnler & Issanchou, 1995; Hellemann, Mela, Aaron, & Eleri Evans, 1993). For example for high fat version of a cream cheese, consumers were more severe at home than in laboratory. Authors argued "that assessors overestimated the products in the laboratory because during home consumption consumers refer to a broader range of products (i.e. other brands)" and also "the possibility that assessors like to please the experimenter when they rate the products in the laboratory". In our case, the lower scores in home tests could be explained by the status of the oyster-based products themselves and the strong involvement attached to raw oyster consumption in France. As mentioned in the introduction, just as well for consumer and non consumer, raw oyster is a luxury and "high- symbolic value" food strongly associated to family consumption for specifics events. Moreover, as in home tests the families were given the products with their packaging (for 4 products) they became probably more aware of the fact that oyster-based products were processed food, all the more so since the ingredient list was on packaging. Furthermore, it is likely that the family environment developed higher involvement for its members and may therefore have led to more critical analysis (Boutrolle, 2007; Stroebele and De Castro, 2004; de Graaf, 2005).

Conversely, the social interaction in staff canteens and the limited portion sizes presented to the consumers may explain a generally better evaluation (King, 2004, Boutrolle, 2007).

CONCLUSION

In conclusion, this study showed the impact of social representation, strengthened by the specific initial product characteristics and the positive or negative effects of the first exposure and tasting of raw oyster on perception and its repercussion on expectations or fears related to processed oyster-based products. For instance, contrasted behaviours may appear depending on the initial profile of the consumer, traditional raw oyster consumer or non-consumer. The results allowed us to identify two different market orientations, the first adapted to traditional raw oyster consumers, rather old, with a range of products as close as possible to the natural product, where the oyster taste is clearly recognised; the second aimed at non-consumers of raw oysters, rather young, and proposing products with adapted characteristics, for example an attenuated odour or taste of oyster and a texture with few or even no oyster pieces. For non-raw, live oyster consumers, the more the oyster was processed (such as butter and potted oyster), the less the sources of disgust identified by Rozin and Fallon (1987) and Kolnai (1998) were effective. In their minds, the process played a part in reifying the oyster substance and reducing the aversion. This segmentation also covers expectations of consumers in terms of age distribution, and confirms the opposition between younger and older people. Processing could make possible generational transfer in oyster consumption if these expectations are fulfilled. Nevertheless, the first consumption or the willingness to consume an oyster or an oyster-based product remains a hurdle in the case of non-consumers. As suggested before, the positive effect of early and frequent exposure, for instance in canteens or university cafeterias, should be exploited in order to have a long-term influence

570 on food choice and the preferences of the younger consumers. However, one of the main
571 limits of our research is the lack of information on real uses and context of consumption. Are
572 these products still adapted to festive and refined consumption according to the French
573 traditional habit or doomed to a more ordinary consumption? The question could be answered
574 through further research.
575
576 **Acknowledgements**
577 This study, carried out with the support of the Pôle Agronomique Ouest and Valorial, was
578 funded by the Brittany and Pays de la Loire regions. The products used in the study were
579 processed by three industrial partners: Cuisine Gourmande, La Belle Iloise and Youinou.
580 Thanks to Sodexo and especially the staff in the four restaurants in Lyon, Nantes and Tours
581 for their efficient organization in the consumer tests.
582

583 **REFERENCES**

584 Barker, L.M. (1983). Building memories for foods. In Barker, L. M. (Ed.) The psychobiology of
585 human food selection. Westport: AVI

586 Bourdieu, P. (1979). *La distinction*. Paris, Editions de Minuit.

587 Boutrolle, I., Arranz, D., Rogeaux, M., & Delarue, J. (2005). Comparing central location test and
588 home use test results: Application of a new criterion. *Food Quality and Preference*, 16(8), 704–
589 713.

590 Boutrolle, I., Delarue, J., Arranz, D., Rogeaux, M., & Koster, E. P. (2007) Central location test vs.
591 home use test: Contrasting results depending on product type. *Food Quality and Preference* 18(3),
592 490-499.

593 Cardinal, M., & Debucquet, G. (2010). De nouveaux produits pour lever les freins à la consommation
594 d'huîtres et élargir les marchés pour les PME ? Adéquation entre perceptions du consommateur et
595 degré de transformation du produit. Rapport de recherche de fin de contrat. Projet régional
596 Bretagne et Pays de la Loire. Ifremer - Audencia.

597 Daillant-Spinnler, B., & Issanchou, S. (1995). Influence of label and location of testing on
598 acceptability of cream cheese varying in fat content. *Appetite*, 24(2), 101–105.

599 Darmon, P. (1999) *L'homme et les microbes*. Paris ; Fayard

600 Debucquet, G., & Merdji, M. (2004). Triploïd oysters. *Slow Food*, 46, 68-75.

601 Debucquet, G., Merdji, M. & Fischler, C. (2007). La perception des contaminations alimentaires par
602 les consommateurs : analyse des représentations et des pratiques associées à la prévention du
603 risque microbien. 12èmes Journées de Recherche de Marketing de Bourgogne, Dijon, 8-9
604 novembre 2007.

605 Debucquet, G. (2011). Considérer les normes sociales et culturelles pour une meilleure acceptation des
606 innovations technologiques en alimentation: les leçons du rejet des aliments génétiquement
607 modifiés (OGM). *Management International*, 15(4): 49-68.

608 Delwiche, J.F. (2004). The impact of perceptual interactions on perceived flavor. *Food Quality and*
609 *Preference*. 15, 137-146.

610 Donoghue**,** S**.** (2000). Projective Techniques in Consumer Research. *Journal of Family Ecology and*
611 *Consumer Sciences*,28, 47-53.
612 de Graaf, C., Cardello, A.V., Matthew Kramer, F., Lesher, L. L., Meiselman, H.L., & Schutz, H.G.
613 (2005). A comparison between liking ratings obtained under laboratory and field conditions: The
614 role of choice. *Appetite*, 44(1), 15-22
615 Desmet, P.M.A., & Schifferstein, H.N.J. (2008). Sources of positive and negative emotions in food
616 experience. *Appetite*, 50, (2-3), 290-301
617 Faurion, A. (1996). Le goût : un défi scientifique et intellectuel, *Psychologie française*, 41(3), 217-225
618 Fischler, C. (1990). L'homnivor*e*. Paris, Odile Jacob.
619 France Agrimer, (2010). Les Filières Pêche et Aquaculture en France, Données Statistiques 2009.
620 Girard, S., & Mariojouls, C. (2003). French consumption of oysters and mussels analysed within the
621 European market. *Aquaculture Economics and Management*, 7, 319-333.
622 Hellemann, U. A., Mela, D. J., Aaron, J. I., & Eleri Evans, R. (1993). Role of fat in meal acceptance.
623 *Food Quality and Preference*, 4(1–2), 90.
624 Jodelet, D. (1994). Représentations sociales : un domaine en expansion. In D. Jodelet (Eds), Les
625 représentations sociales (pp. 31-62). Paris, PUF**.**
626 King, S. C., Weber, A. J., Meiselman, H. L., & Lv, N. (2004). The effect of meal situation, social
627 interaction, physical environment and choice on food acceptability. *Food Quality and Preference*,
628 15(7–8), 645–653.
629 Kole, A. P. W., Altintzoglou, T., Schelvis-Smit, R. A. A. M., & Luten, J. B. (2009). The effects of
630 different types of product information on the consumer product evaluation for fresh cod in real life
631 settings. *Food Quality and Preference*, 20(3), 187-194.
632 Kolnai, A. (1998). The standard modes of aversion: Fear, disgust and hatred. *Mind*, 107(427), 581-
633 595.
634 Kozlowska, K., Jeruszka, M., Matuszewska, I., Roszkowski, W., Barylko-Pikielna, N., & Brzozowska,
635 A. (2003). Hedonic tests in different locations as predictors of apple juice consumption at home in
636 elderly and young subjects. *Food Quality and Preference*, 14(8), 653–661.

637 Loewen, R., & Pliner, P. (1999). Effects of prior exposure to palatable and unpalatable novel
638 foods on children's willingness to taste other novel foods. *Appetite*, 32, 351-366
639 Martins, Y., & Pliner, P. (2005). Human food choices: an examination of the factors underlying
640 acceptance / rejection of novel and familiar animal and non animal foods. *Appetite*, 45, 3, 214-224.

641 Mojet, J., & Koster, E.P. (2005). Sensory memory and food texture. *Food Quality and Preference*, 16,
642 251-266.

643 Moliner, P. (2001). Formation et stabilisation des représentations sociales. In P. Moliner (Eds), La
644 dynamique des représentations sociales (pp. 15-41). Grenoble, PUG**.**
645 Morrot, G., Brochet, F., & Dubourdieu, D. (2001). The color of odors. *Brain and Language*, 79, 309-
646 320.

647 Moscovici, S. (1961). La psychanalyse, son image et son public. Vendôme, Presses Universitaires de
648 France.
649 Murphy, E. F., Clark, B. S., & Berglund, R. M. (1958). A consumer survey versus panel testing for
650 acceptance evaluation of Marine sardines. *Food Technology*, 12, 222–226.
651 Reinert, M. (1993). Quelques problèmes méthodologiques posés par l'analyse de tableaux "Enoncés X
652 Vocabulaire". JADT 1993 - 2èmes Journées internationales d'Analyse statistique des Données
653 Textuelles, Montpellier.
654 Reinert, M. (2002). Les "mondes lexicaux" et leur "logique" à travers l'analyse statistique de divers
655 corpus. JADT 2002 - 6èmes Journées internationales d'Analyse statistique des Données Textuelles.
656 Rozin, P., & Fallon, A. E. (1987). A perspective on disgust. *Psychological Review, 94,23-41.*
657 Stroebele N., & De Castro, J.M. (2004). Effect of ambience on food intake and food choice. *Nutrition*,
658 20, 821-838.

659 Yeomans, M.R., Chambers, L., Blumenthal, H., & Blake, A. (2008). The role of expectancy in sensory
660 and hedonic evaluation: the case of smoked salmon ice-cream. *Food Quality and Preference*, 19,
661 565-573.
662

Footnotes

[1]Analyse des Lexèmes Co-occurrents dans les Enoncés Simples d'un Texte (Analysis of co-occurent lexemes in simple wordings of a text)

[2]For the two groups (NC and C) constituted of 16 persons (2 focus-groups of 8 persons each), the number in bracket represents the number of citations of each term.

[3]Historians have analysed the importance of the beliefs associated with red meat and blood, especially during the pre-scientific period (Darnon, 1999). A recent research project dedicated to the perception of food germs has shown that blood in red meat is still nowadays perceived as risky because of the survival of the belief in "spontaneous generation" among lay persons (Debucquet, Merdji, Fischler, 2007).

Table 1. Oyster- based product characteristics: form, ingredients, presentation and preparation

	Oyster based products	Main ingredients and (% of oyster in recipe) when recipe available	Presentation and product preparation
S	Soup	Oyster (15),vegetables, spices	Metallic can; warm in a pan
P	Potted oyster	Oyster (30), cream, onion, white sauce, butter, garlic	Glass jar, cool before spreading
B	Oyster butter	Oyster (43), cream, butter, white sauce, onion, garlic	Glass jar, cool before spreading
T	Hot toast	Oyster (17.5), seaweed, carrot, onion	Metallic can; spread on bread and toast 5 min in an oven
C	Frozen oyster	whole oyster with sauce in a half-shell	Cook 10 min in an oven

683
684
685 **Table 2.** Characteristics of the staff restaurant consumer panel and at-home consumer panel
686

	At-home panel	Staff restaurant panel
Gender (%)		
Female / Male	56.2 / 43.8	41.1 / 58.9
Age (years) (%)		
< 25	27.6	14.6
26-35	9.7	24.0
36-45	21.4	24.1
46-55	26.2	20.1
+55	15.2	17.2
Educational level[1] (%)		
Low	29.7	7.6
Middle	31.9	33.1
High	27.5	59.3
Oyster eater (%)		
Yes / No	74.5 / 25.5	76.0 / 24.0
Respondents (Total)	145	481

687 [1]Low educational level: elementary school; middle educational level: secondary school and middle degree
688 professional education; high educational level: secondary school and higher educational level, higher degree of
689 professional education, university or higher
690
691
692
693

Table 3. Overall liking in staff restaurant test (mean and standard deviation) according to socio-demographic variables and perception of "naturality"

	Factors	F and p values[1]	Factor level[2]	Products P	B	T	S	C
Overall liking	Consumer Type	$F_{4,1}$=4.66 p=0.03	C [b]	6.0 (2.0)	5.7 (2.0)	6.1 (2.1)	6.3 (2.3)	7.0 (1.8)
			NC [a]	6.2 (2.4)	5.7 (2.4)	5.2 (2.4)	5.7 (2.5)	6.7 (2.2)
	Age	$F_{4,4}$=0.42 p=0.79	< 25	6.4 (2.1)	6.6 (2.1)	5.0 (2.4)	5.5 (2.4)	7.7 (1.4)
			26-35	5.8 (2.0)	6.0 (2.0)	5.8 (2.2)	6.1 (2.2)	7.0 (2.1)
			36-45	5.9 (2.2)	5.8 (2.1)	6.2 (2.5)	6.5 (2.6)	7.0 (1.9)
			46-55	6.0 (2.3)	5.0 (1.8)	6.4 (1.9)	6.2 (2.6)	6.6 (1.9)
			+55	6.1 (2.1)	5.2 (2.2)	6.3 (2.0)	6.6 (2.1)	6.7 (1.6)
	Gender	$F_{4,1}$=0.62 p=0.43	Male	5.9 (2.0)	5.7 (1.9)	5.7 (2.2)	6.3 (2.2)	6.9 (1.8)
			Female	6.2 (2.3)	5.6 (2.2)	6.2 (2.2)	6.1 (2.4)	7.0 (1.8)
	Educational level	$F_{4,2}$=2.15 p=0.11	Low	6.5 (2.2)	6.1 (2.5)	7.5 (1.7)	6.3 (2.4)	6.9 (2.8)
			Medium	6.1 (2.2)	5.8 (1.8)	5.8 (2.4)	5.8 (2.2)	7.1 (1.8)
			High	5.8 (2.1)	5.5 (2.1)	5.8 (2.1)	6.6 (2.3)	6.9 (1.7)
Overall liking	Product	$F_{4,1073}$=10.7 p=0.000	General mean	6.1 (2.1) [ab]	5.7 (2.0) [a]	5.9 (2.2) [ab]	6.2 (2.4) [b]	6.9 (1.9) [c]
Perception of "naturality"		$F_{4,1006}$=13.4 p=0.000	General mean	5.6 (2.5) [b]	5.1 (2.3) [a]	5.85 (2.3) [b]	6.4 (2.3) [c]	6.7 (3.8) [c]

[1]F value for the tested factor and probability associated in the analysis of variance with products and factor used as independent variables

[2]Factor levels with different letters are significantly different at $p<0.05$

Table 4. Overall liking and perception of "naturality" in the at home test (mean and standard deviation)

	Factor	F and p values[1]	Factor level[2]	P	B	Products T	S	C
Overall liking	Consumer Type	$F_{4,1}$=1.1 p=0.29	C	5.0 (2.3)	4.7 (2.5)	5.0 (2.7)	6.8 (2.6)	6.9 (2.1)
			NC	4.4 (2.2)	5.1 (2.4)	5.1 (2.4)	5.0 (2.5)	6.7 (1.9)
	Age	$F_{4,4}$=4.5 p=0.001	< 25 [a]	4.8 (2.3)	4.8 (2.5)	5.0 (2.5)	4.3 (2.7)	6.1 (2.0)
			26-35 [b c]	5.1 (2.4)	4.2 (1.9)	5.2 (2.0)	6.3 (1.8)	7.7 (1.6)
			36-45 [a b]	4.7 (2.1)	4.8 (2.3)	4.9 (2.5)	5.8 (2.6)	7.0 (1.8)
			46-55 [a b]	4.8 (2.7)	4.5 (2.8)	4.5 (2.8)	5.9 (2.7)	6.6 (2.4)
			+55 [c]	5.1 (1.9)	4.8 (2.6)	6.0 (3.0)	6.5 (2.3)	7.7 (1.5)
	Gender	$F_{4,1}$=0.4 p=0.52	Male	4.7 (2.3)	5.1 (2.5)	5.3 (2.7)	5.8 (2.7)	6.7 (2.1)
			Female	4.9 (2.3)	4.7 (2.4)	4.8 (2.6)	5.5 (2.6)	7.0 (2.0)
	Educational level	$F_{4,2}$=1.3 p=0.27	Low	5.2 (2.1)	5.1 (2.4)	4.6 (2.4)	4.8 (2.9)	6.4 (1.7)
			Medium	4.8 (2.4)	5.0 (2.6)	5.2 (2.8)	6.0 (2.4)	7.1 (2.1)
			High	4.6 (2.4)	4.5 (2.4)	5.1 (2.6)	5.9 (2.5)	7.0 (2.1)
	Products	$F_{4,643}$=16.1 p=0.000	General mean	4.9 (2.3) [a]	4.8 (2.5) [a]	5.0 (2.6) [a]	5.6 (2.6) [b]	6.9 (2.0) [c]
Perception of "naturality"	Products	$F_{4,634}$=9.8 p=0.000	General mean	5.1 (2.8) [a]	4.7 (2.7) [a]	5.1 (2.5) [a]	5.9 (2.3) [b]	6.6 (2.4) [c]
	Refusal to taste		Whole panel %	4.8	4.1	14.5	13.0	17.1
			C %	4.6	0.9	12.0	11.1	13.9
			NC %	5.4	13.5	21.6	18.9	27.0

[1]F value for the tested factor and probability associated in the analysis of variance with products and factor used as independent variables

[2]Factor levels with different letters are significantly different at $p<0.05$

Tableau 5. Positive descriptors: lexical classes and significant associations with oyster-based products, socio-demographic profiles, and oyster consumers (C) or non-consumers (NC).

Class description	% of classified statements	Lexical universe	Oyster-based product	Socio demographic profiles
Class 1 *The taste of oyster and sea: light, choice / exquisite, refined*	55.0	Taste (25) of oyster (44), unctuous (21), fresh (17), light (14), sea (12) product (13), choice / exquisite (11), creamy (10), taste with right balance (9), sea product (7), iodine (5)	Oyster butter (15)	More than 55 years old (9) 46-55 years old (7) Man (4) Introduced to oyster consumption before age of 10 (3) Raw oyster eater (C) (3)
Class 2 *Texture and appearance, convenience issues*	37.0	Good (43) texture (32), small (23) pieces (23) of vegetables (28), smell (28) of vegetables (28), pleasant (20) presentation (26), pleasant (20) consistency (15), nice (19) color (18), well (17) seasoned (16), easy (9) to prepare (9), to spread (5)	Cooked oyster in half-shell (19)	Woman (8) 26-35 years old (5) Less than 25 years old (4) Introduced to oyster consumption between ages of 20 and 30 (4) Students (3)
Class 3 *The analogy with fish-based products*	8.0	Like (72), fish (170), soup (189) or potted (60)	Soup (40)	36-45 years old (17) High educational level (5) Introduced to oyster consumption over the age of 30 (3)

Ranking of words in lexical classes and socio demographic characteristics in decreasing order of chi-square values (chi-square value significant at $p < 0.05$)

Tableau 6. Negative descriptors: lexical classes and significant associations with oyster-based products, socio-demographic profiles, and oyster consumers (C) or non consumer (NC).

Class description	% of classified statements	Lexical universe	Oyster-based product	Socio demographic profiles
Class 1 *The bizarre and the suspect*	37.0	Unpleasant (27) smell (72), unappetizing (49) appearance (52) and colour (32), unpleasant (19) and strange (9) consistency (12), strong (17), bad (8), not digested (7), too dirty (5), repulsive (5)	Soup (22) Hot toast (11)	Born in land (10) C consumer (6) Introduced to oyster consumption between the ages of 36 and 45
Class 2 *The incompatibility with fat*	29.0	Fatty (73), sickly (31), sticky (28), cream (27), viscous (26), doughy (16), bitter (13)	Oyster butter (31) Potted oyster (7)	Born in seashore (4) NC consumer (3) More than 55 years old (3)
Class 3 *The taste of oyster: "tasteless or too strong"*	25.0	Taste (79) of raw (12) oyster (105), not enough (24) found again (23) or too strong (5), like scallop (21)	Cooked oyster in half-shell (33)	Less than 25 years old (7) Student (7) Low educational level (7)
Class 4 *The aversion to oyster pieces: disgust towards the animal itself*	9.0	Big (30) / too many (4) pieces (145) of oyster (13), unpleasant (50), not liking (42), not eating (12)	Potted oyster (4)	NC consumer (12) neither raw nor cooked Has never been introduced to oyster consumption (6)

Ranking of words in lexical classes and socio demographic characteristics in decreasing order of chi-square values (chi-square value significant at $p < 0.05$)

722