Food Neophobia and its Influence on the Lack of Diversification in Seafood Consumption

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Abstract

This master's thesis is performed in collaboration with the Research Institute of Sweden. The purpose of the study was to investigate food neophobia, or an aversion to trying new foods, in the Swedish population and see if it correlates with the country's low and undiversified seafood consumption. The topic of the study stems not only from consumers consuming less seafood than is recommended, but also from a lack of variety in the seafood consumed.

The study was executed by way of an online voluntary survey aiming to measure a subset of the Swedish population's food neophobia and their perception towards seven different seafoods, salmon, herring, cod, shrimp, mussels, oysters, and seaweed. Participants were asked to fill in an approach and an avoid new foods scale that measured food neophobia, to select conceptualisations they associated with the seafoods presented in the survey, to select situations they deemed appropriate for the seafoods to be consumed in, and lastly to answer how frequently they consumed the seafoods presented in the survey.

Due to a lack of food neophobic survey participants, it was not possible to investigate whether food neophobia correlated with a lack of a diverse seafood diet. The study showed that only 2.4% of the survey participants exhibited traits of high food neophobia with average avoid new foods scores ranging from 4-5 out of 5. The overall average approach new foods score was 3.968 out of 5 while the average avoid new foods score was 1.696 out of 5, indicating that participants were motivated to try new foods rather than avoid them and were therefore not food neophobic. The most consumed seafoods reported by the participants consecutively were salmon, shrimp, cod, herring, mussels, seaweed and lastly oysters. The findings revealed that the frequency of consumption of various seafoods was not correlated to the participants' not being food neophobic, but rather to the seafood's negative and positive sensory attributes, whether they are perceived as healthy, whether they are perceived as traditional, and whether they are perceived as simple to prepare. In comparison to the other seafoods, frequently consumed seafoods, salmon, shrimp, and cod, were associated with similar conceptualisations and selected by the participants to be appropriate for consumption in more and similar consumption situations compared to the other seafoods.

Popular Abstract

Does Aversion to Trying New Foods Contribute to a Lack of Diversity in Seafood Consumption?

Do you eat a variety of seafood? The Swedish population not only consumes less seafood than the recommended 2-3 times per week, but their seafood consumption patterns are also undiversified. Even though there are over 85 species of seafood available on the Swedish market, consumers prefer to buy a specific variety of seafood more frequently than others. Food neophobia, or aversion to trying new foods, is one factor that may be influencing Sweden's undiversified seafood consumption. With so many different types of seafood available for consumption, people suffering from food neophobia may be hesitant to try new seafoods and instead stick to those they are familiar with.

An online survey was distributed across multiple platforms to determine whether food neophobia and a lack of diversity in seafood consumption are correlated. Aside from determining whether survey participants were food neophobic, the survey was structured around seven different seafoods, four of which are the most consumed in Sweden (salmon, herring, cod, and shrimp) and the other three are less frequently consumed (mussels, oysters, and seaweed). To investigate and compare the survey participants' perception and attitudes towards frequently consumed seafood versus ones not so regularly consumed, survey participants were asked how frequently they consumed each seafood, which consumption situations they believed it was appropriate to consume each seafood, and lastly which words they associated with each seafood.

The most consumed seafoods reported by the participants consecutively were salmon, shrimp, cod, herring, mussels, seaweeds and lastly oysters. Only 6 out of the 250 survey participants displayed food neophobic so investigating if food neophobia was correlated to the lack of diversity in seafood consumption could not be conducted. However, the results did show that even though the participants were not food neophobic, they still preferred to consume the seafoods they were more familiar with and perceived as traditional (salmon, cod, herring, and shrimp) compared to seafoods they perceived as unique and that have not regularly been a part of their diets (seaweed, mussels, oysters). Being perceived as healthier, affordable, easier to prepare, made salmon, cod and shrimp the most appropriate seafoods to consume in most of the consumption situations compared to the other seafoods.

Preface

This master thesis project was carried out in collaboration with the Research Institute of Sweden (RISE) at Lund University's Faculty of Engineering's Department of Food Technology and Nutrition (LU). From January to June 2022, the project was active.

Thank you to Björn Bergenståhl, my LU supervisor, for providing insightful feedback throughout the project's duration, which aided in the improvement of my work. I'd also like to thank my examiner, Håkan Jönsson, for his insightful comments and recommendations.

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Abbreviations

AppNF	Approach new foods
AvdNF	Avoid new foods
CATA	Check all that apply
EFA	Exploratory Factor Analysis
FN	Food Neophobia
FNS	Food Neophobia Scale
MENF	Motivation to Eat New Foods
RISE	Research Institute of Sweden

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1. Introduction

1.1 Background

Approximately 72% of the seafood consumed in Sweden is imported from Norway, Denmark, and China, with only 28% produced locally (Hornborg, Bergman, and Ziegler, 2021). Sweden has enormous potential to produce nutritious seafood from its waters, as well as to be a leader in the production of sustainable seafood. Blue Food, a research centre comprised of universities, businesses, organizations, and research institutes, aims to increase, and diversify the nutritious seafood produced in Sweden, to encourage a protein shift toward blue and green protein sources, and to change consumer behaviour toward sustainable and nutritious seafood products. Sweden's fish and seafood consumption is currently lower than the recommended value of 2-3 times per week, but it is also not diverse. To investigate the lack of diversity in seafood consumption, the Perception and Design unit at RISE has a project focusing on food neophobia (FN) in seafood consumption within the Blue Food Centre for future seafood. The primary goal of the project is to better understand the factors that influence perception and behaviour in seafood consumption. The thesis seeks to investigate if FN correlates to the lack of diversification in seafood consumption in a subset of the Swedish population.

1.2 Objectives

The master's thesis sought to investigate whether FN and the lack of diversification in seafood consumption correlate by surveying consumers' attitudes and perceptions toward various types of seafood consumed in Sweden. A voluntary online survey was developed and distributed across various social media platforms to first assess participants' FN by measuring how motivated they are to avoid new foods and how motivated they are to approach them. Following that, the survey presents a total of seven different types of seafood, and survey participants were asked to (1) select which situations they thought were the most appropriate to consume them in, as well as (2) select words they associated with the seafood from a presented list, using conceptual profiling. The seven types of seafood were chosen based on how frequently they are consumed in Sweden; four of them are among the top four most consumed in Sweden, while the other three have low consumption rates among seafood consumers. Measuring consumers' attitudes and perceptions toward various seafoods will aid in assessing consumers' undiversified seafood consumption and assessing whether it correlates with FN.

1.3 Hypothesis

The hypotheses were designed with both participants who avoid new foods and those who want to try new foods in mind.

1. Participants who are motivated to try new foods report relatively higher consumption frequencies of the less frequently consumed types of seafood in Sweden in comparison to the participants who are motivated to avoid new foods.
2. The more commonly consumed types of seafood in Sweden will have similar conceptual associations than less frequently consumed seafood.
3. The more commonly consumed types of seafood in Sweden will be deemed more appropriate for consumption in all consumption situations than the less commonly consumed types of seafood.

1.4 Delimitations

The survey population is not representative of the Swedish population. Only people with online access and access to the platforms where the survey was distributed were able to respond, which may exclude the older demographic as well as consumers who are not very active online. People who are not interested in seafood or food in general may be turned off by the survey's voluntary nature. As a result, the data may be skewed toward food-interested consumers while excluding those who aren't.

1.5 Report Structure

The theoretical background will be the focus of the report's first section. The consumption of seafood in Sweden, as well as its patterns, will be discussed in this section. A section on FN and how it leads to avoiding new foods will also be included, as will a section on conceptual profiling and, finally, a section on situational appropriateness. The following section will address the project's practical implementation, which includes the creation and distribution of the survey, as well as the data analysis. The report will conclude with a results section displaying summaries of data collected from the survey, a discussion section expounding on the collected results, and finally a conclusion. The report will also include a supplementary data section containing all raw data and additional information.

2. Theoretical Background

2.1 Motivators to Seafood Consumption

According to numerous studies conducted around the world, many consumers have a positive attitude toward eating seafood and view it as a pleasurable experience, albeit with varying degrees of intensity (Birch, Lawley, 2012, Birch, Lawley, 2014, Birch et al, 2012, McManus et al, 2012, Neale et al, 2012, Pieniak et al, 2010a). People eat seafood for a variety of reasons, but the main drivers of seafood consumption are taste, habit, health, and social obligations (Lamy, 2020).

In terms of health advantages, multiple studies show that consumers perceive fish and seafood as healthy foods that provide a variety of specific health and nutritional benefits, mostly due to the high protein and omega-3 fatty acid content, as well as the low-fat level. Consumers tend to appreciate the positive effects seafood consumption directly has on them and their families, thus health benefits being the top motivation for seafood consumption in many countries (Carlucci et al., 2015). Social standards were found to be significant determinants of seafood consumption in some studies, though not as prominent as health. Not only can peer pressure influence fish purchases and consumption, but a study by Olson (2001) discovered that moral commitments to a family's health also influence seafood purchases in families.

Many consumers of seafood are habitual seafood consumers and have been since childhood, which is why many studies have investigated the role of childhood fish consumption in adult fish consumption. Birch and Lawley (2014) discovered that consumers who ate seafood frequently as children were more likely to have positive attitudes toward seafood later in life.

2.2 Barriers to Seafood Consumption

Even though seafood is an integral part of a healthy diet, several national food consumption studies indicate that seafood is not consumed in sufficient quantities. The studies conducted indicate that financial, social, functional, and psychological barriers are the primary and comprehensive reasons why consumers do not want to purchase or consume seafood more frequently (Christenson et al. 2017, Dijkstra et al. 2015, Skuland 2015, Birch and Lawley 2012, Hicks et al. 2008, Carlucci et al., 2015)

Functional barriers are obstacles resulting from consumers' lack of trust, familiarity, and understanding of seafood. The less familiar a buyer is with a seafood, or the less

information they have about it, the less confident or self-efficacy they have in acquiring it. Self-efficacy in the context of seafood refers to how confident consumers are in their ability to make appropriate decisions when picking, sorting, and preparing seafood (Lamy, 2020). Consumers who are knowledgeable about seafood have a better understanding of how to select and prepare seafood based on previous experiences and familiarity with seafood, which leads to a higher level of self-efficacy. However, some consumers can get confused and overwhelmed by the wide variety of preparation methods, product varieties, species, and product quality, which leads to the labelling of seafood as difficult to prepare (Birch and Lawley, 2012).

Because seafood is perceived to be a relatively expensive meal option, some people refrain from purchasing it for financial reasons. Many focus group participants in Denmark, Iceland, Norway, and Australia stated that they perceived fish to be too expensive, making price one of the most significant fish consumption barriers. Even though there are numerous types of seafood on the market, each with a different price tag ranging from expensive oysters to more affordable cod, many studies show that consumers generally perceive all seafood to be expensive. Previous research has shown that consumers who are more knowledgeable and skilled in seafood preparations are less price-conscious than less skilled seafood consumers. The possibility of financial loss is adversely affected by functional risk, which includes the possibility of spoiling the seafood during storage or preparation due to a lack of consumer knowledge or confidence and is thus more likely to be associated with less experienced seafood consumers (Birch and Lawley, 2012, Carlucci et al., 2015).

People's rejection can be the source of social barriers. Individuals may eat less seafood because of social norms or pressure from friends or family members who dislike it. Several studies have found that consumers who dislike eating fish, as well as consume less fish themselves, may have a negative impact on the level of fish consumption of their family, because the person in charge of the household is unwilling to prepare seafood meals and then receive negative comments. Several studies have provided empirical evidence that household seafood consumption is negatively affected by pressure from some members who do not like eating fish (Birch and Lawley, 2012, Carlucci et al., 2015).

According to research, low and non-seafood consumers perceive seafood to have unpleasant sensory qualities such as bad textures and smells, causing them to consume seafood less frequently. These barriers, which typically form in childhood, can be caused by negative past experiences with seafood, such as the presence of bones or a dislike of the touch of seafood (Birch and Lawley, 2012). Food neophobia, or the inability to try new

foods, has also been identified as a psychological barrier to seafood consumption. With such a wide variety of seafood available, consumers who experience food neophobia are more likely to stick to the seafood they are familiar with and avoid trying new species (Costa, Silva, and Oliveira, 2019). Studies have shown that neophiliac consumers have a greater hedonic response to seafood than neophobic consumers. Furthermore, when tested on children and adolescents, the results revealed that parental neophobia had a significant influence on the children's eating habits, and that interventions on both children and parents are required to encourage seafood consumption in homes (Birch and Memery, 2020, Jaeger et al., 2021).

2.3 Seafood Consumption in Sweden

According to Sweden's National Food Agency, fish and shellfish should be consumed no less than 2-3 times per week, and a variety of fish and shellfish should be consumed. Unfortunately, Swedish seafood consumption is below the recommended dietary value and not very diverse (Hornborg, Bergman, and Ziegler, 2021). A 2018 study revealed that 36% of participants reported eating seafood the recommended amount of 2-3 times per week. Only 2% of those polled said they ate seafood 5-7 days per week, while 3% said they ate the same amount in a year (Statista, 2018). Additionally, a 2019 survey showed that consumption was less than two portions per week on average, and only one-third of Swedes, primarily the elderly, followed The National Food Administration's recommendations. A study conducted between 2016 and 2017 to observe young people's seafood consumption habits discovered that many of them ate seafood, but only one and a half times per week (Hornborg, Bergman, and Ziegler, 2021).

Even though a variety of seafood is imported into Sweden as well as grown there, such as blue mussels, oysters, and seaweed, there is still a lack of diversity in the population's consumption of seafood (Table 1). The ten most popular types of seafood in Sweden are salmon, herring, cod shrimp, tuna, Alaska pollock, mackerel, saithe (coalfish), and rainbow trout. When it comes to the diversity of seafood in Sweden, there are over 85 species or species groups available on the Swedish market. However, consumption of salmon, herring, cod, and shrimp accounts for 60% of total Swedish seafood consumption (Hornborg, Bergman, and Ziegler, 2021). According to a 2018 survey, salmon was the most purchased fish in Sweden, with a share of 22 percent, followed by cod and herring, both with 13 percent popularity among participants (Statista, 2021).

Table 1: Number of servings (one serving=125g) consumed per capita in Sweden in 2019 if the entire population ate seafood all 52 weeks of the year (Hornborg, Bergman, and Ziegler, 2021).

Seafood	**Number of Portions**	**Portion per capita**
Salmon	279,561,565	27
Cod	200,077,032	19
Shrimp and crayfish	164,341,780	16
Herring, sprat, and anchovies	129,277,912	13
Other saltwater fish	76,966,855	7
Tuna	49,224,255	5
Freshwater fish	22,054,526	2
Mackerel	22,210,477	2
Mussels and oysters	24,267,904	2
Other (squid, crabs, lobsters, algae)	20,137,886	2
Total	988,116,192	96

2.4 Food Neophobia (FN)

First observed in 1768, FN has been recognised in many species and stems from the hesitation to try new foods due to the inability to predict if the food would have any harmful or poisonous effects post digestion. Today, even with the safety of most foods, humans still have the tendency to shy away from foods they are unfamiliar with because FN has evolutionarily adapted to ensure that people avoid the possible dangers that may arise from consuming new foods (Alley, 2018). Neophobia primarily affects the elderly and children, and is less prevalent among young people, particularly those living in cities for they are more exposed and become accustomed to a wider range of foods. While FN usually fades away during adolescence, it can still be detected in adults who limit their food and drink to a few familiar products and are not open to eating anything else. As a result, they may face nutritional inadequacies as well as social marginalisation. Adult food neophobia appears to be influenced by a variety of socio-demographic variables, all of which are negatively correlated with FN, such as urbanization, increased income, and increased education (Faccio and Guiotto Nai Fovino, 2019).

FN is classified as a trait because it can be permanent and is associated with one's personality. It can also be thought of as a mind-set that is more dependent on one's food environment and thus more adaptable. It is stronger in some more than others, and in those where it is stronger, it influences their diet and the foods they choose to eat. The fact that it has such an impact on a person's dietary quality and thus health has made its study more popular (Alley, 2018). Seafood is one of the foods that is good for our health and whose consumption can be influenced by FN.

Plinner and Hobden developed the Food Neophobia Scale (FNS) in 1992 to specifically measure FN in humans. It is a ten-item scale with a seven-point Likart scale for each item. Despite being used numerous times around the world, the technique does pose some challenges because it was designed and validated on a specific sample that does not represent the global population. For example, while the term "ethnic" was once appropriate, it no longer reflects current societal trends or word usage. People have become more exposed to cuisines from various cultures because of globalisation, which has reduced the novelty of food from various cultures. Researchers have also demonstrated that removing some items from the FNS improves their studies because some items fail to load onto the main factor during data analysis, implying that the item's wording does not reflect generalised FN. For example, item 9 on the scale "I will eat almost anything" excludes consumers who avoid foods for reasons other than FN, such as diets or allergies (Metcalf, Wiener, and Saliba, 2022, Damsbo-Svendsen, Frøst and Olsen, 2017). Another criticism levelled at the FNS is that it was initially claimed to only measure one factor, but numerous studies have shown that it generates two factors: avoidance and approach to new foods. Even with both factors, studies tended to reverse-score the items that measured participants' motivation to approach new foods and claim they measured participants' motivation to avoid new foods. However, this method reduced the scale's reliability because these two motives should be distinguished and measured separately (Nezlek, Forestell and Cypryanska, 2021). FN measuring two related constructs relates back to the omnivore’s dilemma, first explained by Rozin (1976), which states that as people, we are motivated to try new foods because a more varied diet is linked to better health, but we are also motivated to avoid new foods due to the risk of becoming ill or even dying because of eating them.

2.5 Conceptual Profiling

Conceptual profiling is a procedure that associates a set of adjectives with objects. It was developed as an alternative to directly measuring emotion. The idea behind conceptual profiling is that objects elicit emotions, and that there is a direct link between the emotions elicited by the object and the conceptualizations connected with it. The conceptual associations tend to be long lasting whilst the emotions are fleeting (Thomson, 2016).
Food products can evoke positive or negative emotions from consumers, which contribute to whether the product is liked or not and furthermore whether it will be purchased. Long-term and frequent consumption habits can be influenced by deep emotional effects. The food industry regularly uses the liking, purchase intent, or overall opinion of a product as a metric to determine the success of a product on a market. However, in the scenario of long-term product acceptance, their results are frequently misinterpreted. This discrepancy between expected and actual results arises because the factors that influence a person's real-life, long-term purchasing and consumption patterns do not always predict how that person will respond to liking or purchase intent questions asked during research on the product (Thomson and Coates, 2018).

We create associations between the identity of a food product and other conceptual associations retained in the mind as we become more familiar with it. All food products have conceptual associations, and these associations are characteristics of the food or emotions we link to it. Some of these conceptual associations are formed by external influences such as advertising, while others are formed through personal experiences. Even though these associations are made subconsciously, there is a degree of consistency in the conceptualizations people link with food because of common experiences, cultures, and heritages. Inevitably, the food's identity and the related conceptualizations converge and merge in the individual's consciousness. This implies that when we consume food, we are affected not only by the food itself, but also by the accompanying conceptualizations. Sensory features, which are fundamental to the product and thus part of its identity, are linked to conceptualisations through this method. Although conceptualisations are infinitely diverse, they can be divided into three categories: functional (*"will make me healthy"),* emotive *("will make me happy")*, and abstract ("*is simple")* (Thomson, Crocker and Marketo, 2010).

Food can have a conceptual profile since many people have similar ideas about what food is. The conceptual profile reflects how people feel about food and the feelings it elicits as a result. When it comes to consumer items, the type of product, the sensory features that

distinguish it from other products in the same category, and the expected functional properties that distinguish it from other products in the same category determine the profile. Concept description is one method used in conceptual profiling that utilises words to explain and label conceptual associations. The method necessitates the creation of a conceptual lexicon that is comprehensive enough to completely characterize and distinguish among the items under study while avoiding repetition. Its development is unique to each category and takes time and resources. For product conceptual lexicons, 20-30 emotive phrases and 15-20 functional terms are often developed, depending on the product category. MMR Research Worldwide identified a short list of 30 conceptual phrases that are utilized in many research projects nowadays based on frequency of use, generic application, and discriminatory power. (Thomson and Coates, 2018).

2.6 Situational Appropriateness

According to a 2018 study conducted in Sweden, 60 percent of participants purchased seafood to eat for dinner and 9 percent purchased it to eat as a snack (Statista, 2018). To better understand consumer seafood choices, it is necessary to recognize why different seafoods are chosen and when they will be consumed. What situation the seafood will be consumed in is a component that can aid in defining consumers' goals, and thus customize not only their seafood selections toward "situationally appropriate" solutions, but also provide direction to the product development process.

Appropriateness is defined as "the quality of being especially suitable or fitting," and when used in consumer research, situational appropriateness refers to the perceived fit between a product and the specific context in which it will be used. Because of the concept of perception, consumers must be subjective when evaluating products, but their decisions are also influenced by experience, social interactions, and culture. The substantial interpretation of situational appropriateness is that consumers choose products to meet the goals associated with a specific consumption situation, rather than simply liking the product or its characteristics. Appropriateness refers not only to how much a product is liked and its characteristics, but also to consumer characteristics and expected usage situation to determine the final purchasing decision (Giacalone, 2019).

The popular Item-By-Use (IBU) method, which is commonly used in consumer research, will be used to measure in which situations consumers find it appropriate to consume a variety of seafoods. It is sometimes referred to as 'substitution in use,' and it consists of asking consumers to choose which situations they believe a list of products should

be used in. The results of this method can help researchers and product developers predict consumer food choices because it reports their willingness to use a product, when they consume it, and whether the product is perceived as unique or elicits any emotional responses (Giacalone and Jaeger, 2019).

3. Methodology

3.1 Research Strategy

3.1.1 Motivation to eat new food (MENF)

To measure participants' food neophobia (FN), instead of using the food neophobia scale (FNS), the MENF scale developed by Nezlek, Forestell and Cypryanska (2021) was used. The MENF scale measures two separate factors, people's motivation to approach new food and their motivation to avoid it. The scale operates based on separating the motives behind why people avoid and approach new foods. The developers of the scale believe that knowing the reasons why participants are avoiding or motivated to try new foods can be utilised by researchers or the food industry to work towards reassuring and stimulating specific groups based on their reason for avoidance or approach. The scale was utilised in this study for unlike the FNS the language used is not outdated and it reflects current societal trends or word usage. Additionally, because the scale measures two separate factors, there is no need to reverse scores of items that measured one factor to get scores for another factor, for this reduces the reliability of the overall scale.

The MENF scale consists of five avoidance items and five motivation items as can be seen in Table 2. Participants were asked to respond to each item in Table 1 using a 5-point Likart scale with the following labels: 1 = not at all like me, 2 = a little like me, 3 = somewhat like me, 4 = like me, 5 = very much like me.

Table 2: Items on MENF scale

Motives to approach new foods (AppNF)
I enjoy trying foods that I have never eaten before. I enjoy learning about new foods I am interested in trying familiar foods that have been prepared with new ingredients. I am curious about the flavours of new foods and ingredients. I get sort of excited when I know I am going to eat some new types of food.
Motives to avoid new foods (AvdNF)

I don’t trust new foods.
I am afraid to eat things I have never had before
I think that if I eat something I have not eaten before that it will taste strange.
I think that if I eat something I have not eaten before that I will not like it.
Foods I have never eaten before seem sort of disgusting.

3.1.2 Conceptual Profiling

To investigate what conceptual associations and emotions consumers link with seafood, participants were asked to respond to conceptual profile questions as part of the survey. Participants were presented with seven seafood items, four most consumed in Sweden and three currently cultivated but not consumed as frequently. For each of the seafood items- salmon, cod, herring, shrimp, mussels, oysters, and seaweed- participants were provided with 20 conceptual words, as can be seen from Table 3. Fourteen of the words used are from the MMR Worldwide conceptual lexicon for conceptual profiling (Thomson and Coates, 2018). The six other words were taken from Jaeger et al., (2020), who performed a similar study to investigate consumer acceptance of seafood in China. For each seafood the words were randomised, and participants were asked to check all that apply (CATA) of the words they associated with each seafood.

Table 3: List of conceptual words used for conceptual profiling of seven seafood items

Boring	Smelly	Fresh	Sophisticated
Cheap	Bones	Juicy	Fun
Trustworthy	Vibrant	Simple	Comforting
Traditional	Unique	Inspiring	Modern
Adventurous	Health	Happy	Irritating

3.1.3 Situational Appropriateness

A CATA question was also used for measurement of situational appropriateness of the seven seafoods. Found in Table 4, The ten situational uses were selected to be relevant for seafood consumption in Sweden, which mostly includes but not limited to domestic domains (Elzerman et al., 2020). Participants were asked in which situations, listed in Table 4, do they find it appropriate to consume each of the different kinds of seafood.

Table 4: Consumption situations

Usage Situation:	Abbreviated in survey as:
When I eat with my family	Family
When I eat with my friends	Friends
When I eat alone	Alone
When I want to eat a healthy meal	Healthy
When I cook for children	Children
When I want to prepare a meal for a special occasion	Special
When I prepare lunch	Lunch
When I prepare dinner	Dinner
When I'm eating at a restaurant	Restaurant
When I'm preparing a snack/light meal	Snack

3.1.4 Consumption Frequency

To end the survey, participants were asked how frequently they consumed each of the seven seafood items. Options provided for selection were weekly, monthly, once every 4-6 months, once a year, and never.

3.2 Data Collection & Participant Selection

The online survey tool Sunet was used to create the survey, which was then distributed on social media platforms, in various social groups such as "Fiske", and Matlagning recept och tips". The survey was also distributed on numerous university pages around Sweden. A sample of the survey can be found in section 9.1 of the supplementary data. To take part in the survey, respondents had to live in Sweden given that one of the aims of this study is to investigate the lack of diversity in seafood consumption amongst Swedish residents. Vegetarians and vegans were also excluded from this study**.** To take part the participants were informed that they must either be omnivores (consume meat, fish, and other seafood), flexitarians (refrain from consuming meat, fish, and other seafood at least once a week) or pescatarians (does not consume meat but consumes fish or seafood). No one under the age of 18 was allowed to participate in the survey. 250 participants took part in the online survey and a summary of their demographics is summarised in Table 5.

Table 5. Summary of demographic results from participants (N = 250) who completed the online survey.

Category	Response	Frequency (%)
Gender	Male	36.8
	Female	62.4
	Won't disclose	0.8
Age	18-24	31.6
	25-34	39.2
	35-44	13.6
	45-54	6.8
	55-65	5.2
	>66	3.6
Diet	Omnivore	70
	Flexitarian	21.2
	Pescatarian	8.8
Years living in Sweden	Born here	54
	>20	3.2
	5 - 20	9.6
	<5	33.2
Education level	Compulsory school certificate	1.6
	Degree from upper secondary school	10.8
	Post-secondary education certificate	13.6
	College/university degree (undergraduate)	32
	College/university degree (postgraduate/masters/PhD)	42
Grocery shopping	Primary/joint shopper in household	92
	Not primary/joint shopper in household	8

3.3 Data Analysis

IBM SPSS Statistics 28 was used to analyse the data of the 250 survey responses.

3.3.1 Motivation to Eat New Foods (MENF) Data

Cronbach's alpha was used to measure the internal consistency of the items in the motives to approach new food (AppNF) and motives to avoid new food (AvdNF) factors of the MENF scale. Cronbach's alpha is calculated by comparing the variances of all individual item scores to the variances of each scale item, and it is thus a function of the number of items in a test, the average covariance between pairs of items, and the variance of the total score. (Chelsea Goforth, 2015).

To determine if the participants were food neophobic or not, their average AppNF and AvdNF scores were calculated. Following that, a Hierarchy analysis was run to determine the number of groups that could be formed based on the participants' average AppNF and AvdNF scores. A K-mean cluster analysis was run to place the participants in these groups, therefore dividing the participants into seafood consumers with varying degrees of food neophobia.

To discover the underlying structure of the large set of variables and reduce the data to a much smaller set of summary variables, the items on the MENF scale were subjected to Exploratory Factor Analysis (EFA) using maximum likelihood as the factor extraction and oblimin as the rotation. This was also done to determine which scale items were highly intercorrelated by identifying and investigating clusters of inter-correlated variables known as "factors". Factors are generated using the maximum likelihood extraction method, based on linear combinations of variables and the factors must have an eigenvalue greater than 1 to be selected. Eigenvalues are used to condense the variance in a correlation matrix. Each MENF scale item will load onto a factor during the analysis, and rotation is a method of maximizing high loadings and minimizing low loadings to achieve the simplest possible structure. Oblim rotation allows scale items to freely take any position and be correlated with one another (Bruin, 2006).

A Pearson's correlation analysis was performed to assess the strength of the relationships between each item on the MENF scale. The Pearson correlation coefficient generated is used to assess the strength of a two-variable linear relationship. The coefficient has a value between -1 and 1, with -1 representing total negative linear correlation, 0 representing no correlation, and + 1 representing total positive correlation (Nettleton, 2014).

3.3.2 Consumption Frequency Data

The one-sample chi-square test is used to see if a single categorical variable follows a predicted population distribution. It compares observed frequencies in each response category to expected frequencies and if the null hypothesis is true, observed and expected frequencies are similar. As a result, the analysis calculates the difference between the observed and expected consumption frequencies. The null hypothesis used in this study is that all the seafoods are equally consumed and the observed consumption frequencies are equally distributed amongst each seafood. (Glen, 2013).

To determine if the consumption frequencies of each seafood varied based on average AppNF and AvdNF scores of the participants, analysis of covariance (ANCOVA) was run on the MENF and consumption frequency data. The seafoods were established as within-subject factors (independent variables), consumption frequency for each seafood was a between-subjects factor (dependent variables), and AppNF and AvdNF scores separately were the covariates (uncontrolled independent variables). ANCOVA is performed using linear regression, which assumes that the relationship between the independent and dependent variables is linear. It primarily measures differences in the mean values of the dependent variables that are related to the effect of the independent variables while considering the influence of the uncontrolled independent variables. The analysis is being utilised in this study to investigate whether the consumption frequencies are influenced by the varying seafoods after a regression analysis of the average AppNF and AvdNF scores on consumption frequencies has been conducted and removed (KHAMMAR, YARAHMADI and MADADIZADEH, 2020).

3.3.3 Situational Appropriateness and Conceptual Profiling Data

The Cochran's Q test, which is commonly used with binomial data, was used to determine whether the proportion of "checks" in the CATA data is the same across groups of the same size. Cochran's Q's null hypothesis is that the proportion of "checks" for all groups is equal. The data from these sections was analysed using Cochran’s Q test to determine if the conceptualisations and the consumption situations were equally selected for each seafood. If either the consumption situations or conceptualisations are equal for all groups then the null hypothesis is not rejected (Stephanie, 2016). To explore and display the associations evoked between the seafoods and the consumption situations as well as the seafoods and the conceptual associations, Correspondence analysis was run on all the CATA data.

4. Results

4.1 Motivation to Eat New Foods (MENF)

The MENF scale has an acceptable internal consistency, for both the Approach new foods (AppNF) scale (Cronbach's alpha = 0.907) and the Avoid new foods (AvdNF) scale (Cronbach's alpha = 0.905) have values greater than 0.7 (Glen, 2021). Pearson's correlation analysis reported that the two scales negatively correlated (r= -0.608) and results from the Exploratory factor analysis (EFA) produced two factors with eigenvalues greater than 1.0 (F1=5.88 and F2=1.46). These two factors accounted for 73.5% of the total variance and from the summary statistics in Table 7, it is shown that the two factors represented the data well and that each item can be loaded onto a factor.

Pearson's correlation analysis performed, (Table S2, supplementary data) to measure the relationship between each of the items showed that all the AppNF items had a positive relationship with each other and a negative relationship with the AvdNF items. The AvdNF items had a positive relationship with each other and a negative relationship with the AppNF items. There was a significant difference between the scores of the items as $\rho<0.01$ for all correlated items.

AppNF and AvdNF scores were calculated for each participant and the mean scores of the two scales (Table S1, supplementary data) indicates that the participants of the survey were more motivated to approach new foods than they were to avoid them. The average AppNF score of 3.9 indicates that most participants chose "like me" on the AppNF scale items, whereas the average AvdNF score of 1.7 indicates that the majority chose "not at all like me" or "a little like me". Individual mean item scores in Table 7 emphasize participants' motivation to try new foods rather than avoid them, and only 6 out of the 250 participants exhibited traits of extreme food neophobia (FN), with average AvdNF scores ranging from 4-5 out of 5, whereas the remaining participants were motivated or at least willing to try new foods, and thus showed no signs of being food neophobic. Displayed in Table 6 are the three groups formed from the hierarchy and K- mean cluster analysis, which further illustrates how very few participants were food neophobic. Participants in Groups 1and 3 had low AvdNF averages and Group 2, which were the participants who were most neophobic, only consisted of 35 participants with an average AvdNF score of 3.3 out of 5.

Table 6: Groups formed in K-mean cluster analysis with their average AppNF and AvdNF scores.

	No. of participants	Average AppNF	Average AvdNF
Group 1	91	3.6	1.7
Group 2	35	2.5	3.3
Group 3	124	4.7	1.2

Table 7: Factor loadings, mean (M) scores and standard deviations (SD) of items from the Motivation to Eat New Foods scale done by the online survey participants (n=250).

Item	**AppNF**	**AvdNF**	**M**	**SD**
I enjoy trying foods that I have never eaten before	0.809		3.86	1.13
I enjoy learning about new foods	0.831		4.09	1.03
I am interested in trying familiar foods that have been prepared with new ingredients	0.714		4.00	1.04
I am curious about the flavours of new foods and ingredients	0.883		4.08	1.05
I get sort of excited when I know I am going to eat some new types of food	0.799		3.81	1.21
I don't trust new foods		0.734	1.77	0.98
I am afraid to eat things I have never had before		0.772	1.77	1.04
I think that if I eat something I have not eaten before that it will taste strange		0.846	1.91	1.01
I think that if I eat something I have not eaten before that I will not like it		0.867	1.66	0.95
Foods I have never eaten before seem sort of disgusting		0.770	1.37	0.76

4.2 Frequency of Consumption

Illustrated in Fig 1 and Table S4, the seafood with the highest consumption frequency was salmon, followed by shrimp, cod, herring, mussels, seaweed and lastly oysters.

For every seafood the chi squared values are larger than the critical chi squared value of 9.488 and $\rho<0.05$ (Fig 1). The null hypothesis is rejected because observed consumption is significantly different from expected consumption frequencies for each seafood.

Overall, the results from the analysis of covariance (ANCOVA) showed that consumption of each of the seafood did not correlate to participants' average AppNF or AvdNF scores. All ρ values for the seafood in relation with either the AppNF or AvdNF scores were above 0.05 as seen in Table 8 below.

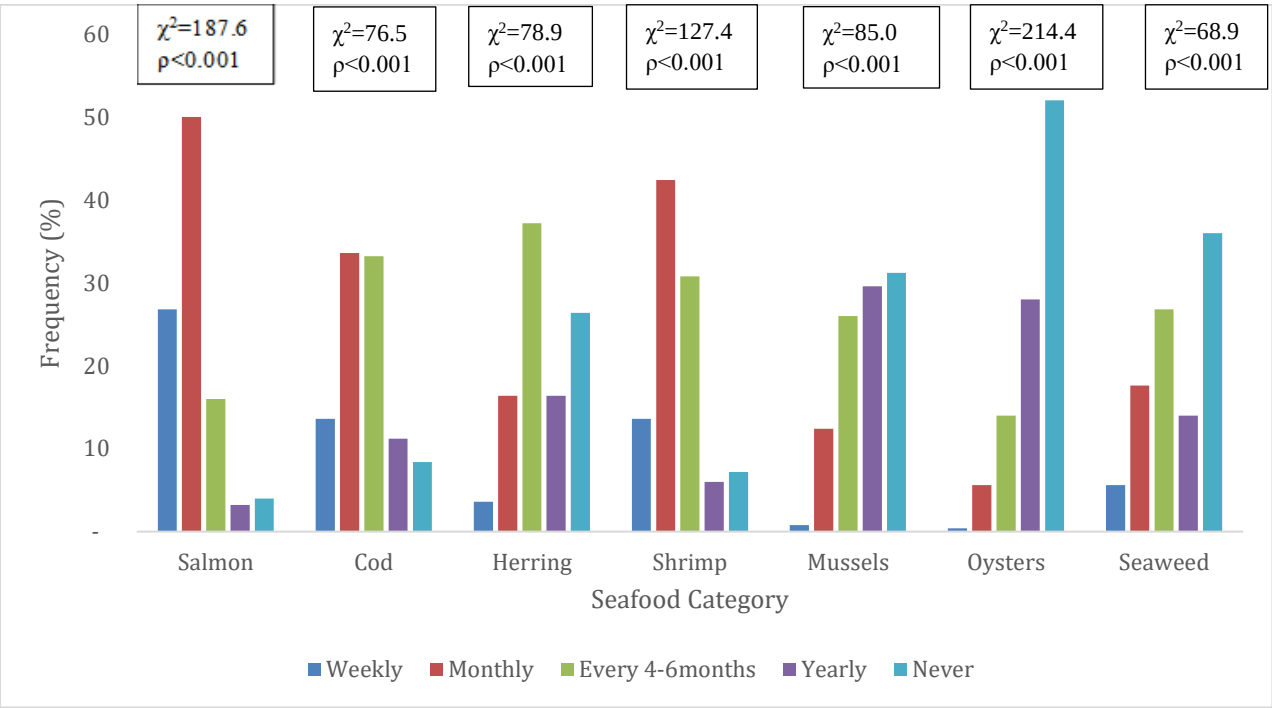

Fig 1: Seafood consumption frequencies with results from one sample chi^2 test.

Table 8: Summary table of analysis of covariance ($p < 0.05$).

Seafood	**Items**	**p-value**
Salmon	Salmon*AppNF	0.298
	Salmon*AvdNF	0.787
Cod	Cod*AppNF	0.301
	Cod*AvdNF	0.588
Herring	Herring*AppNF	0.055
	Herring*AvdNF	0.526
Shrimp	Shrimp*AppNF	0.839
	Shrimp*AvdNF	0.875
Mussels	Mussels*AppNF	0.330
	Mussels*AvdNF	0.707
Oysters	Oysters*AppNF	0.649
	Oysters*AvdNF	0.391
Seaweed	Seaweed*AppNF	0.698
	Seaweed*AvdNF	0.989

4.3 Conceptual Profiling with CATA

As illustrated in Figures 4 and 5, the frequency with which participants checked conceptualisations for each seafood is not equal. Crochan's Q test (Table S6, supplementary data) was used to measure similarities and determine whether the distributions of salmon, seaweed, oysters, herring, mussels, cod, and shrimp differed among the conceptual associations ($p<0.05$). The distributions were overall significantly different ($p<0.001$), indicating that participants did not equally associate the seafoods with the conceptualisations. Along with the Crochan's Q test, Correspondence analysis performed on the CATA displays distinct and similar conceptual associations for each seafood (Fig 3).

Seaweed, followed by oysters, were the seafoods that were perceived as the most "*Adventurous*" when compared to the other seafoods. The seafoods most associated with the negative sensory attribute *"Bones*" were herring and cod, with no significant differences between them and the other seafoods. When compared to the other seafoods, oysters were the least associated with the word "*Cheap,"* while herring was the most. When compared to the other seafoods, salmon, cod, and shrimp were the seafoods most associated with "*Comforting*".

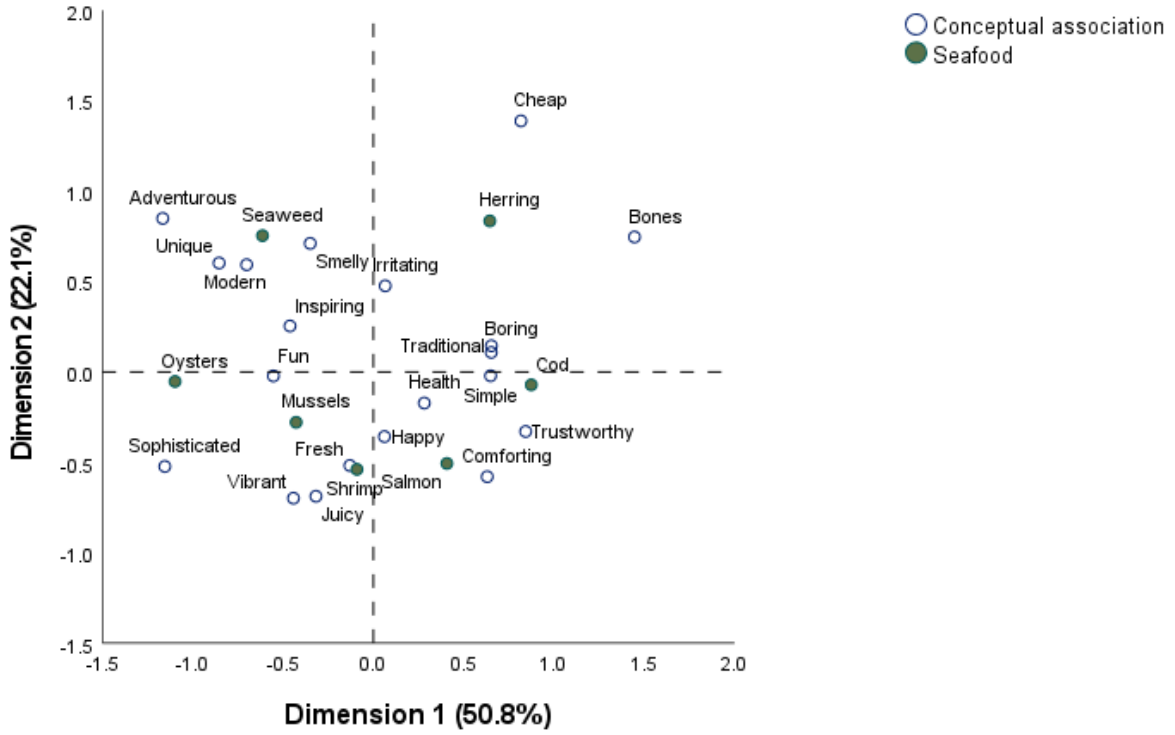

Fig 3: Correspondence analysis of associations and seafoods. Dimension 1 and 2 account for 72.9% of the total variance in the conceptual profiling data.

With the exception of seaweed, herring was associated the least with the positive sensory feature "*Fresh*" and was significantly different from the other seafoods. The seafoods most associated with "*Fresh"* were shrimp and salmon, with a significant difference between the others. Except for mussels and seaweed, shrimp was the seafood most closely associated with "*Fun*." Shrimp also received the most votes for the conceptualisation "*Happy*," with a significant difference observed between the other six seafoods. In comparison to the other seafoods, salmon was significantly associated with *"Health."* Following salmon, cod and seaweed were frequently associated with "*Health*" and showed significant differences when compared to the other seafoods. Except when compared to mussels, seaweed was significantly regarded as the most "*Inspiring*." There was a significant difference between herring compared to salmon, seaweed, and cod in terms of "*Irritating*." When compared to the other seafoods, seaweed was significantly deemed to be the most "*Modern*." Except for seaweed, oysters were deemed the least "*Simple*," with a significant difference when compared to all other seafoods. In the selection of "*Juicy*" as a conceptualisation, salmon, shrimp, oysters, and mussels differed significantly from herring, seaweed, and cod. Herring, oysters, and seaweed were consistently associated with the negative sensory attribute "*Smelly*," with a significant difference when

compared to salmon, cod, shrimp, and mussels. When compared to the other seafoods, oysters were considered the most "*Sophisticated*," followed by shrimp, which was only significantly different from salmon, cod, herring, and seaweed. Seaweed, oysters, and mussels were deemed the least "*Traditional*," and were markedly different from herring, cod, salmon, and shrimp. When compared to the other seafoods, cod, shrimp, and salmon were significantly more "*Trustworthy*" and "*Comforting*." Seaweed, followed by oysters, were the most closely associated with the word "*Unique,"* and both were significantly different from the other seafoods.

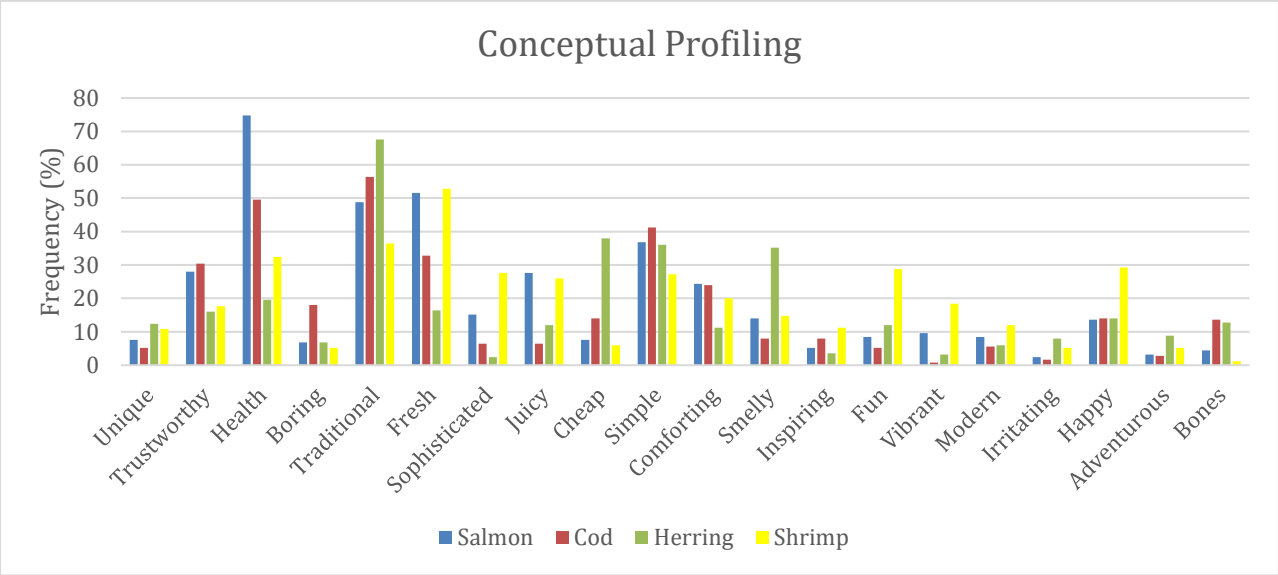

Fig 4: Conceptual associations selected by participants for the most consumed seafoods in Sweden

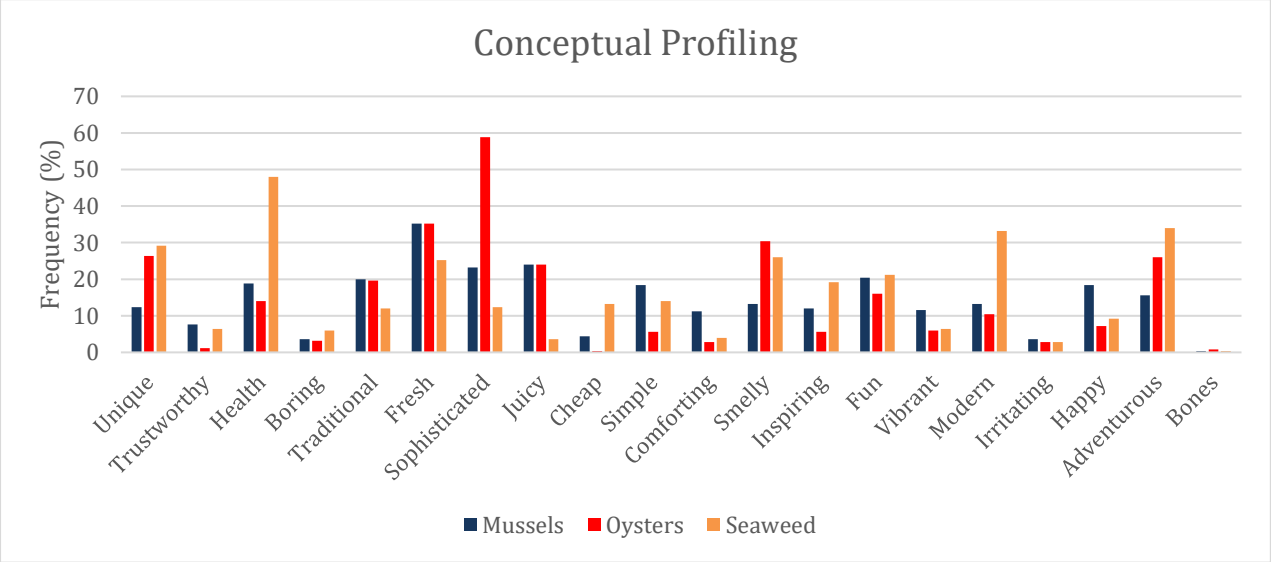

Fig 5: Conceptual associations selected by participants for less frequently consumed seafoods in Sweden.

4.4 Situational Appropriateness with CATA

The CATA situational appropriateness data was analyzed using Crochan's Q (Table S8, supplementary data) to see if the distributions of salmon, seaweed, oysters, herring, mussels, cod, and shrimp differed significantly across consumption situations ($p < 0.05$). The distribution of the seafoods in the different consumption situations, as shown in Fig 6, was significantly different ($p<0.001$) and therefore shows that each seafood has a consumption situation pattern different from the others.

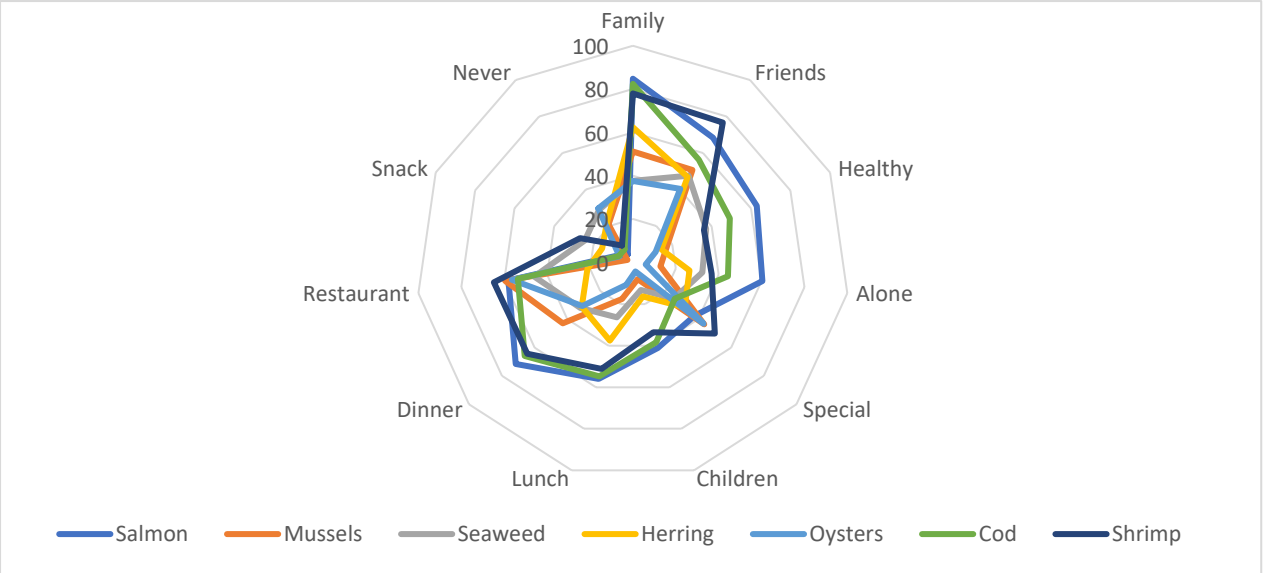

Fig 6: Frequency (%) of consumption situations selected for each seafood by participants.

Correspondence analysis of the CATA data from all participants, in addition to the Crochan's Q test, displays situations in which the participants thought it was appropriate to consume each seafood (Fig 7) and which groups of seafoods were thought to be appropriate to consume in the same situations. When compared to the other seafoods, salmon was deemed to be the most appropriate for consumption as part of a *"Healthy*" meal. Significant differences were also observed between shrimp and cod with the other seafoods as the next seafood to be considered the most appropriate to be consumed as part of "*Healthy*" meals. Seaweed was chosen moderately to be consumed in the "*Healthy*" consumption situation, and it differed significantly from oysters, mussels, and herring. Shrimp, salmon, and cod were significantly different from seaweed, oysters, mussels, and herring and were thought to be more appropriate for the consumption situations "*Dinner", "Lunch", "Family"* and "*Children*". Shrimp and salmon were chosen as the most appropriate seafoods to eat with "*Friends*" and were significantly different from the other seafoods. Salmon was significantly considered the most appropriate seafood to consume *"Alone"*. Oysters and mussels were deemed the least suitable for consumption

"*Alone*," and were significantly different from herring, shrimp, and cod. Shrimp and seaweed were significantly perceived as the most appropriate to consume as part of "*Snack"*. Shrimp, mussels, and oysters were deemed most appropriate for consumption during "*Special*" occasions, as well as at "*Restaurants*" that included salmon. In comparison to the other seafoods, herring was deemed the least appropriate for consumption at a *"Restaurant."*

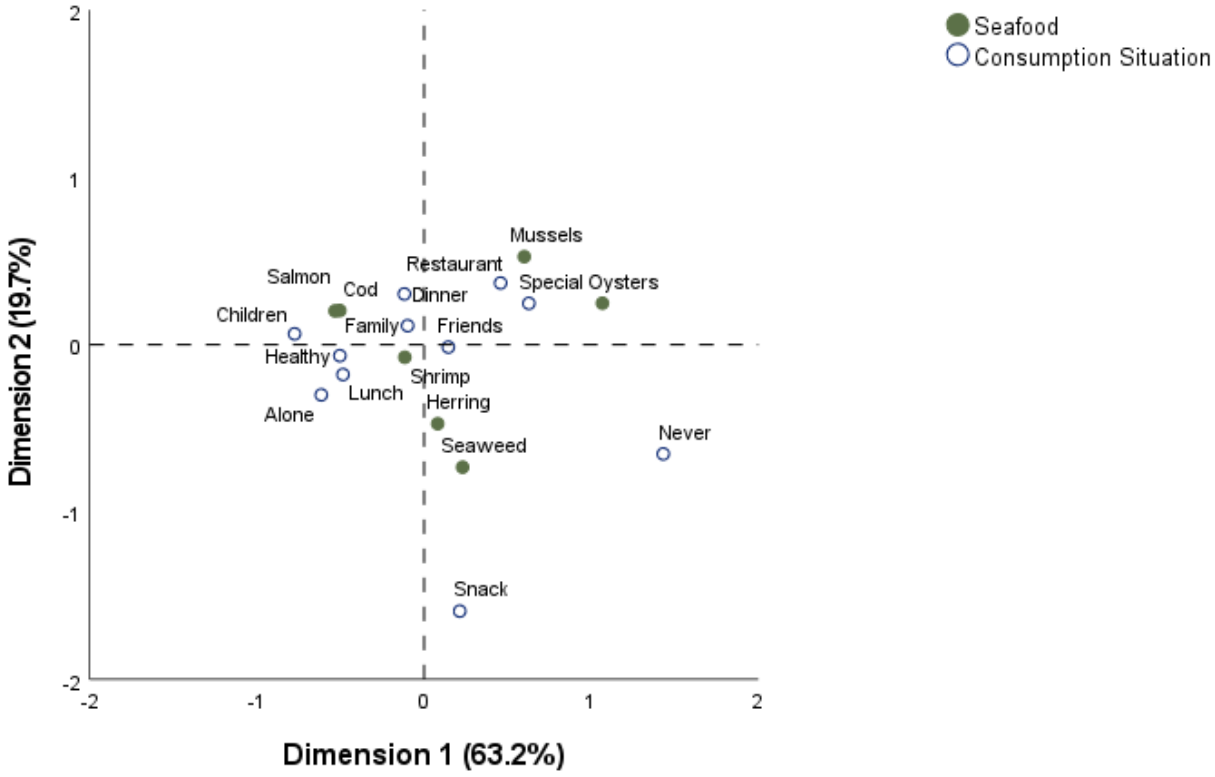

Fig 7: Correspondence analysis of appropriate consumption situations and seafoods. Dimension 1 and 2 account for 82.9% of the total variance in the conceptual profiling data.

5. Discussion

5.1 Food Neophobia (FN) and Consumption Frequency

The participants' average approach new foods (AppNF) and avoid new foods (AvdNF) scores were not normally distributed, and a significant proportion of respondents were food neophiliac rather than neophobic. Because the current study was voluntary, those who chose to take the survey may have a more positive attitude toward food than those who did not, which explains the lack of food neophobic participants.

Exposure is a common explanation for people's lack of food neophobia, and many variables influence exposure, such as age and education. Females are expected to have a greater exposure to novel foods due to their greater involvement in food purchase and preparation, and approximately 62% of the participants in this study were female. The overall effect of gender on FN is unclear, with some studies in the UK and Canada finding no effect, but a study among Swedish adults found women to be less food neophobic than men. 92% of the participants in this study were either the primary or joint grocery shopper in their household, and a study conducted amongst Swedish families showed that these people are less food neophobic because they are regularly responsible for buying and preparing food, thus increasing their exposure to novel foods, and making them less neophobic. FN has been measured to increase with age (>50) and decrease with education level. More than 80% of the participants in this study were aged 18-44, as well as 74% of them held a bachelor’s degree or higher. If FN is thought to vary with exposure, it should be expected that higher education would have an impact on FN scores because it is likely to increase people's access and exposure to various stimuli, events, and issues, reducing the likelihood of food neophobia. (Meiselman, King & Gillette, 2010, Hursti & Sjödén, 1997, Tuorila et al., 2001)

The effect of FN on seafood consumption frequencies could not be investigated due to a lack of participants motivated to avoid new foods. It was discovered, however, that participants' motivation to try new foods had no effect on the number of times they consumed the various seafoods. That is, the varying consumption frequencies of the various seafoods and lack of diversity in seafood consumption is influenced by factors other than the participants' willingness to try new foods, as explained below.

5.2 Seafood Conceptualisations and Situational Appropriateness

Health is the number one motivator for seafood consumption and when utilised as a functional conceptualisation seafoods most associated with *"Health"* are related to feeling good and living a better lifestyle by consumers. A study conducted in France with 22,938 participants discovered that 86% of the participants agreed with the comment "I purchase fish for health issues," and when the importance of 33 fresh seafood attributes to Norwegian consumers was investigated, it was discovered that health was one of the most important attributes in a survey of 840 respondents (Lamy, 2020). However, in this study, the conceptualisation "*Health"* and consumption situation "*Healthy"* were more frequently associated with salmon, cod, seaweed, and shrimp than with all seafoods, implying that not all seafoods are perceived as healthy by the participants. Blue mussels are rich in protein, omega 3 fatty acids, and are low in fat. However, after decades of health benefits being communicated, the notion of salmon and cod being healthy is widely held compared to other seafoods (Statista, 2021b). This is also reflected in the belief that salmon is healthier than herring. Because herring is typically purchased brined, pickled, or salted, whereas salmon is typically purchased fresh, the minimal processing that salmon undergoes when compared to herring makes salmon a healthier option for consumers. Seaweed is extremely nutritious, contains high levels of omega-3 fatty acids, vitamins, minerals, and trace elements, so even though it is not as commonly consumed as herring, it is still deemed more appropriate to consume as a "*Healthy*" meal (Pavia, 2018).

A study conducted in Norway showed a strong correlation between consumers perceiving seafood as inconvenient to prepare and them not consuming seafood. The participants had higher consumption frequencies to seafood they perceived as easier to prepare than ones they thought were not (Carlucci et al., 2015). A consumer's lack of confidence in purchasing and preparing seafood is a measured barrier to seafood consumption; however, if consumers believe they have the knowledge and skills to prepare seafood, their confidence grows, and they are more comfortable consuming the seafood on a regular basis. Herring, cod, and salmon were frequently associated with the functional and abstract conceptualisation "*Simple*", whereas oysters, mussels, and seaweed were not. Perceiving salmon, herring, and cod as "*Simple*" indicates that participants are more confident in preparing these seafoods, which they may not feel with seaweed because it is a new ingredient that can be used in a variety of ways they are unfamiliar with, or with oysters and mussels, which require more preparation. Salmon and cod can be purchased in a variety

of products in the Swedish market, such as fresh, frozen, fish sticks, or ready-to-eat slices, and the ease of preparation of these products at mealtimes may be why participants perceived salmon and cod as the more appropriate seafoods to consume at "*Lunch", "Dinner",* when "*Alone"* and prepare for "*Children".* Their association with being easy to prepare lends to why salmon and cod are frequently consumed and thus considered appropriate to consume in these situations compared to less frequently consumed seafoods such as mussels. Seaweed, like salmon, is available in a variety of products on the Swedish market, including a dried snack, which may explain why participants discovered it alongside shrimp, which is commonly consumed in Sweden as Skagenröra (shrimp sandwich), best consumed as a *"Snack".*

The term "*Traditional"* was frequently associated with the seafoods salmon, herring, cod, and shrimp. These seafoods have been consumed by the Swedish population for years. Salmon was once a luxury food item, traditionally consumed cured or smoked, but it is now widely available, less expensive, and available in a variety of forms including pickled, frozen, fresh, or ready-to-eat slices. Herring, which has greatly supported the Swedish economy since the Middle Ages, was traditionally smoked or salted for preservation purposes. Nowadays it is commonly consumed breaded and fried, or served pickled in a salted, acidic, and sweetened brine. Surströmming, or fermented herring, is another way to consume herring and is considered a delicacy by some Swedes but not all due to its pungent odour. Shrimp became popular amongst the upper class in the 1500's but was considered unclean to consume by the general public until the early 1900's when shrimp farming became popular in Kosterfjorden**.** Today, small Baltic shrimp caught in southern Scandinavian fjords and inlets are the most popular in Sweden and can be purchased canned, brined, frozen, or fresh. These are a popular menu item during Swedish holidays such as Midsummer Eve and are commonly consumed as Skagenröra, or shrimp salad. (Fredborg, 2020, Kjølberg, 2018**,** Dailyscandi, 2016).

These seafoods are also a staple at Swedish holidays such as Christmas, Easter, and Midsummer, particularly herring, salmon, and shrimp, lending to the "*Traditional*" association made to these seafoods because their consumption at these times is a long-established habit. Because most traditions include both friends and family, it stands to reason that shrimp, salmon, and cod were the seafoods that participants thought were appropriate to eat with "*Family*" and shrimp and salmon with "*Friends*". Because these seafoods are associated with tradition and consumed frequently amongst friends and family, their consumption has become habitual, which is a top driver for seafood consumption, and thus continue to be consumed regularly, which is why they are the most consumed seafoods in Sweden. Like this study, a survey of

3,213 consumers in the Czech Republic, Germany, Greece, Italy, Portugal, Romania, Sweden, and the United Kingdom concluded that, despite barriers to consumption, higher seafood consumption rates emerged in Mediterranean countries where fish is a significant part of the traditional diet. Similarly, a study in Norway discovered that habit was a strong predictor of behavioural intention to consume fish (Lamy, 2020). Seaweed, oysters, and mussels are not consumed during these occasions that include friends and family, and where therefore not perceived as appropriate to consume amongst these groups of people compared to salmon, shrimp, and cod.

Despite being the second most consumed seafood in Sweden, participants reported eating shrimp and cod more frequently than herring, and unlike salmon and cod, herring was frequently associated with the negative sensory attributes "*Smelly"* and *"Bones"* rather than the abstract conceptualisations "*Trustworthy*" and "*Comforting*." The abstract conceptualisations have both emotional and functional connotations in that they promote a sense of safety while also implying that the seafood is healthy, which participants did not appear to associate with herring. Despite the fact that cod was the seafood most associated with the concept "*Bones*," it did not seem to deter participants from consuming it frequently and finding it appropriate to consume in the situations "*Lunch," "Dinner*," and to prepare for "*Children*," as they did with herring. Furthermore, the sensory characteristics associated with herring are not ones that entice consumers to buy seafood, which may explain why it was deemed the most "*Irritating*." So, even though herring has been a part of the Swedish diet for years, its sensory characteristics can cause consumers discomfort, causing them to lose trust in the seafood and find fewer situations where it is appropriate to be consumed. Due to these unfavourable perceptions, some consumers' aversion to herring may result in lower consumption among friends and family members because they do not want to cause discomfort to the person who does not like it; thus, its lower consumption is also due to social pressures (Pihlajamäki et al., 2019).

The association of herring with negative sensory attributes may also explain why participants associated shrimp with "*Fun*" and "*Happy*," as well as finding it more appropriate to consume among "*Friends*" than herring, even though both are popular seafoods served during national holidays such as Midsummer and Easter, where pickled herring and Skagenröra are popular dishes. Shrimp has grown in popularity over the years, as evidenced by Räkmackans dag, a day dedicated to the shrimp sandwich, having its own proverb "Att glida in på en räkmacka" (gliding in on a shrimp sandwich), and a survey conducted by the Norwegian Seafood Council, which revealed that the pandemic resulted in

an increase in shrimp consumption (Bergman, and Ziegler, 2021, www.nordstjernan.com). The functional conceptualisation "*Fun*," which consumers can experience during celebrations when friends and family surround them, promotes the emotion of happiness, leading to regular consumption of shrimp on other occasions when compared to other seafoods.

The functional conceptualisation "*Fresh*" describes a seafood's overall quality as it relates to sensory characteristics such as appearance, flavour, and texture. It is regarded as a positive characteristic for a seafood to possess and has a significant impact on the popularity of a seafood because consumers perceive fresh seafood to be more valuable and thus purchase it more frequently. Unlike herring, salmon and shrimp were most associated with the concepts "*Fresh*" and "*Juicy*," indicating that these are the positive sensory features participants most associated with salmon and shrimp, further bolstering their popularity among participants. Salmon, mussels and oysters were also frequently associated with "*Fresh"* and "*Juicy,"* but this could be due to consumers purchasing and consuming them shortly after capture, as this did not correlate with them being consumed more frequently (Xiao et al., 2015).

Seaweed was the seafood most perceived as "*Inspiring", "Modern", "Adventurous",* and "*Unique".* Because seaweed is a newer addition to the Swedish diet compared to other seafoods that have been consumed for a longer period of time, it explains why it is perceived with these abstract concepts. Consuming seaweed is not common, so it is out of the ordinary for most people, eliciting a sense of novelty. Participants perceived oysters to be "*Unique*" and "*Adventurous*," but they reported the least consumption frequency, along with seaweed, indicating that even if consumers are motivated to try new foods, this is not a factor in them consuming unusual and new seafoods more frequently. Furthermore, seaweed and oysters were frequently selected as "*Smelly*" by the participants, suggesting that the negative sensory attribute that they associate with these seafoods may contribute to why they don't consume them on a regular basis. According to Debucquet et al. (2012), younger, non-consumers of oysters were more willing to consume processed oysters than raw oysters because the processing helped to improve the odour and taste they disliked.

Price, as mentioned by Carlucci et al., (2015), can be a major determining factor in how frequently seafood is consumed, and it is frequently a barrier. The functional concept "*Cheap*," most associated with herring may imply that participants perceive herring to be of poor value as a seafood, because its products are not as expensive as salmon and cod products on the market and yet they were not perceived as "*Cheap*" by the participants. This may also explain why herring isn't considered as appropriate to consume in the situations "*Health,"*

"Children," and "*Dinner*" when compared to salmon and cod, for participants may perceive other seafoods as better for consumption. Oysters were least associated with the conceptualisation "*Cheap*" and along with shrimp and mussels they were frequently associated with the conceptualisation "*Sophisticated*". The perception of oysters being expensive along with having the highest association with the conceptualisation "*Sophisticated*" and second highest with "*Unique*" and "*Adventurous*" may be why the participants found it appropriate to consume oysters most at "*Restaurants*" and during "*Special"* occasions, compared to the other consumption situations. The conceptualisation "*Sophisticated*" can promote feelings of being classy or superior, therefore participants believe the appropriate situations to consume such seafoods as oysters, mussels, and shrimp are during "*Special"* occasions or at "*Restaurants*" where this atmosphere is present.

6. Further Study

Consumers with extreme food neophobia (FN) were extremely rare participants in a study aimed at investigating FN. Participants who are motivated to avoid new foods will need to be recruited in order to effectively measure FN's influence on consumption frequency and perception of various seafoods. The AppNF and AvdNF scales each contain different items that assess consumers' willingness to avoid or try new foods. With more participants, the scale items can be better differentiated, and the motives that most influence the approach or avoidance of new foods can be measured.

Most seafoods in Sweden are available in a variety of forms, including fresh, frozen, canned, and ready-to-eat. Further research can be conducted to determine whether the degree of processing of seafood influences how they are perceived by consumers, the popularity of the various processing varieties, and whether there is a relationship between FN and acceptance of the various products of the same seafood.

According to the findings of the study, the sensory characteristics, negative or positive, associated to seafood correlate to how frequently they are consumed. Additional studies can be conducted that include more sensory attributes, both negative and positive, to investigate which attributes consumers associate with various seafoods, whether the attributes relate to consumption frequency, and which situations consumers believe are most appropriate or not for the seafoods to be consumed in based on the sensory attributes they are associated with.

7. Conclusion

Due to a lack of data, it was not possible to determine whether food neophobia (FN) correlates with undiversified seafood consumption. The study found that the two variables were not correlated, so the hypothesis relating food neophobia or lack thereof to consumption frequencies of various seafoods can be rejected. However, the data collected showed that the participants' lack of diversity in seafood consumption is not correlated with food neophilia.

Except for herring, the most consumed seafoods, salmon, shrimp, and cod, had conceptualisations that were similar compared to the less frequently consumed seafoods, mussels, oysters, and seaweed.

In most consumption situations, commonly consumed seafoods, salmon, shrimp, and cod were deemed more appropriate to consume than the less commonly consumed types of seafood, seaweed, mussels, and oysters. Apart from the consumption situations "*Restaurant*" and "*Special*", where oysters and mussels were among the most appropriate, the top three consumed seafoods in this study were similarly deemed more appropriate to consume in all the other consumption situations. Even though herring is the second most consumed seafood in Sweden, it was significantly considered as inappropriate to consume when compared to salmon, cod, and shrimp in most consumption situations in this study.

When it comes to associating seafood with being healthy, study participants had uneven perceptions. Some seafoods were considered as healthier to consume than others, and these seafoods reported higher consumption frequencies. Different sensory characteristics correlate to how seafood is perceived, as well as how frequently and at what situations it is consumed. The seafoods frequently associated with positive sensory characteristics such as "*Fresh*," were more popular among participants; and seafoods associated with negative sensory characteristics such as "*Smelly*" were not as regularly consumed and found not appropriate to consume in most situations. Additionally, the participants association of some seafoods with being easy to prepare correlated with those seafoods having higher consumption frequencies and being deemed appropriate to consume in more situations. Seafoods perceived as difficult to prepare were consumed less frequently and were deemed inappropriate to prepare at home during mealtimes but more appropriate to consume at restaurants or only on special occasions.

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9. Supplementary Data

9.1 Online Survey

Gender

☐ Female
☐ Male
☐ Do not wish to disclose
☐ Other

Age

☐ 18-24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55-64 ☐ 65 and older

Level of Education

☐ Compulsory school certificate
☐ Degree from upper secondary school (technical school or equivalent)
☐ Post-secondary education certificate (not college/university)
☐ College/university degree (undergraduate/bachelors)
☐ College/university degree (postgraduate/masters/phd)

Diet (I describe myself as.....?)

☐ Omnivore (I eat meat, fish, and other seafood)
☐ Flexitarian (I refrain from eating meat or fish and other seafood at least 1 day per week)
☐ Pescatarian (I don't eat meat but I eat fish and other seafood)

I am the primary or joint food shopper in my household.

☐ Yes
☐ No

How many years have you lived in Sweden? Select the option that best applies to you.

☐ I was born here
☐ 20 or more
☐ 5-20
☐ 5 or less

For each of the statements listed below, select the response that best describes you.

	not at all like me	a little like me	somewhat like me	like me	very much like me
I enjoy trying foods that I have never eaten before.	☐	☐	☐	☐	☐
I enjoy learning about new foods.	☐	☐	☐	☐	☐
I am interested in trying familiar foods that have been prepared with new ingredients.	☐	☐	☐	☐	☐
I am curious about the flavors of new foods and ingredients.	☐	☐	☐	☐	☐
I get sort of excited when I know I am going to eat some new types of food.	☐	☐	☐	☐	☐
I don't trust new foods.	☐	☐	☐	☐	☐
I am afraid to eat things I have never had before	☐	☐	☐	☐	☐
I think that if I eat something I have not eaten before that it will taste strange.	☐	☐	☐	☐	☐
I think that if I eat something I have not eaten before that I will not like it.	☐	☐	☐	☐	☐
Foods I have never eaten before seem sort of disgusting.	☐	☐	☐	☐	☐

Which of the following words do you associate with salmon (lax). Check all that apply

- ☐ Unique
- ☐ Trustworthy
- ☐ Health
- ☐ Boring
- ☐ Traditional
- ☐ Fresh
- ☐ Sophisticated
- ☐ Juicy
- ☐ Cheap
- ☐ Simple
- ☐ Comforting
- ☐ Smelly
- ☐ Inspiring
- ☐ Fun
- ☐ Vibrant
- ☐ Modern
- ☐ Irritating
- ☐ Happy
- ☐ Adventurous
- ☐ Bones
- ☐ None of the above

(This question was also asked about the other seafoods: herring, cod, shrimp, mussels, oysters, and seaweed)

In which of the following situations do you find it appropriate to consume the different kinds of seafood listed below. Select all options that apply.

	Fa-mil-y	Fri-en-ds	He-alt-hy	Al-on-e	Sp-eci-al	Ch-ildr-en	Lu-nc-h	Di-nn-er	Re-sta-ura-nt	Sn-ack-/lig-ht me-al	Ne-ver
salmon (lax)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
mussels (musslor)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
seaweed (tång)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
herring (sill)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
oysters (ostron)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
cod (torsk)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
shrimp (räka)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Please indicate approximately how frequently you consume the products listed below.

	Weekly	Monthly	Once every 4-6 months	Once a year	Never
salmon (lax)	☐	☐	☐	☐	☐
mussels (musslor)	☐	☐	☐	☐	☐
seaweed (tång)	☐	☐	☐	☐	☐
herring (sill)	☐	☐	☐	☐	☐
oysters (ostron)	☐	☐	☐	☐	☐
cod (torsk)	☐	☐	☐	☐	☐
shrimp (räka)	☐	☐	☐	☐	☐

9.2 Motivation to Eat New Foods

Table S1: Summary statistics for AppNF and AvdNF scales.

	Mean	Standard Deviation	Cronbach's alpha
AppNF scale	3.968	0.935	0.907
AvdNF scale	1.696	0.812	0.905

Table S2: Results from Pearson's correlation to measure the relationship between the AppNF and AvdNF items

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10
Item 1	1	0.802	0.553	0.688	0.714	-0.532	-0.525	-0.419	-0.525	-0.434
Item 2	0.802	1	0.536	0.735	0.663	-0.549	-0.515	-0.419	-0.483	-0.427
Item 3	0.553	0.536	1	0.642	0.559	-0.391	-0.313	-0.316	-0.342	-0.282
Item 4	0.688	0.735	0.642	1	0.744	-0.525	-0.481	-0.354	-0.456	-0.401
Item 5	0.714	0.663	0.559	0.744	1	-0.546	-0.511	-0.400	-0.491	-0.403
Item 6	-0.532	-0.549	-0.391	-0.525	-0.546	1	0.760	0.639	0.682	0.619
Item 7	-0.525	-0.515	-0.313	-0.481	-0.511	0.760	1	0.657	0.677	0.593
Item 8	-0.419	-0.419	-0.316	-0.354	-0.400	0.639	0.657	1	0.715	0.553
Item 9	-0.483	-0.483	-0.342	-0.456	-0.491	0.682	0.677	0.715	1	0.718
Item 10	-0.427	-0.427	-0.282	-0.401	-0.403	0.619	0.593	0.553	0.718	1

9.3 Consumption Frequency

Table S3: Seafood category consumption and the results of one-sample chi-square tests.

	χ^2	df	p-value
Salmon	187.6	4	<0.001
Seaweed	68.9	4	<0.001
Oysters	214.4	4	<0.001
Mussels	85.0	4	<0.001
Shrimp	127.4	4	<0.001
Cod	76.5	4	<0.001
Herring	78.9	4	<0.001

Table S4: Consumption Frequencies of 250 Participants

	Salmon	Cod	Herring	Shrimp	Mussels	Oysters	Seaweed
Weekly	67	34	9	34	2	1	14
Monthly	125	84	41	106	31	14	44
Every 4-6 months	40	83	93	77	65	35	67
Yearly	8	28	41	15	74	70	35
Never	10	21	66	18	78	130	90

9.4 Conceptual Profiling

Table S5: Frequencies (%) of conceptual associations selected for each seafood

Conceptualisation	**Salmon**	**Cod**	**Herring**	**Shrimp**	**Mussels**	**Oysters**	**Seaweed**
Adventurous	3.2	2.8	8.8	5.2	15.6	26	34
Bones	4.4	13.6	12.8	1.2	0.4	0.8	0.4
Boring	6.8	18	6.8	5.2	3.6	3.2	6
Cheap	7.6	14	38	6	4.4	0.4	13.2
Comforting	24.4	24	11.2	20	11.2	2.8	4
Fresh	51.6	32.8	16.4	52.8	35.2	35.2	25.2
Fun	8.4	5.2	12	28.8	20.4	16	21.2
Happy	13.6	14	14	29.2	18.4	7.2	9.2
Health	74.8	49.6	19.6	32.4	18.8	14	48
Inspiring	5.2	8	3.6	11.2	12	5.6	19.2
Irritating	2.4	1.6	8	5.2	3.6	2.8	2.8
Juicy	27.6	6.4	12	26	24	24	3.6
Modern	8.4	5.6	6	12	13.2	10.4	33.2
Simple	36.8	41.2	36	27.2	18.4	5.6	14
Smelly	14	8	35.2	14.8	13.2	30.4	26
Sophisticated	15.2	6.4	2.4	27.6	23.2	58.8	12.4
Traditional	48.8	56.4	67.6	36.4	20	19.6	12
Trustworthy	28	30.4	16	17.6	7.6	1.2	6.4
Unique	7.6	5.2	12.4	10.8	12.4	26.4	29.2
Vibrant	9.6	0.8	3.2	18.4	11.6	6	6.4

Table S6: Cochran's Q analysis of conceptual profiling data ($\rho<0.05$). Values in **bold** denote for significant difference.

	Adventurous	Bones	Boring	Cheap	Comforting	Fresh	Fun	Happy	Health	Inspiring
seaweed-oysters	0.131	1.000	1.000	0.000	1.000	0.234	1.000	1.000	**0.000**	**0.000**
seaweed-mussels	**0.000**	1.000	1.000	**0.049**	0.260	0.234	1.000	**0.034**	**0.000**	0.062
seaweed-herring	**0.000**	**0.000**	1.000	**0.000**	0.260	0.536	0.051	1.000	**0.000**	**0.000**
seaweed-shrimp	**0.000**	1.000	1.000	0.267	**0.000**	**0.000**	0.256	**0.000**	**0.002**	**0.02**
seaweed-salmon	**0.000**	0.685	1.000	1.000	**0.000**	**0.000**	**0.001**	1.000	**0.000**	**0.000**
seaweed-cod	**0.000**	**0.000**	**0.000**	1.000	**0.000**	1.000	**0.000**	1.000	1.000	**0.000**
oysters-mussels	**0.008**	1.000	1.000	1.000	0.074	1.000	1.000	**0.003**	1.000	0.173
oysters-herring	**0.000**	**0.000**	1.000	**0.000**	0.074	**0.000**	1.000	0.416	1.000	1.000
oysters-shrimp	**0.000**	1.000	1.000	1.000	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**	0.436
oysters-salmon	**0.000**	1.000	1.000	0.267	**0.000**	**0.001**	0.256	0.595	**0.000**	1.000
oysters-cod	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	1.000	**0.008**	0.416	**0.000**	1.000
mussels-herring	0.421	**0.000**	1.000	0.000	1.000	**0.000**	0.117	1.000	1.000	0.011
mussels-shrimp	**0.008**	1.000	1.000	1.000	**0.047**	**0.000**	0.117	**0.005**	0.595	1.000
mussels-salmon	**0.000**	0.685	1.000	1.000	**0.000**	**0.001**	**0.002**	1.000	**0.000**	0.105
mussels-cod	**0.000**	**0.000**	**0.000**	**0.019**	**0.000**	1.000	**0.000**	1.000	**0.000**	1.000
herring-shrimp	1.000	**0.000**	1.000	**0.000**	**0.047**	**0.000**	**0.000**	**0.000**	**0.031**	**0.036**
herring-salmon	1.000	**0.000**	1.000	**0.000**	**0.000**	**0.000**	1.000	1.000	**0.000**	1.000
herring-cod	0.843	1.000	**0.000**	**0.000**	**0.000**	**0.001**	0.522	1.000	**0.000**	1.000
shrimp-salmon	1.000	1.000	1.000	1.000	1.000	1.000	**0.000**	**0.000**	**0.000**	0.278
shrimp-cod	1.000	**0.000**	**0.000**	0.118	1.000	**0.000**	**0.000**	**0.000**	**0.000**	1.000

salmon-cod	1.000	**0.000**	**0.000**	0.562	1.000	**0.000**	1.000	1.000	**0.000**	1.000

Table S6 (cont.): Cochran's Q analysis of conceptual profiling data ($\rho<0.05$). Values in **bold** denote for significant difference.

	Irritating	Juicy	Modern	Simple	Smelly	Sophisticated	Traditional	Trustworthy	Unique	Vibrant
seaweed-oysters	1.000	**0.000**	**0.000**	0.498	1.000	**0.000**	1.000	1.000	1.000	1.000
seaweed-mussels	1.000	**0.000**	**0.000**	1.000	**0.003**	**0.042**	1.000	1.000	**0.000**	0.416
seaweed-herring	**0.042**	0.16	**0.000**	**0.000**	0.135	0.088	**0.000**	**0.027**	**0.000**	1.000
seaweed-shrimp	1.000	**0.000**	**0.000**	**0.000**	**0.019**	**0.000**	**0.000**	**0.004**	**0.000**	**0.000**
seaweed-salmon	1.000	**0.000**	**0.000**	**0.000**	**0.008**	1.000	**0.000**	**0.000**	**0.000**	1.000
seaweed-cod	1.000	1.000	**0.000**	**0.000**	**0.000**	1.000	**0.000**	**0.000**	**0.000**	0.254
oysters-mussels	1.000	1.000	1.000	**0.012**	**0.000**	**0.000**	1.000	0.667	**0.000**	0.254
oysters-herring	0.091	**0.003**	1.000	**0.000**	1.000	**0.000**	**0.000**	**0.000**	**0.000**	1.000
oysters-shrimp	1.000	1.000	1.000	**0.000**	**0.000**	**0.000**	**0.001**	**0.000**	**0.000**	**0.000**
oysters-salmon	1.000	1.000	1.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	1.000
oysters-cod	1.000	**0.000**	1.000	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	0.416
mussels-herring	0.188	**0.003**	0.224	**0.000**	**0.000**	**0.000**	**0.000**	0.101	1.000	**0.004**
mussels-shrimp	1.000	1.000	1.000	0.374	1.000	1.000	**0.001**	**0.017**	1.000	**0.049**
mussels-salmon	1.000	1.000	1.000	**0.000**	1.000	0.463	**0.000**	**0.000**	1.000	1.000
mussels-cod	1.000	**0.000**	0.148	**0.000**	1.000	**0.000**	**0.000**	**0.000**	0.364	**0.000**
herring-shrimp	1.000	**0.000**	0.701	0.374	**0.000**	**0.000**	**0.000**	1.000	1.000	**0.000**
herring-salmon	**0.018**	**0.000**	1.000	1.000	**0.000**	**0.005**	**0.000**	**0.001**	1.000	0.087
herring-cod	**0.003**	1.000	1.000	1.000	**0.000**	1.000	0.136	**0.000**	0.364	1.000
shrimp-salmon	1.000	1.000	1.000	0.204	1.000	**0.008**	0.054	**0.010**	1.000	**0.002**
shrimp-cod	0.682	**0.000**	1.000	**0.003**	0.924	**0.000**	**0.000**	**0.000**	1.000	**0.000**

salmon-cod	1.000	**0.000**	0.488	1.000	1.000	0.247	1.000	1.000	1.000	**0.002**

9.5 Situational Appropriateness

Table S7: Frequencies (%) of consumption situations selected for each seafood

Consumption Situations	**Salmon**	**Cod**	**Herring**	**Shrimp**	**Mussels**	**Oysters**	**Seaweed**
Alone	60.4	44.4	26.4	36.8	12.8	6	32.4
Children	41.2	38.4	16.4	33.6	8	4.4	13.2
Dinner	71.6	66	31.2	64.4	42.8	30.8	32
Family	84.8	82.4	62.4	78	51.2	37.6	37.6
Friends	68.4	56.4	46.8	76.8	50.8	40.4	47.6
Health	62.8	49.2	14.4	36	17.2	11.6	37.2
Lunch	56	54.8	37.6	51.2	17.6	10.8	26.4
Restaurant	58	53.6	21.2	68.8	59.6	56.4	46
Snack	7.6	7.2	15.6	26.8	2.8	6.8	24.4
Special	37.6	25.6	31.6	50	43.6	43.2	25.2

Table S8: Cochran's Q analysis of situational appropriateness data ($\rho<0.05$). Values in **bold** denote for significant difference.

	Alone	Children	Dinner	Family	Friends	Health	Lunch	Restaurant	Snack	Special
seaweed-oysters	**0.000**	0.096	**0.001**	1.000	1.000	**0.000**	**0.001**	0.174	**0.000**	**0.000**
seaweed-mussels	**0.000**	1.000	0.393	**0.006**	1.000	**0.000**	0.393	**0.012**	**0.000**	**0.000**
seaweed-herring	1.000	1.000	0.058	**0.000**	1.000	**0.000**	0.058	**0.000**	**0.037**	1.000
seaweed-shrimp	1.000	**0.000**	**0.000**	**0.000**	**0.000**	1.000	**0.000**	**0.000**	1.000	**0.000**
seaweed-salmon	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.049**	**0.000**	**0.022**
seaweed-cod	**0.027**	**0.000**	**0.000**	**0.000**	0.361	**0.021**	**0.000**	1.000	**0.000**	1.000
oysters-mussels	1.000	1.000	1.000	0.006	0.102	1.000	1.000	1.000	1.000	1.000
oysters-herring	**0.000**	**0.002**	1.000	**0.000**	1.000	1.000	**0.000**	**0.000**	**0.037**	**0.045**

oysters-shrimp	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	0.694	**0.000**	1.000
oysters-salmon	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	1.000	1.000	1.000
oysters-cod	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	1.000	1.000	**0.000**
mussels-herring	**0.005**	0.143	**0.000**	0.062	1.000	1.000	**0.000**	**0.000**	**0.000**	**0.032**
mussels-shrimp	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	1.000	**0.000**	1.000
mussels-salmon	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	1.000	**0.037**	1.000
mussels-cod	**0.000**	**0.000**	**0.000**	**0.000**	1.000	**0.000**	**0.000**	1.000	1.000	**0.000**
herring-shrimp	0.110	**0.000**	**0.006**	**0.001**	**0.000**	**0.000**	**0.006**	**0.000**	**0.001**	**0.000**
herring-salmon	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	1.000	1.000
herring-cod	**0.000**	**0.000**	**0.000**	**0.000**	0.196	**0.000**	**0.000**	**0.000**	0.06	1.000
shrimp-salmon	**0.000**	0.301	1.000	1.000	0.482	**0.000**	1.000	1.000	**0.000**	**0.022**
shrimp-cod	0.866	1.000	1.000	1.000	**0.000**	**0.006**	1.000	0.094	**0.000**	**0.000**
salmon-cod	**0.000**	1.000	1.000	1.000	**0.024**	**0.004**	1.000	1.000	1.000	**0.032**