

Are edible insects the new black?

An exploratory study assessing Danish children's perception of edible insects

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Abstract

The consumption and production of livestock have a negative impact on the environment and climate. In many Western countries, the consumption is particularly high and it is expected to increase globally. This increase will lead to further pressure on already stressed planetary boundaries. Recently edible insects have been proposed to be an alternative to conventional meat, because they have a lower environmental footprint. Although the consumption of edible insects are practised in many cultures, resistance is prevalent in Western countries, including Denmark that also experiences one of the highest consumption of meat globally. Most research to date has focused on adults, yet children seem curious and open to try edible insects, thus this study explored factors that lead to acceptance and rejection as well as their liking of dishes containing edible insects. The study took place on four schools in Denmark and included children from sixth grade. Focus group discussions were conducted before and after a course that included a lecture, cooking of five different dishes with insects, and subsequent tastings. Moreover, a survey assessing the liking of dishes were distributed to all children partaken. A total of 26 children participated in the discussions and 82 completed the survey. Thematic analysis was used to analyse data from the discussions while means were calculated for the hedonic ratings. The dish containing insect flour was most liked, and the whole grasshoppers were least liked. Factors leading to acceptance included previous experience with edible insects, curiosity, looks of a dish, and little or no taste of an insect. Rejection included insect's origin and nature. Mixed factors that could lead either to acceptance or rejection included appearance of the insect, societal influence, texture, taste, and cooking with insects. Factors appeared to be rooted in misconceptions, influences from society, and disgust towards animalness. It was suggested that most factors causing rejecting could likely be overcome by providing knowledge, by positive articulation, processing insects before reaching the consumer and disguising or incorporating insects in liked and known dishes.

Keywords: edible insects, entomophagy, adolescents, perceptions, meat alternative, barriers to adoption

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1 Introduction

1.1 Current (and future) problems behind meat consumption and production

The global population is expected to grow to 9.8 billion in 2050 (United Nations, Department of Economic and Social Affairs, Population Division, 2017), leading to increases in global food demand. The appetite for animal protein is projected to increase globally by 76% from 2005/2007 to 2050 (Alexandratos & Bruinsma, 2012), due to population growth, rise in income, and changing dietary patterns (Steinfeld et al., 2006). Meat consumption is especially high in Western countries including Denmark, but is on the rise globally (Alexandratos & Bruinsma, 2012). The high consumption and production of meat and corresponding social and environmental problems, should not be seen in isolation, but as something that affects the lives of people across the globe and into the future, and can thus be termed as a serious sustainability challenge as framed by Jerneck et al. (2011). Throughout the production chain large amount of inputs such as freshwater, feed, and energy are required. Additionally, it causes considerable environmental problems such as land degradation, deforestation, and pollutes air, water and soil, it emits large amount of greenhouse gases and causes biodiversity loss (Steinfeld et al., 2006). In fact, 70% of all agricultural land is used to produce livestock (Steinfeld et al., 2006) and represents around 14% of total anthropogenic greenhouse gas emission (Gerber et al., 2013). Thus, current and likely future meat consumption and corresponding production is tremendously unsustainable and adds great pressure on already stressed planetary boundaries (Steffen et al., 2015). Therefore, we are in a dire need of finding alternatives to current meat intake that do not necessarily stem from conventional livestock.

1.2 Edible insects as an alternative protein source

Edible insects have lately emerged as an alternative to conventional meat consumption in order to address issues such as food insecurity, rising demand for animal protein as well as environmental problems (van Huis et al., 2013). Edible insects are from an environmental perspective, a promising source of animal protein compared to protein from conventional meat, depending on insect species, developmental stage, and rearing method. For example, Oonincx et al. (2010) suggest that the production of certain insects emits less ammonia and fewer greenhouse gases compared to conventional meat. A life cycle analysis reveals that the global warming potential of mealworms per kilo edible protein is lower compared to chicken, pork, and beef, with the latter being 5.52-12.51 times higher compared to mealworms (Oonincx & de Boer, 2012). Compared to conventional livestock and depending on the aforementioned factors certain insects are more efficient at converting feed into protein (Oonincx et al., 2010; van Huis, 2013), require less land (Oonincx & de Boer, 2012), and less

water (Miglietta, De Leo, Ruberti, & Massari, 2015). Furthermore, edible insects are nutritionally considered a great alternative to conventional meat. For example, although with variations between and within species, insects contain ample amount of protein that is comparable to conventional meat, they are rich in fat, fibre, and micronutrients such as calcium, iron, zinc (Bukkens, 2005), and vitamin B₁₂ (Roos & van Huis, 2017). Additionally, because of insects' various flavours, no smell, and attractive consistency Western cultures might find them appealing to eat (Ramos-Elorduy, 1997). Lastly, within the past few years, edible insects of various types and in different products have reached online stores, speciality shops, and certain supermarkets in Denmark, making them more available.

1.3 Barriers and opportunities to insect consumption

More than 2100 different insect species have been recorded to be consumed worldwide (Jongema, 2017), primarily in regions such as Africa, Asia, and Latin America where they are part of a regular diet (Ramos-Elorduy, 1997). Insects are consumed due to reasons such as high availability (Halloran, Roos, Flore, & Hanboonsong, 2016; van Huis et al., 2013), positive sensory qualities¹ (Deroy, Reade, & Spence, 2015; Ramos-Elorduy, 1997), scarcity of other food (van Huis et al., 2013), and their nutritional value (Ramos-Elorduy, 1997). Despite the fact that adults in the West appear to be willing to consume insects (Caparros Megido et al., 2014; Ruby, Rozin, & Chan, 2015; Videbæk & Grunert, 2017), a plethora of interconnected reasons preclude this consumption. Numerous studies² assessing factors affecting the consumption of insects among adults have been conducted, confirming that many factors exist. Factors impeding the adoption of edible insects include limited availability (House, 2016; Shelomi, 2015); lack of knowledge on how to prepare food with insects (Tan et al., 2015; Tucker, 2014); high price (House, 2016; Shelomi, 2015; Tan et al., 2015); unsuitability with existing eating habits (House, 2016); safety (Tan et al., 2015); a perception of insects as disgusting (Looy & Wood, 2006; Ruby et al., 2015); and little sensory appeal (House, 2016; Sogari, Menozzi, & Mora, 2018). On the other hand, opportunities for acceptance have also been identified. These include curiosity (House, 2016; Looy & Wood, 2006; Tan et al., 2015); insect preparation method (i.e. degree of visibility and/or added to a familiar and liked dish) (Caparros Megido et al., 2016; Hartmann, Shi, Giusto, & Siegrist, 2015; Ruby et al., 2015; Tan et al., 2015; Tan, Tibboel, & Stieger, 2017; Videbæk & Grunert, 2017); novelty (House, 2016); positive sensory expectations (Hartmann et al., 2015); low scores for food neophobia (Hartmann et al., 2015); prior experience with insects (Caparros Megido et al., 2016); and rationalised considerations such as environmental and health benefits (House, 2016). Nonetheless, it is important to note that these factors are often intertwined, meaning that they do not work in isolation, thus, they

¹ Positive sensory qualities refer to the liking of a food's taste, smell, appearance, or texture

² The following "list" is not exhaustive, because numerous more studies exist with similar conclusions

all to a certain degree play a role in the acceptance or rejection of edible insects, as noted by House (2016). Moreover, as proposed by House (2016) and Tan et al. (2015) factors affecting initial and repeated consumption differs, for example, appealing sensory properties is important for repeated consumption.

1.4 Children as potential eaters of edible insects

Most research in Western cultures to date has primarily focused on edible insects among adults (apart from Caparros Megido et al., 2014; Looy & Wood, 2006), while little attention has been given to adolescents. Yet, why not extend the research to include this age group as well? A few arguments exist for this, especially in the case of Denmark where children regularly influence what is served at home (Jeppesen, Hansen, Bech-Larsen, & Grunert, 2017) and perhaps a spillover effect to other family members can be expected. Moreover, children are likely more amenable when it comes to changing food habits (World Health Organization, 2005), and food habits established in childhood are likely to persist into adulthood (Kelder, Perry, Klepp, & Lytle, 1994; Mikkilä, Räsänen, Raitakari, Pietinen, & Viikari, 2005). Therefore, exposing children to insects at an early age might be more successful than focusing on adults, whose food habits are usually more established and inflexible (World Health Organization, 2005).

1.5 Aim and research questions

While acknowledging that countless factors affect the consumption of edible insects, this thesis will primarily focus on individual perceptions of edible insects and how these are mediated by outside factors such as culture and peers. This is not to say that other factors, such as price, availability, and rational discourses about environmental and health benefits are unimportant, but they are out of the main scope of this thesis, because the former factors likely are more important than the latter factors concerning children. However, given the exploratory nature of this thesis, I am receptive to other influencing factors. In addition, because controlled studies do not necessarily reflect real-life situations where food is often consumed in a social setting (House, 2016), and due to the focus of this study it will take place in a natural setting which in this case means a school with other peers around. Moreover, the study will also assess the liking of dishes with edible insects. Using a mixed method approach and a primarily exploratory research design, this thesis will investigate and provide in-depth insights on Danish children's perception of edible insects and their sensory properties. Thus, the aim of this thesis is to acquire an understanding of children's perceptions surrounding edible insects, in order to identify potential opportunities and barriers that affect the introduction of edible insects.

In order to achieve this aim I therefore pose the following overarching research question:

How can barriers that hinder children in adopting edible insects be overcome?

I will operationalise this through the following sub research questions:

A survey will be used to assess **1) what dishes containing insects do children find (un)acceptable, after having tasted them?** While focus group discussions before and after tastings will explore **2) which factors influence the acceptance or rejection of edible insects?** As well as **3) how do these factors influence the acceptance or rejection of edible insects?**

1.6 Contribution to sustainability science

This thesis is situated within the field of sustainability science due to a number of reasons. The way humans interact with our ecosystems, in this case exemplified with an unsustainable consumption of meat is one of the greatest environmental problems of today (Steinfeld et al., 2006). The consumption and corresponding production pose serious problems not only locally but also globally and for present and future generations (Steinfeld et al., 2006). Because sustainability science deals “...with the interactions between natural and social systems, and with how those interactions affect the challenge of sustainability: meeting the needs of present and future generations ... and conserving the planet’s life support systems” (PNAS, n.d.) the current topic is relevant within the field of sustainability science. Sustainability science is problem-driven and solution-oriented while striving for a sustainable transition (Clark & Dickson, 2003; Kates, 2011), in line with these core principles, this study aspires to understand and illuminate the apparent resistance to the adoption of edible insects in the West in order to make diets more sustainable. Another important aspect in the context of sustainability science is interdisciplinarity (Jerneck et al., 2011; Kates et al., 2001). Our food choices are formed by a number of internal and external factors, therefore this study will draw on several disciplines, such as psychology and sociology, in order to understand children’s perceptions of edible insects, making it interdisciplinary.

1.7 Thesis structure

The following section will present the theoretical framework that discusses different factors affecting food consumption. In the methodology section I will describe my chosen methods, including focus group discussions, observation, and survey that were used in collecting data. Thematic analysis was used to analyse the qualitative data, while means were calculated for the hedonic ratings from the survey. Findings will be analysed and presented in the subsequent section and will be discussed

afterwards. I will end the paper with reflections on limitations, suggestions for future research, recommendations and a conclusion.

2 Theoretical framework

This section will briefly introduce four different psychological reasons to food rejections, namely inappropriateness, danger, disgust, and distaste. Afterwards, I will elaborate on rejections grounded in disgust and distaste and connect these reasons to the rejection of edible insects, because these reasons are arguably the most relevant ones.

2.1 Four psychological reasons to food rejections

The consumption of food and the importance of a nutritious diet in general is crucial for a well-functioning body and health. Yet, the type of food that is accepted or rejected depends on a myriad of external as well as internal factors. Rozin and Fallon (1980) propose three different psychological types of food rejections including distaste, danger, and disgust, while later introducing a fourth category, namely inappropriateness (Fallon & Rozin, 1983). The authors describe the categories in the following ways: I) distaste as the rejection of food based on a dislike of sensory properties; II) danger due to harmful consequences after ingestion; III) disgust owing to the knowledge of what a substance is or its origin (Fallon & Rozin, 1983; Rozin & Fallon, 1980); and lastly, IV) inappropriateness classified as inedible objects (Fallon & Rozin, 1983).

2.1.1 Disgust

Rozin and Fallon (1987) define disgust towards food as the “revulsion at the prospect of (oral) incorporation of an offensive object. The offensive objects are contaminants; that is, if they even briefly contact an acceptable food, they tend to render that food unacceptable” (p. 23). This means that an offensive substance is not only disgusting on its own, but also has the potential of contaminating other substances just by touching them, even if this contact is brief, and the thought of consumption invoke aversion. Angyal (1941) notes that this reaction of disgust is strengthened the closer in contact a person comes to the offensive substance and that oral incorporation is much worse than only touching it. Humans are omnivores and a number of products of animal origin is undoubtedly a common part of most people’s daily diet across cultures; however, it is simultaneously primarily food of animal origin that are considered disgusting (Angyal, 1941; Fallon & Rozin, 1983; Rozin & Fallon, 1980). Disgust towards specific animals seems to be dependent on cultures, for instance, in most Western cultures edible insects and dog meat arouse disgust (Martins & Pliner, 2005).

Although disgust shares similarities with distaste, they are different. First, while the rejection of a substance owing to bad taste occurs primarily in the mouth, the rejection of food due to disgust happens in various stages, namely prior ingestion, in the mouth, and in the body (Fallon & Rozin, 1983).

Secondly, negative sensory properties such as bad taste, smell, appearance, and texture play a central role in the rejection of substances due to distaste (Jones, 2000), thus it is difficult to reject a substance without close contact or actual ingestion. On the other hand, disgusting substances are primarily rejected due to contamination properties and ideational factors such as their nature and origin (Rozin & Fallon, 1987). Although disgust presumably emanates from and holds similar properties as distaste, the latter is often imagined (Rozin & Fallon, 1987). While these reasons for rejections seem to be the case regarding adults, it is different for younger children. Rozin and Fallon (1987) propose that while distaste is likely the only reason behind food rejections in newborns, danger and finally disgust appear later in childhood. For instance, the authors found that not until children reach the age of eight do they reject grasshoppers due to its nature (disgust), and not merely because of distaste or danger (Rozin & Fallon, 1987). Thus, suggesting that the rejection of food due to disgust is indeed learned and culturally dependent (Bodenheimer, 1951).

2.1.2 Distaste

As previously mentioned the liking or disliking of a food relates to the sensory properties of a substance, based on a multisensory process including the different senses taste, smell, feeling, and possibly sight and hearing (DeCosta, Møller, Frøst, & Olsen, 2017). There are five basic tastes: sweet, bitter, sour, salty, and umami. Evolutionary, the sense of taste was a matter of survival, because it aided people in differentiating between what substances were safe or unsafe to ingest. For instance, the tastes of sweet, salty, and umami indicated that a substance was high in nutrients, whereas a bitter or sour taste indicated that something was harmful to ingest (Ventura & Worobey, 2013). From birth humans have a preference for sweet (Cowart, 1981) and salt (Liem, 2017), while the liking of other tastes develops through experience and repeated exposure (Birch & Marlin, 1982; Pliner, 1982), suggesting that taste preferences are modifiable throughout life. Moreover, there is no doubt that the sensory quality of food plays a tremendous role in people's food choices, especially concerning children (Norton, Falciglia, & Ricketts, 2000), thus this should be prioritised when novel food is to be introduced into a new market.

2.2 The rejection of insects as food due to disgust and distaste

In Western cultures, the prospect of consuming edible insects often elicit disgust (Looy & Wood, 2006; Rozin & Fallon, 1987; Ruby et al., 2015), and is likely rejected due to their nature and origin as well as fear of contamination (Rozin & Fallon, 1980). Nevertheless, in order to overcome this disgust, it is important to understand what exactly it is people find disgusting regarding insects. Seemingly, it is only in certain situations that people find the ingestion of insects disgusting. For instance, many red-

coloured food products obtain their colour through crushed scale insects, which for many people do not discourage ingestion. Moreover, research assessing adults' preferences also suggests that people are more willing to eat food containing processed insects compared to whole insects (Hartmann et al., 2015; Ruby et al., 2015; Tucker 2014; Videbæk & Grunert, 2017), though without actually having tasted the products. However, experiments with actual tastings suggest a similar pattern (Caparros Megido et al., 2016; Tan et al., 2015). This tendency is, according to Angyal (1941), also experienced regarding meats in general, where food of animal origin is usually prepared so that the animal resemblance is minimised. It thus seems that regardless of what type of animal is consumed, people would rather not be reminded of its animalness. However, as proposed by Rozin and Fallon (1987) insects are seen as disgusting and *perceived* to lack sensory appeal. This means that people reject insects because they *believe* insects taste bad, though without actually having tasted them. Yet, edible insects are seen as tasty in many cultures (Ramos-Elorduy, 1997), hence it seems that this dislike of insects is indeed learned as suggested by Bodenheimer (1951). Although it is evident that disgust plays a central role in the rejecting of insects, the importance of positive sensory properties should not be disregarded (Deroy et al., 2015). This has also been suggested by other researchers both regarding actual willingness to consume insects (Hartmann et al., 2015; Tan et al., 2015; Tucker, 2014), but also concerning repeat consumption (House, 2016). Interestingly, the taste of insects differs greatly depending on species, developmental stage, sex, preparation method, and feed, and can taste as different as fish, apple, pumpkin, potato, caviar, and so forth (Ramos-Elorduy, 1998), hence regardless of individual likings, it would be surprising if their sensory properties were unable to satisfy anyone in the West. As mentioned earlier, apart from two studies (Caparros Megido et al., 2014; Looy & Wood, 2006), I have been unable to identify other research that has looked into children's perceptions of edible insects. As revealed previously, it seems that disgust towards foods develops later in life (Rozin & Fallon, 1987) and I have observed at several occasions that children seem to be more curious, interested as well as willing to eat insects, compared to adults. I thus believe that children should be given more attention regarding the matter, as they might be more susceptible for adaption. Moreover, it is important to understand children's perception of edible insects and how these are formed in order to overcome any potential barriers for acceptance.

3 Methodology

The following section briefly describes the ontological standpoint that this study departs from, continuing with an introduction to the participating schools and elaborating on the chosen methods and tools that I used to collect and analyse the data. I applied a mixed method approach where a survey was used complementary, while focus group discussions were the core component.

3.1 Philosophy of science

This study was situated within a critical realist perspective. Bhaskar (2008) describes three layers that together form reality: the *real*, the *actual* and the *empirical*. The *real* includes mechanisms that create opportunities for events. The *actual* is where events occur based on activated mechanisms from the *real*. The *empirical* refers to events that are experienced and observed. The *real* and the *actual* exist regardless of the observer, whereas the *empirical* is subjectively observed (Egholm, 2014). The individual can be mediated by outside mechanisms and the individual can in turn mediate those (Egholm, 2014), i.e. children's perception of edible insects can be mediated by outside mechanisms such as culture and peers. This thesis thus takes starting point in the *empirical*, while reflecting and drawing in theory on the *actual*. These phenomena can be uncovered through conversations, although in order to fully understand and explain the mechanisms at play interpretation and theory are necessary (Fletcher, 2016). Thus, the relevant concepts were elaborated upon in the previous section and will be combined with interpretations in the discussion.

3.2 Participating schools

I carried out the fieldwork on four public schools in Denmark in 2018. This amounted to five classes in total because two classes on one school participated. The course fitted into the subject home economics³ and was consequently part of regular class for sixth grade⁴ and thus obligatory for the pupils. See timeline and number of participants in Appendix A.

3.3 Lecture and cooking

The course consisted of a 90 minutes lecture and a subsequent cooking session that I held for each class. The pupils were introduced to topics such as a description of insects in general; usage of as well

³ In Denmark, the subject home economics [in Danish: Madkundskab], can be described as something that is practical and theoretical, because it combines the practical parts of cooking with experiences and knowledge regarding food, cooking, taste, health, meals, foodstuffs, and consumption (Danish Ministry of Education, 2018, p. 1)

⁴ In Denmark, pupils in sixth grade are usually between the age of 11-13

as disadvantages of insects; edible insects around the world; environmental and nutritional aspects of edible insects; and production methods of edible insects.

The cooking session occurred after the lecture and lasted around two hours. The choice of menu I decided upon in consultation with the teacher from the first school. While it was desired to have dishes that contained a variety of different types and shapes of insects, dishes also had to be manageable within the specific timeframe, in accordance with the competences of the pupils, and acceptable in general. The different dishes were purposefully not designed to represent direct alternatives to meals usually containing animal protein, but rather designed as samples acceptable in a classroom setting. Five different dishes were chosen and all recipes originated from or were inspired by recipes from Askov's (2017) cookbook *Insects on the menu*⁵ or from her website buglady.dk. Dishes included blended mealworms in a pimiento sauce, whole fried grasshoppers, banana muffins with insect flour (lesser mealworm or mealworm)⁶, blended wax moth larvae in mini omelettes, and egg salad with whole lesser mealworms on top (see Appendix B for recipes and corresponding images). As suggested by Deroy et al. (2015), insects are not necessarily supposed to be eaten on their own, I thus decided on using recipes where insects were incorporated in a dish – though with the exempt of whole grasshoppers. Cooking occurred in the school's kitchen and we divided the pupils into five small groups that cooked one dish each. All dishes were served as a buffet so everybody had the chance to taste the food they desired, thus tasting was voluntary. Although pupils were divided into smaller groups, all cooking took place within the same room so all had the opportunity to see how other dishes were created and upon arrival all insects were available for inspection, hence all pupils had an understanding of what the different dishes contained.

3.4 Participant observation

After each lecture and cooking session, I recorded my observations as field notes, which helped me in developing additional questions for the focus group discussions. For me to better recall, I took photographs of the dishes and pupils while eating. These observations proved useful for the discussions when participants were unable to recall the situation, thus aiding to their memory.

3.5 Questionnaire

To examine what dishes containing insects children found acceptable and their willingness to eat insects again I conducted a survey (Appendix C). Through 27 questions, the respondents were asked

⁵ The book is called "Insekter på menuen: Den nye trend i Europa" in Danish

⁶ At the first school, it was flour made from mealworm, but on the other schools it was from lesser mealworm. This change was due to the fact that I could not obtain the same flour throughout the study

to rate, if applicable, the five different dishes on an age appropriate five-point hedonic scale⁷ with verbal descriptors as suggested by Kroll (as cited in Lawless & Heymann, 2010). Moreover, the respondents were asked if they were willing to consume the dish again and subsequent discussions allowed me to acquire deeper insights. All pupils participating in the cooking session were asked to fill out the questionnaire. Completion of the questionnaire happened in class with either a teacher or I present. The children were instructed to do the survey individually and in order to prevent potential biases they were encouraged to ask questions if they were unclear about something. The respondents were promised anonymity.

3.6 Focus group discussions

A qualitative tool was required to obtain in-depth insights regarding factors influencing acceptance or rejection of edible insects. Focus group discussions are commonly used to gain an in-depth understanding of a topic and when looking for a plethora of perspectives and opinions (Krueger & Casey, 2015). I chose to use focus group discussions⁸ instead of one-to-one interviews, because children are likely more willing to open up in groups than on one-to-one interviews (Horner, 2000) and since it may seem less intimidating (Barbour, 2007). Because different factors leading to acceptance or rejection of foods are at play at the prospect of, during and after consumption of foods, I decided to have discussions before and after the course.

At some schools the teacher selected five pupils that voluntarily participated, while on another school pupils who wanted to partake were selected randomly through a lottery – the same five children participated in both discussions (Appendix D). All the participants stated that they consumed meat and 11 of the 26⁹ had tasted insects before. All groups consisted of a mixture of sexes, 11 were boys and 15 were girls. Inspired by Krueger and Casey (2015) two semi-structured interview guides (Appendix E and F) were developed to cover specific questions related to my research questions. These guides each consisted of several phases (Table 1).

⁷ This scale is commonly used to measure the appeal of a dish and provides information regarding the degree of dis(liking) (Lawless & Heymann, 2010)

⁸ Henceforth I will, when referring to focus group discussions primarily use the term discussions only

⁹ It did not add up to exactly 25 children, because at one school, one girl only participated in the pre-discussion and for the post-discussion a different girl participated

Table 1. Phases of the two discussions (Own illustration, 2018).

	Interview guide <i>before</i> course	Interview guide <i>after</i> course
Phase 1	Introduction including an explanation of the purpose of the discussion and rules	
Phase 2	Opening questions where the participants were invited to state their name, age, and favourite dish	Opening questions where the participants were invited to state their name, age, and what dish they cooked
Phase 3	Introductory questions asking them if they had or had not tasted insects as well as what they thought about it	Introductory questions asking them to talk about whether some of the things they had experienced in the course could get them to consume or not consume insects again
Phase 4	Transition questions where they were asked to talk about reasons to consume or not consume insects and encouraged to talk about insect eating in general	Transition questions where they were encouraged to talk about insect eating in general
Phase 5	Key questions where each dish was discussed and the participants were asked their willingness to taste the dish and why or why not	Key questions where each dish was discussed and the participants were asked their willingness to taste the food again and why or why not
Phase 6	Ending phase that included a short summary and they were encouraged to add anything they believed I had missed	More key questions included questions on why and how they would be willing to consume insects again
Phase 7		Ending phase that included a short summary and they were encouraged to add anything they believed I had missed

While the number of questions were limited, probes were used throughout the discussions to have the participants elaborate on their answers in more depth, to follow up on interesting elements or when I did not fully understand their answers.

I used a variety of tools in the discussions. Firstly, images of the five dishes¹⁰ were used during evaluation of these (phase 5, both discussions) (Appendix B). Furthermore, to spur the conversation and imagination of the participants images of people eating different insects were used in phase 5 (before course) or 4 (after course). Additionally, because the attention span of children can be limited and to assure engagement (Krueger & Casey, 2015) as well as avoiding change in opinions and thus reduce social desirability bias (Barbour, 2007) each participant was given a response booklet (Appendix G and H) to write down certain answers and used as a basis for further discussion in plenum.

Conducting focus group discussions with children requires a different set-up than with adults, as their attention span is often shorter and it can become messy with many participants (Krueger & Casey, 2015), I therefore decided to keep the discussion to a maximum of approximately one hour, with fewer questions and with only five children. Moreover, to avoid memory-problems (Krueger & Casey, 2015), yet to assure that the participants had time to reflect on the course, the discussions took place rather soon afterwards. The discussions were audio-recorded.

¹⁰ These images were the ones from the recipes

3.7 Ethical considerations

Prior to the course each pupil (and home) was given a consent form informing them about the course, activities that were obligatory (i.e. lecture and cooking session) and optional (i.e. the consumption of insects, filling in the questionnaire, and participating in the discussions) as well as allergens regarding edible insects. Because this involved minors, written consent from the home as well as the pupil were required. A few pupils failed to return the form in time, and oral consent via telephone was given to the teacher instead. I distributed two different consent forms, one form for the pupils that were only going to fill in the questionnaire (Appendix I) and another form for the pupils that were going to fill in the questionnaire and participate in the discussions (Appendix J).

3.8 Reflexivity

As this study was primarily qualitative and thus subjective by nature (Bryman, 2016) and the fact that I was deeply involved in the whole process inevitably influenced how the whole study evolved (Horsburgh, 2003), it is therefore important that I explicitly identify some aspects that may have impacted the process and outcome. When I embarked on this journey I was intrigued by the fact that some people find edible insects to be disgusting and rejecting them on that matter, while others accept them saying they taste fine. In the beginning of this thesis, I shared the same feelings as the former, while towards the end I leaned more towards the latter. I assume that my change in perception likely occurred because I actively engaged in all five tasting sessions. Thus, pushing by own limits a bit further each time. This journey therefore broadened my horizon and made me view edible insects through two different lenses, which aided to the whole process of conducting this study.

I also recognise that doing research with and trying to understand children as an adult can be challenging, due to issues such as unequal power relations and different language use (Curtin, 2001), which I tried to overcome in the following ways. The interaction with the children throughout the course helped me establish a friendly relationship with the participants. By creating a relaxed, fun, respectful, and friendly atmosphere (Kawulich, 2005; Krueger & Casey, 2015) I hope it encouraged the children to share their honest opinions on the topic. To reduce miscommunication I tested all questions on two children younger than the target group prior data collection. However, I acknowledge that these measures will inevitably not completely eradicate the aforementioned issues.

3.9 Data analysis

Given a mixed method approach, I used different strategies to analyse the data separately.

3.9.1 Focus group discussions

Inspired by Krueger & Casey (2015), I transcribed each discussion shortly after it had taken place, in case changes had to be made to the interview guide to the following discussion. I performed an abridged transcription based on the audio recordings of the discussions, where conversations that deviated from the topic were omitted.

I used thematic analysis to analyse and identify most salient themes. The data was analysed in NVivo 12 Plus. Braun and Clarke (2006) describe thematic analysis as “a method for identifying, analysing and reporting patterns (themes) within data” (p. 79). Inspired by the same authors this analysis consisted of a six-phase iterative and systematic process that included: I) becoming familiar with the data, which I did through thorough transcriptions, reading the datasets several times and taking notes. II) code generation, where I created and attached labels to interesting and relevant extracts. In order to enhance coding, this was performed while listening to the recording. III) theme construction, where I organised each code into a meaningful and potential theme. IV) reviewing potential themes, where I ensured that each coded extract did indeed match the actual theme. V) defining and naming themes, which I did by describing and naming each theme conforming to the content. VI) final write up, where I transformed everything into a final paper drawing on my own empirical data while zooming out and bringing in other studies and theory in order to answer my research questions. Pseudonyms were given for each participant. I analysed data from pre- and post-focus group discussions separately. Moreover, I only translated quotes and excerpts used in this paper into English.

As acknowledged by Braun and Clarke (2006) it is impossible to disregard completely ones theoretical framework and due to the nature of my research, I did not follow a strict inductive or deductive approach to my analysis. This meant that throughout the analysis, I had my initial research questions and theoretical framework in the back of my mind, meaning that the themes materialised not only inductively through my data, but also deductively. Therefore, I approached my data with an open mind, thus I did not disregard interesting and relevant elements, yet my research questions guided me throughout. The findings will be presented descriptively and analytically while, in line with critical realism, I draw on theory to interpret and explain the participants’ utterances in the discussion section.

3.9.2 Questionnaire

Responses from the hedonic rating scale were assigned numbers (1-5), e.g. the response “super bad” = 1. I calculated the mean scores separately for the five evaluated dishes based on the hedonic rating scale and percentages were calculated for the respondents’ willingness to try the dish again.

4 Analysis and findings

In this thesis I set out to investigate factors that influence children in the rejection or acceptance of edible insects before, during and after tastings and to assess if children find dishes with edible insects acceptable. This section will start by presenting the analysis and findings from the pre-focus group discussion, proceed with the post-focus group discussion and end with the results of the survey.

When analysing the empirical data it became apparent that reasons for rejection or acceptance were complex and in many regards intertwined. Thus, when reading this section, the following should be considered: the term rejection involves factors that were articulated negatively, yet it does not mean that insects were *completely* rejected due to those factors, as other factors may overrule. For instance, participants might have found some insects dirty, yet curiosity meant they would still taste them. The term mixed encompasses themes that can fit within both rejection as well as acceptance. For example, the theme “appearance of the insect” covers the subtheme “size of the insect”, because it could either be rejected (large insect) or accepted (small insect). Furthermore, placing a theme under rejection does not mean that all participants were in agreement, yet it was placed there primarily because most of the participants articulated it in that regard. Therefore, the three factor types can provide a quick overview.

4.1 Pre-focus group discussion

When analysing the data from the pre-focus group discussions I identified eight central themes and five subthemes (Figure 1).

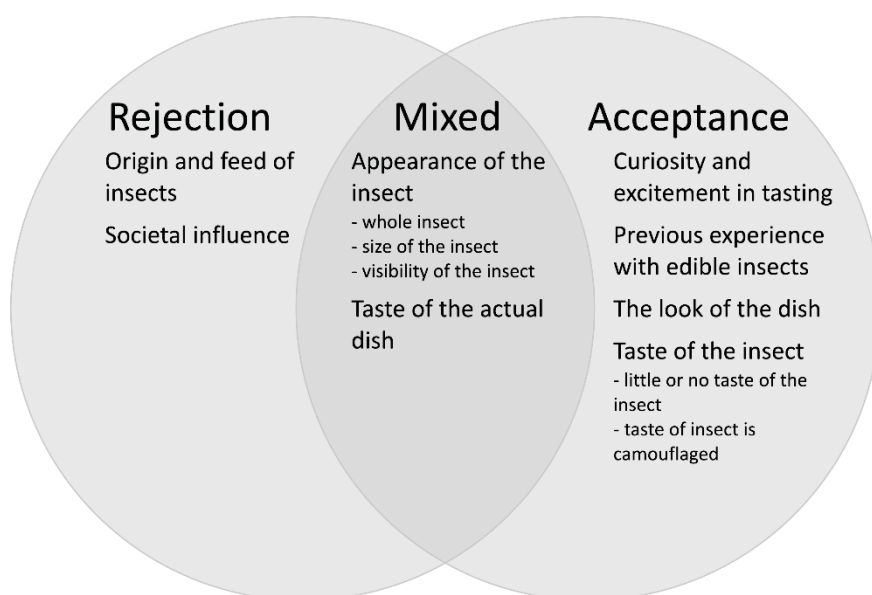


Figure 1. Themes and subthemes identified from pre-focus group discussions. A total of eight themes and five subthemes divided into either rejection, mixed, or acceptance (Own illustration, 2018).

4.1.1 Themes related to rejection

Origin and feed of insects

Some of the participants found the thought of eating insects unappealing because of their habitat and feed. For instance, because insects originate from nature they were believed to be unclean and dirty and they should be thoroughly cleaned and cooked before eating. Anna explained “they crawl under the soil and in the forest and such places” and another said “you don’t know where they have been ... and then you put it in your mouth” (Luna). However, another noted that “as long as they are washed then it’s okay,... [otherwise] it would almost be the same as eating fried soil” (Oscar), a statement others agreed with. Furthermore, some of the participants were worried about what they had eaten in nature as exemplified by “isn’t it them [insects] that tend to sit on animals when they are dead. Birds ... If a bird is dead or something and they [insects] sit on them [and eat]” (Freja).

Societal influence

For some, the rejection of insects is also rooted in influences from media and peers. Some of the participants had for instance watched TV shows where insects had been portrayed to taste bad, which then led the participants to think they were disgusting. As Agnes described “I don’t think it is the most delicious, also because I have seen some programmes where they [people] eat those insects and they say it doesn’t taste very nice”. For another, the rejection was due to negative experiences with insects when she was younger, something that had haunted her for years and still made her scared of insects, meaning that she would not eat any. Ida explained:

I’m actually scared of most insects ... whether they are alive or dead I’m still afraid of them ... I have experienced sometimes in kindergarten that they [other kids] would tease me with the fact that I disliked insects ... And they would take insects and put them under my blouse and stuff.

Even during the discussion, a negative articulation of insects could shape the perception of others in a negative way, as this excerpt shows when talking about a whole grasshopper:

Agnes: “I think, then it becomes a bit more disgusting, compared to if there had been no head [on it], because I imagine that the eyes will splash out, and what is inside, I don’t think that is so delicious, but”

Elliot interrupted: “Thanks for ruining it, Agnes!”

Oliver: “Agnes!!!!”.

Clearly indicating that if insects are articulated negatively, whether it is in the media or among peers, it influences the perception of others.

4.1.2 Themes related to rejection and acceptance (mixed)

Appearance of the insect

I identified three subthemes under the theme “appearance of the insect”; namely “whole insect”, “size of the insect”, and “visibility of the insect”. The subtheme “whole insect” comprises perceptions regarding the thought of eating a whole insect, which many of the participants were appalled by. This was especially evident when discussing grasshoppers where some believed it to be particularly unappetising, because of features such as eyes, teeth, head, and legs. As described by two participants:

Alfred: “I also think it would be really disgusting to eat a head ... of a grasshopper ... Because when you look at its eyes”

Laura: “Yaiks!”

Alfred: “Its eyes and everything ... when you look at it, if I eat that, WHAT do I then eat?”

Laura: “Its brain cells!”.

Although the thought of eating a whole grasshopper was appalling to many, some believed it to be more delicious and easier to eat if head and legs had been removed. As Oliver explained “when there are no legs [on the grasshopper] ... I think it will become really really delicious”. Likewise, Victor drew parallels to larvae that he found easier to eat than grasshoppers because “[if there were no legs on it] then there really wouldn’t be much to it, it would almost be the same as mealworms ... it doesn’t really have any legs that you can see”. Yet, it was not only a matter of eating whole insects. The “size of the insect” also played a role. For the majority of the participants it seemed better to eat smaller insects compared to larger ones because it would be easier and more appetising to eat, as Oliver explained “because they are so small [lesser mealworms], I don’t think it is that hard [to eat]”. Moreover, smaller insects were also preferred because they would be quicker to eat and if they were liked it may even open up for opportunities to try larger insects as Oscar noted “I think, then it’s over quickly, and then you tasted it, and then you know whether you like it ... [if it tastes good] then you can eat a big one”. However, larger insects seem to be more daunting because they need to be chewed more and their internal parts are more pronounced making it unpleasant. Victor described when discussing a large larvae “well it is because it is so big and thick and then you really think about its insides and such, and then having to chew it, that is a little [disgusting]”. Similarly, Valdemar explained:

It is just that it's so big. The others you can probably hardly taste because they are so small, or feel in your mouth, the big one you can feel all the way through [your body] when you swallow it and in your stomach.

This also speaks to the fact that the participants believe that the larger an insect is the more you can also actually feel it in your whole system. In prolongation to this, the "visibility of the insect" also was of importance, where many of the participants found it difficult to eat a dish with visible insects and that it would be better if they were hidden inside a dish or even blended completely. As Agnes explained when discussing the egg salad "those larvae don't look so nice when they are on top [of the egg salad] ... that you KNOW you eat the insect". Oliver took it even further stating that it would be better if they were completely invisible:

I think it would be worse if it was mixed [into the egg salad], without being blended, because then you don't know "when have I eaten it, when have I not" and then you become scared of every bite you take.

For most of the participants, resistance decreased the less visible the insect was, something that was especially noteworthy when discussing muffins with insect flour that several believed would be the easiest to eat, as Karla explained "because there are no whole [worms] ... and it is just flour, I'll find it easy to eat". Yet, by concealing the grasshoppers a bit by adding seeds made them more acceptable, as noted by Oliver "by adding sesame seeds you can see it even less, and that makes it even easier [to eat]". This clearly shows that concealing the insects makes consumption easier.

Taste of the actual dish

The actual dish that the insects were part of was important when evaluating dishes. For instance, if the insect was incorporated in a dish that was known and liked, it was expected to taste good regardless of the insect. It was repeatedly discussed how they liked or disliked a dish due to other ingredients. For example, as Elliot put it "I have said [it tastes] super good ... [and] I really wanna taste it and I really like eggs", Elliot completely ignores the larvae on top, because the way he sees it, it has to taste good because he likes the dish. Similarly, others believed that "because it is muffins and muffins taste super good" (Frederik) and "I think it tastes super good because ... if it [the grasshopper] is fried in chili and such, I love chili, and those seeds ... I think that will taste good together" (Laura), meaning that if they liked the other ingredients or the actual dish it had to taste nice irrespective of the insect within. In continuation to this, Noah also stated that it would be better to have the insect incorporated in something recognisable and without it being too weird:

I don't think it should be exaggerated ... because ... when they make it with gross flavour or weird flavour. I just think that to begin with, that it should be more normal food and not ... make something weird, that people don't want to buy ... and not where you make a whole new dish with them [insects]. That you have not heard about and is really weird.

The opposite was evident when other ingredients or the actual dish was disliked as explained by Elliot "I'm not the biggest fan of banana muffins [so I think it tastes bad]".

4.1.3 Themes related to acceptance

Curiosity and excitement in tasting

Several of the participants expressed curiosity and excitement regarding the upcoming cooking and tasting of insects, something that was especially rooted in the fact that they looked forward to trying something new, unusual, and different. Freja stated "I'm looking forward to what we will cook, I think it sounds really interesting", while Agnes thought it would be "hilarious to eat something from nature, something I find pretty funny". Oliver's excitement was also related to an environmental concern, something that was rarely expressed in any of the discussions. Oliver explained "I think it sounds interesting and I will actually like to try it, also because I know that if you cultivate that [insects] instead of cows ... you can spare the Earth from many production-things". Another participant was also interested in acquiring an understanding of how edible insects could be used in cooking, as Noah articulated "which ones can you eat ... [and] what do you do with them".

Previous experience with edible insects

Prior experience with edible insects played a positive role in how the participants perceived the prospect of future tastings. Both regarding expected liking of an already tasted insect, but also concerning unknown insects as explained by Elliot "I think it will taste good because I have already tasted mealworms, so I look forward to tasting other insects". Remarkably, none of the participants who had tasted insects before articulated it in a negative way; on the contrary, they often regarded it as tasty or with no flavour leading to an expected liking of other dishes containing an already tasted insect. For example, Frida said "mealworms don't taste that bad, so I think it [pimiento] could [taste good]" and Laura stated "I've had a hamster that ate those small mealworms and then I tried one, and it was just like eating a very small crisp and it didn't really have a flavour, so [I think it [pimiento] will taste good]".

The look of the dish

For several participants it was a matter of how the dish was presented, but also whether the dish looked familiar. For instance, if a dish was nicely presented in the image it also would be expected to taste great as explained by Alfred “I think it looks like Danish meatballs¹¹ ... and they look extremely nice ... I really would like to taste them”. Yet, it was also connected to the subtheme “visibility of the insect” because when the insect was hidden it looked like regular food. As Alma put it “I just think it looks like regular omelettes and I just think it looks good ... when you see it, you don’t really think that there are wax moth larvae in [so it must taste really nice]”. Similarly, Aksel also believed that “it looks like normal banana muffins, so you wouldn’t think about the insects that are in there”. Nevertheless, for others it did not matter if worms were visible on the egg salad, as long as the dish itself looked appetising as Frederik stated “that tastes super good ... because it looks really delicious”. It therefore seems that for several of the participants the presentation of the food plays a key role in acceptance regardless of whether the insect is visible or not.

Taste of the insect

For several of the participants it was important that the taste of the insect was not overly pronounced, a belief that led to an expected liking of an insect or dish. I identified two subthemes namely “little or no taste of the insect” and “taste of the insect is camouflaged” under this theme. The former encompasses beliefs about how an insect has no taste since it is in the form of flour as explained by Agnes “I have said [it will taste] good, because I don’t think the flour is gonna make much of a difference, so I just think it will taste similar to banana muffins”. Yet it also covers beliefs about how a small insect has no taste, as illustrated with a statement from Victor when talking about the egg salad “that sounds delicious ... I guess you can’t taste it [lesser mealworms] that much, because most small things you don’t taste that much”. The latter subtheme includes beliefs about how the taste of the insect is camouflaged when part of a dish, yet also that it is better to have the insect with something else than on its own. This indicates that insects should not be served on their own, not only due to the insect’s appearance, but also because of its potential flavour. As Luna described it “I think it’s okay, because I don’t really think you can taste them, since there is so much else with them [egg salad and rye bread]”.

¹¹ In Danish: frikadeller

4.2 Post-focus group discussion

A total of six themes and four subthemes were identified when analysing the data from the post-focus group discussions (Figure 2).

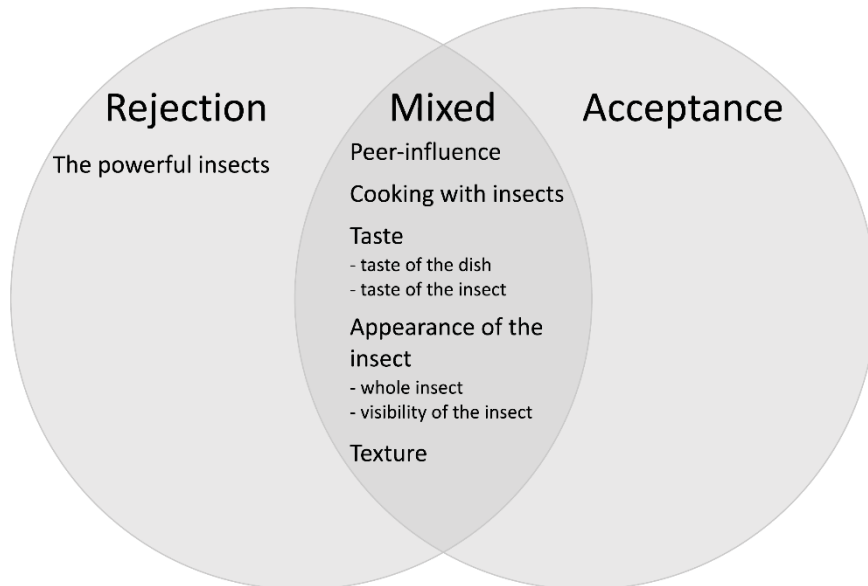


Figure 2. Themes and subthemes identified from post-focus group discussions. A total of six themes and four subthemes divided into either rejection or mixed (Own illustration, 2018).

4.2.1 Themes related to rejection

The powerful insects

For some of the participants the thought of the insects beat everything else, even if they liked the taste or the looks of the food, the actual thought of the insects within the dish made them reject the food. It did not necessarily mean that they did not taste the food during tastings, but they seemed unwilling to consume it again. For some it had been impossible to enjoy the food, since the thought of the insect had been so powerful. Interestingly, for some, grounded or blended insects did not increase likings whatsoever as expressed by two participants: "I actually don't think it [pimiento] tasted of anything, but when you knew it had worms in it, then I just did not feel like eating it again" (Laura), and "when you saw them [omelettes], you just think "mmm they look delicious", but when you think "fuck there are worms in it" [then I don't like it]" (Alfred). Frederik disliked the thought of insect flour greatly, because it reminded him of Indianmeal moth sometimes found in regular flour. Yet he still ate five muffins, because as he explained "it was because I found out they tasted good", however, in the future he would rather have regular ones without insect flour because of the aforementioned reason. The thought of insects in the food is thus very powerful, and easily overshadows a potential nice taste. Moreover, Anna explained that she believed the whole thought of eating edible insects had actually

worsened after the tastings because she sensed that it was crawling within her, especially regarding the whole grasshopper:

I still don't think they look so nice ... I actually think it [now] becomes a little bit more disgusting ... the thought of having touched them and eaten them, and that there might be one like that inside your stomach [that is disgusting].

4.2.2 Themes related to rejection and acceptance (mixed)

Peer-influence

Cooking and eating food with insects together with peers also played a role, in some cases negative, and in other cases positive. I observed that, common for all classes was that all of the muffins were eaten. This also meant that the children often had to be quick if they changed their mind and decided to taste after all, something Freja noticed "when we came back and said that some of the things, in particular the muffins, tasted good, then they also would have liked to have tasted". Clearly indicating that if others said something tasted nice, then others would also have liked to try. Similarly, if peers were eating, it made others decide to taste as well, as pointed out by Oscar "I was just so hungry, and then I saw everybody else starting to eat and then I also tried". Cooking and eating with peers could also be negative. Something that was especially evident at one school where grasshoppers were articulated negatively, resulting in the rejection by others, despite a liking for the taste:

Anna: "It was Benjamin and Thor's fault, that we didn't eat them [grasshoppers]"

Olivia: "yes! It was hyped too much that they were disgusting"

Anna: "yes, then we couldn't really eat them because"

Noah interrupted: "they kept talking about how when you take a bite then you would get as well all that's inside it"

Olivia continued: "guts"

Anna: "and then you felt pretty sick"

Olivia agreed: "yes"

Anna: "but the taste was good ... I believe, if they had not said that, I could have eaten more".

Similarly, if others felt sick it could be transferred to others as Anton explained "well Esther,... she nearly puked, I think ... and that gave me sort of a nausea-feeling".

Cooking with insects

For a few participants it played a role that they cooked the food themselves, both positively and negatively. For some, it was a matter of safety, especially concerning the grasshoppers' legs that had to be removed before cooking. Some girls explained that they were pleased that they had been the ones in charge of that, so they did not have to worry about it not being done correctly:

Olivia: "Well I actually liked more that it was us who had made it, since, with the grasshoppers and if those legs were still on"

Anna continued: "they could get stuck ... That was not a nice thought"

Olivia: "no, so I find it better if you do it yourself, then it is, you are probably a bit more thorough".

However, the actual cooking was also experienced negatively by others and for some it had been disgusting to experience how insects had been handled. For instance, Alma disliked the omelettes because she had seen how they were prepared "I tasted them ... they tasted bad because when I saw them [wax moth larvae] being blended, I can't, that was not really me ... I don't want to taste them again". For Frederik, who had been in charge of the blending, it had also been rather disgusting, as he explained "that was really gross, I thought of all the insides that came out ... and it stank".

Taste

The actual taste was of major importance for many participants and I identified two subthemes under this theme namely "taste of the dish" and "taste of the insect". They are somewhat related, because many of the participants found it difficult to know what exactly it was they dis(liked) in a particular dish. The subtheme "taste of the dish" encompasses a general liking or disliking of the actual taste of a dish. For many it was seen positively that it tasted as it would, had it been a dish without insects, as stated by Freja "[I think they [muffins] tasted good] ... they tasted pretty normal". A statement several others agreed with. The muffins were particularly liked and because they tasted good, the participants wanted to try them again "I tasted them and they tasted really super good and I really want to taste them again ... you couldn't taste that there were [insects in them]" (Karla). While Anton also thought they were good "because they tasted sweet". Irrespective of the insects within, it often came up in the discussions that some were unhappy about others eating more than one muffin:

Anton: "Arthur got three"

...

Elliot: "I also only got one"

Agnes: "Why did he get three?"

...

Oliver: "THAT IS NOT OKAY!!!"

Anton: "Unfair!".

Generally, the dishes were accepted just because of their taste as stated by Oliver "everything else but the grasshoppers was actually really easy to eat even if you knew what was in it, it tasted really really great". This statement indicates that for some, it did not matter if a dish had insects in it, as long as the taste was good. While several liked the taste of a dish, it was the opposite for others, which led to rejection. For example, in Valdemar's case it was evident that it was actually not the taste of the insect he disliked, but the actual dish it was incorporated in "[it tasted bad, because] I don't like eggs ... [the worms] tasted fine though". A dislike of the dish the insect was incorporated in was repeatedly discussed, due to a dislike of for example "too much salt" (Anton), "chili sauce" (Olivia), and "soy sauce" (Freja). It was generally difficult for the participants to explain let alone know whether it was the actual dish or the insect that they disliked as Oliver expressed "it might be that it was an insect [that I disliked it], because I liked the sesame seeds [and the marinade] ... so it might be that grasshoppers are just gross, I don't know". Since Oliver liked all other ingredients, he thought it might be the actual taste of the grasshopper that he disliked. This statement brings me to the subtheme "taste of the insect", which led to rejection or acceptance. The majority of the participants disliked the grasshoppers and Agnes found them to "[have] a weird taste ... in the beginning I thought they tasted of chicken and then I think it became a fish-taste", while Anton thought they "tasted SERIOUSLY disgusting" although he acknowledged that it was also due to the "soy-taste ... [and] that it was really soft". In general, most participants were unwilling to eat them in the future because they disliked them so much, as explained by Alfred "[I tasted them], they tasted really bad ... [and] I NEVER WANNA TASTE THEM AGAIN ... I spat it out on the plate". Victor continued:

I simply thought they tasted so bad, that I had to go to the toilet and get it out of my mouth ... and rinsed my mouth with a glass of water ... [because] of the actual grasshopper [and not the taste of the other ingredients].

During tastings, I did not observe this to be the case with other insects, it seemed particularly evident regarding grasshoppers. At one school, a teacher told me that a pupil had vomited after eating a fried grasshopper. However, it is unclear whether this had to do with its actual taste, but I find it remarkable how negatively the grasshopper was perceived. Yet, a few participants found them to "taste good" (Josefine). In contrast to the grasshopper, several found worms acceptable on their own because they either "tasted of nothing" (Victor) or "tasted of crisps" (Agnes), even the visible worms on top of the egg salad was fine because "they tasted of nothing" (Anton). Few participants indeed found it

disappointing that the larvae on the egg salad had been tasteless and that it would have been better if they had had a more profound taste, as Elliot explained “the lesser mealworms they could have had a stronger curry, you could hardly taste them”.

Appearance of the insect

Similar to the pre-discussion, “appearance of the insect” also played a role regarding actual tastings and I identified two recurrent subthemes: “whole insect” and “visibility of the insect”. Although, the subthemes are considerably related, I have for clarity divided them into two different ones, yet also because I to a certain degree find them different. For several it played no role to eat grounded or blended insects, even though they had once been whole. Ida, who in the pre-discussion had proclaimed that she was not going to eat any food with insects, surprisingly ate and enjoyed muffins and omelettes. When talking about why she had changed her mind she explained that it was because they had “looked the nicest ... [and because the insects had not been] whole ... [which if they had been, I would have] ... run away screaming” (Ida). Several also suggested that the reason the muffins had been so popular was likely also because it had been flour and not whole insects, because it “would be weird if sometimes there is something sticking out” (Josefine). For some, it had been appalling to eat whole insects, because of how they looked yet also because of the thought of what was inside them, hence very similar to the pre-discussion. It seemed evident that the participants did not want to be reminded of how an insect had once been a living creature with their “eyes” (Alma) and “their faces” (Freja). For some this meant that they rejected the grasshoppers without tasting them. The internal parts were also still problematic as described by Oliver “It was pretty difficult to eat the head,... because it looked the way it did ... I now think of that splash that comes when you eat the head, was probably the brain”. The latter subtheme “visibility of the insect”, could act as a motivation and a barrier. For example, if the insect was in the form of flour then some participants seemed indifferent, almost as if they forgot that there were in fact insects within a dish – just not visible ones. As explained by two participants:

Alfred: “The banana muffins were eaten fast, it was probably also because you didn’t think about the worms that was in them”

Alberte added: “it is just worm flour”.

It was repeatedly mentioned that it was much better when insects were invisible, as Agnes explained:

I think it was nice that it was blended, and that it wasn’t just made with the larvae on top ... when the larvae are on top [egg salad] it wasn’t that nice, when you can see them, although you could not taste them at all.

Agnes would have liked them to be inside the egg salad so she could not see them. Especially the grasshoppers were rejected because they were too visible, as Freja stated “you could see them”.

Texture

The consistency of the insect played an important role; most found soft insects unappetising, whereas the opposite was evident when it was crispy. This was especially evident concerning the grasshoppers. Although Josefine liked the flavour of the grasshopper, she disliked the texture “I thought it was a little strange, when you bit in them, then inside it you could feel some sort of slimy stuff”. It was evident through commentary from several children that if the grasshopper had instead been crispy, it would have increased the liking of the texture. A crispy insect was appealing for several, for some because it reminded them of crisps, as expressed by Oliver “I think they [mealworms] tasted like crisps, they were nicely roasted or crispy”.

4.3 Questionnaire

A total of 85 children completed the survey, three responses were omitted due to a failure in answering all questions correctly, thus amounting to 82. Of these, 42 were boys, and 40 were girls and the average age was 12. All respondents stated that they consumed meat and 32 stated that they had tried eating insects before. Figure 3 shows the mean scores of liking for the five dishes that were cooked and tasted. As depicted in the figure, with a mean score of just over four, it is evident that especially the muffins were appealing for many. The egg salad and the omelettes with scores of 3.6 and 3.3, respectively, were also liked. With a mean score of 2.9, the pimiento was rated somewhat neutrally, whereas with a score of 2.2 the grasshoppers were the least liked. Something that was particularly evident among reasons given for *not* tasting a dish in the open-ended questions, was that the actual dish the insect was incorporated in was disliked (n=6), apart from the egg salad this reason seemed unimportant regarding the other dishes.

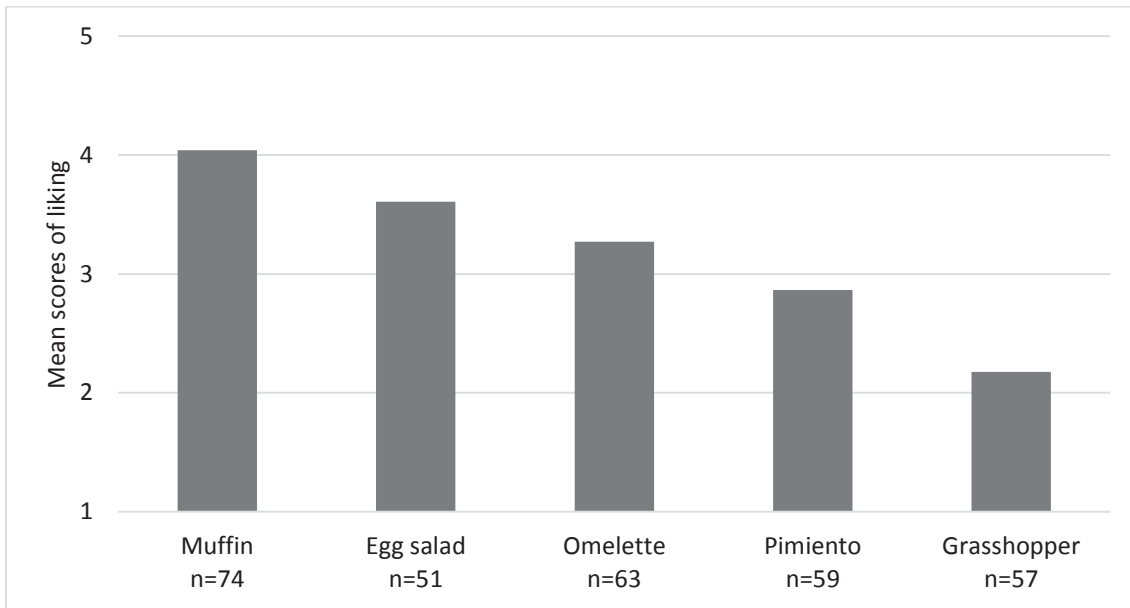


Figure 3. Mean scores of liking. Mean scores for all five dishes evaluated after tastings. The letter n indicates how many children tasted and evaluated the dish of a total of 82 children (Own illustration, 2018).

The respondents were also asked to state their willingness to taste the particular dish again. As seen in Figure 4, 55% stated that they would like to taste the muffins again, which was similar to the egg salad, yet only 27% wanted to taste the omelettes again, and even less wanted to taste the pimiento (22%) and grasshoppers (11%). However, it is also evident that many were unsure about whether they wanted to taste the dishes again, particularly concerning the omelettes and pimiento.

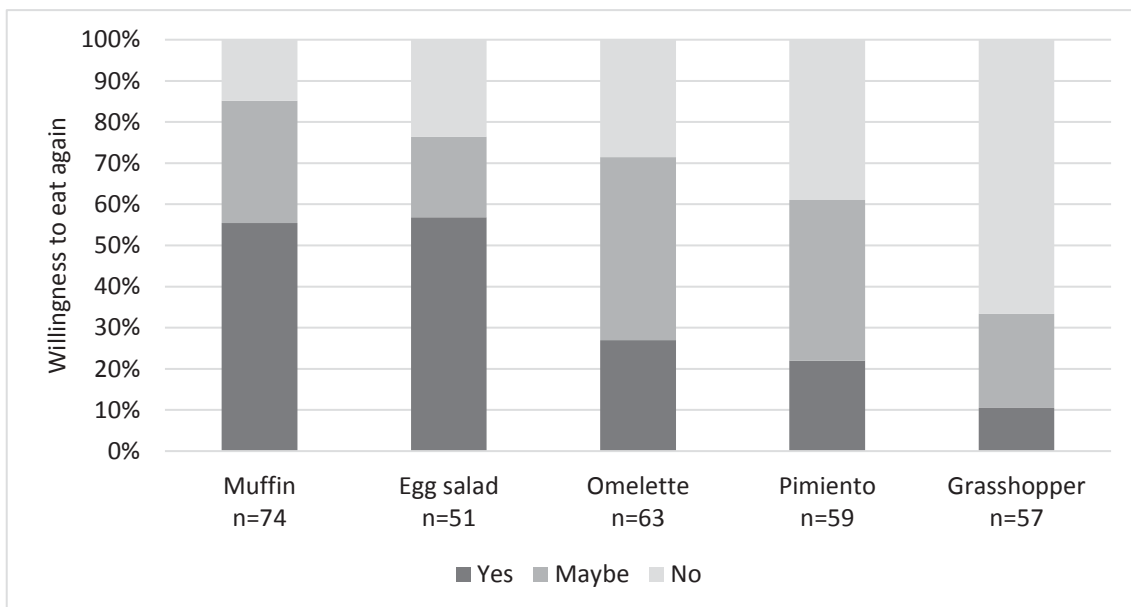


Figure 4. Willingness to eat again. This figure shows in percentages the number of children who would like (*yes*), who would maybe (*maybe*) or who would not like (*no*) to taste the dish again (Own illustration, 2018).

4.4 Summary

The findings of the analysis suggest that a number of factors play a role concerning children's perception of edible insects, yet also that there are different factors at play whether it is at the prospect of consuming edible insects, during, or after tastings. While some factors, for instance the appearance of an insect and the influence of peers can cause either rejection or acceptance, other factors such as beliefs about insects having little taste and prior experience with edible insects were seen as positive factors. The analysis proposes that the factors are somewhat interconnected and albeit taste played a tremendous role, the actual thought of the insect still led to rejection for some.

5 Discussion

This study set out to explore factors affecting children's perception of edible insects and the analysis revealed a multitude of factors. This section will present a discussion based on the analysis in order to answer the research questions. I will also bring forth recommendations on how to overcome existing barriers for this age group, as well as reflect on limitations and suggest a path for future research in this area.

5.1 A misconception of edible insects

The pre-discussion revealed an uneasiness about the habitat and feed of insects, where some found it appalling that edible insects originate from nature and feed on dead animals, a finding that does not appear to be the case regarding adults. This is a somewhat unexpected and interesting finding because it is rooted in a misunderstanding of the origin of edible insects and their feed. A misunderstanding that likely leads to a disgust towards insects and thus rejection, based on what Rozin and Fallon (1980) refer to as an ideational factor i.e. because of an insect's origin it is viewed with disgust. However, while it is correct that certain insects, for instance the lesser mealworm, feeds on dead animals in nature (Falomo, 1986, as cited in Dunford & Kaufman, 2007), it is inaccurate that edible insects sold in Denmark have been fed with dead animals. In fact, edible insects found on the Danish market are only fed plants (M. Engell¹², personal communication, December 28, 2018). Despite this mistaken belief leading to an apprehension of eating insects, it is interesting that certain seafood, such as crabs and lobsters, consumed in Denmark do indeed feed on dead animals, which people seem indifferent about. Moreover, the perception of edible insects as disgusting because of their habitat is likewise misinformed, because the ones sold in Denmark do not stem from nature, but factories (M. Engell, personal communication, December 28, 2018). This argument is interesting considering it is often desired that traditional animals are free-range and have the opportunity to be outside, in nature. Why is it considered disgusting that insects have been living in soil, while it is not disgusting that pigs root in the ground with their noses and take mudbaths? Regardless, since this apprehension is rooted in a lack of knowledge, it can possibly be overcome by providing information on the difference between insects stemming from factories and nature.

¹² Engell is marketing manager at the Danish company Kalu that imports and sells foods on the Danish market, which includes edible insects farmed in Belgium

5.2 A nuanced articulation of edible insects

This study suggests that children's perception of and willingness to eat edible insects is to a certain extent shaped by external influences such as peers and the media, leading to either rejection or acceptance. Research on other foods examining the influence from peers has arrived at similar conclusions (Andersen et al., 2016; Greenhalgh et al., 2009), while similar patterns seem to be apparent regarding adults and edible insects (Tan et al., 2015). Other people act as motivators for action and through interaction it is likely that people will change their behaviour, a phenomenon known as social influence (Kelman, 1958). This can explain why the children in this study either accepted or rejected edible insects. However, because the articulation of edible insects among peers play a central role in shaping opinions and behaviours, it would be beneficial to strive towards a more positive articulation of insects. This would likely be difficult under certain circumstances, because children respond as they do when they are exposed to for instance edible insects: if they do not like it, they say it aloud. It is therefore important that the articulation of insects while eating happen in a positive manner. However, in this particular case it seems that the media also play a role in shaping the opinion of children. Van Huis (2016) suggests that role models can aid in the promotion of edible insects, and in line with his argument, I propose that popular influencers could be used as a marketing strategy for this. How to reach the younger generation has changed recently and peers on social media have gained much popularity in reaching and shaping the opinion of adolescents (Wrang, 2017). Therefore, using young influencers such as YouTubers to positively portray and promote edible insects could be an effective tool regarding this age group.

5.3 No animal resemblance, please

The visual aspects of an insect played a key role and it was articulated that the larger an insect was the worse. Moreover, an insect that was whole was also seen negatively, especially if this insect was also a large one. Therefore, small larvae appeared more popular than for instance a whole grasshopper. Furthermore, the findings suggested that the majority seemed more likely to accept insects if they were grounded or invisible. This is similar to findings from previous research performed on adults (Caparros Megido et al., 2016; Tan et al., 2015). Nevertheless, in many regards insects are not different from other types of animals that people happily consume. For instance, a whole insect was likely to be rejected because of external features such as its head, which makes sense if comparing to other animals that are eaten in the West, e.g. a cow. Most people in the West would not eat the head of a cow. Similar to chicken feet, which are also rarely eaten in a Western context. It somehow seems that we do not want to be reminded of its animalness (Angyal, 1941), something that is clearly the case when standing in the meat section in a Danish supermarket. The meat bears little or no resemblance

to what it once was; instead, it has been chopped up or transformed into filets, sausages, or liver pâté. Considering this, it is understandable that children reject eating whole insects, as eating a whole animal is not something that is practised in a Danish context. This brings me to how the involvement in the cooking of edible insects could be experienced negatively such as when having to blend wax moth larvae. It is not something that people are accustomed to, nor when it comes to other types of meat. On the contrary, it is usually performed at factories or butchers, far away from the consumers. People have been disconnected to this process, hence it makes sense that this is not something that is desired when handling insects. Similarly to the external features, internal parts were also viewed with scepticism which again is reasonable, considering that with the exception of liver pâté, organs and the like are rarely consumed in a Danish context. However, while it is relatively uncomplicated to separate these from large animals such as cows and pigs, it would probably be difficult concerning insects. Fortunately, this issue seemed only to be a problem if the insect was eaten whole or if it was of a large size. Overall, it seems that these barriers can be overcome by assuring that insects are processed before reaching the consumer and assure that their resemblance to a living creature is minimised.

5.4 The incredible importance of taste

The findings from this study revealed that previous experience with edible insects positively affected the expected liking of a dish, in line with other research (Caparros Megido et al., 2016). Likewise, expected and actual (dis)liking of a dish depended largely on whether the actual dish was liked or disliked as well as an appreciation for an insect to have little or no taste. The findings thus indicate that taste is of great importance regarding acceptance and rejection of a dish, and to some extent irrespective of the insects within. In Figure 3 and 4 it appears that if something tasted good, many were also willing to eat the dish again. For instance, muffins had a mean score of 4.0 and 55% stated that they were willing to eat them again. Conversely, grasshoppers had a mean score of 2.2 and only 11% wanted to eat them again, giving the impression that a good taste is of major importance regarding future intake, which was also suggested in the focus group discussions, and is in line with research from House (2016). This is not a surprising finding in itself as it is well accepted that taste is one of the most important reasons concerning food choices (Norton et al., 2000). Yet, what *is* surprising is that if something had a good taste, many seemed indifferent towards the insects within. However, it is noteworthy to acknowledge that these two dishes (muffins and grasshoppers) consisted of flour and a whole insect, respectively, something that likely affected the ratings. However, it is interesting that the egg salad had the second highest mean score and 57% stated that they would like to eat it again. This is notable because whole and visible lesser mealworms were on top. Yet, it might be related to the fact that small insects appeared less intimidating and the importance of little or no taste of the

insect. Another explanation to why the muffins were popular could also be due to their sweetness, because people tend to be drawn towards that sensation (Ventura & Mennella, 2011). A study by Caparros Megido et al. (2014) similarly indicated that people especially liked chocolate-coated mealworms compared to other flavours i.e. paprika, although vanilla was liked less than the other two. Another reason, for why muffins were liked, was perhaps that the taste of the insect was undetectable. However, in the discussions it was evident that the grasshopper received a low mean score due to several reasons including dislike of texture, appearance, yet also a dislike of other ingredients. Concerning the latter reason it thus appears that if the grasshopper had been cooked with ingredients that were liked it may have received a higher mean score, proposing that an acceptable taste is vital. Overall, it appears that taste is of crucial importance, thus if aiming to encourage the consumption of edible insects it is important to incorporate these in a dish that is familiar and liked.

5.5 The disgusting insects

Although a good taste appeared to overrule the thought of the insects for most, a few experienced the opposite. Despite liking the taste and looks of a dish, the thought of the insect within had for some children seemed unpleasant and they were unwilling to eat it again. This is similar to findings from Tan, Fischer, van Trijp, and Stieger (2016). This has implications for consumption, yet it is not a surprising finding. The issue is related to what Rozin and Fallon (1980) consider the insect's nature, meaning that because it is an insect it is considered disgusting and therefore rejected. While most other barriers identified in, this study can be overcome, it is impossible to change the nature of an insect. However, it might be possible to change the *perception* of the nature of the insect. Nevertheless, it is interesting that only a few children seemed to reject edible insects due to their nature, and perhaps this could be explained simply because many of them had already been acquainted to edible insects before. Research indicates that repeated exposure leads to a positive change in attitudes towards that stimuli (Zajonc, 1968), and also regarding the liking of foods (Pliner, 1982). Recently edible insects have become somewhat widespread in Denmark and they are frequently part of the public discourse. Children are exposed to them in arenas such as supermarkets, in cooking sessions at schools, at food festivals, and even insect festivals. Indeed, research on edible insects suggests that people that have tasted insects before are more positive about it than people who have not (Caparros Megido et al., 2016). Perhaps this repeat exposure will in the future be able to change the attitudes of the ones that are especially disgusted towards edible insects. However, it might be more fruitful to focus on the ones that appear indifferent towards insects' nature, as they might be more willing to consume them if other barriers are diminished.

5.6 Limitations and future research

Hedonic ratings were used in the survey to assess the liking of the five dishes. This scale can be used to assess overall liking of a food or even different attributes such as taste, appearance, or texture. I decided to focus on taste only, when asking “how did you think the dish tasted?”. However, if I had asked them to rate overall liking of a dish a broader perspective could have been obtained. On the other hand, it can be difficult to separate the different attributes when eating (Moskowitz & Krieger, 1995); therefore, the ratings may in fact have portrayed an actual overall liking. Despite the aforementioned, the results from the ratings seemed concurrent with what was articulated in the discussions.

The tastings were based on cooking that the children did, and this naturally caused some problems because the dishes did not always turn out as intended, which could potentially cause a lower rating. Nevertheless, considering that the social aspects of the activities were of great importance and that discussions provided deep insights, it outweighs the limitations concerning this, yet the results from the survey should be interpreted with caution. If aiming only to examine children’s liking of the various attributes (e.g. taste and texture) of insects in future studies, one suggestion could be to perform a controlled study. For example, where food is prepared and served for them and possibly the same dish, yet prepared with different insect species and/or degree of processing.

Measures were taken to reduce potential misinterpretations in the questionnaire and discussions. However, being an adult doing research with children will undoubtedly lead to certain biases, such as them saying what they think I want to hear (Curtin, 2001) and potential interpretative bias due to age difference. Nevertheless, observations throughout the course aided towards a better understanding and in validation. It would have been optimum to return to the participants and asking for assurance in the interpretation of their utterances, something future studies should consider doing.

This study was relatively context specific and owing to the primarily qualitative nature the findings are not generalisable, yet due to a relatively large number of conducted focus group discussions it gives a good indication of which factors are at play. The findings could possibly be broadened up to other cultures where insects are sold, where similar structures are apparent and to a related age group. The study provided valuable insights on an understudied area concerning children’s perception of edible insects that can prove valuable for stakeholders within that area, future studies, and sustainability scientists alike in the quest for a brighter future.

5.7 Summary

It appears that the children's perception of edible insects are indeed formed by outside structures such as peers and culture. It seems that food with insects could be appealing for many, if prepared in the right way. Most of the identified barriers can likely be overcome with the right measures, for instance by providing information on edible insects' origin and feed, articulate insects more positively, by focusing on making food with insects more appealing e.g. by incorporating insects in familiar, tasty, and liked dishes, and by assuring insects are processed before reaching the consumers. However, factors at play are somewhat intertwined, hence it would likely be insufficient to focus only on one aspect. For instance, although a good taste is of major importance, food might be rejected because others talk negatively about it. On top of this, although out of the scope of this thesis, high price and low availability probably also would play a role. Rational discourses such as health and environmental benefits play a role for adults (House, 2016); however, these factors were barely articulated during the discussions, it thus seems that for this age group an emphasis on these aspects would play a minimal role.

6 Conclusion

Current and future meat consumption pose tremendous environmental and climatic problems and a change in existing patterns is crucial. Edible insects seem to be a promising alternative to conventional meat, however resistance for adoption exists in the West. A number of studies have assessed how adults perceive edible insects, yet little research has been undertaken concerning children. Although this latter group might be more susceptible for adoption. Therefore, this study set out to investigate Danish children's perception of edible insects in order to overcome barriers. A course including a lecture, cooking, and subsequent tastings of edible insects were conducted. Through focus group discussions and a survey, children's perceptions as well as liking of dishes were explored. The analysis revealed a multitude of factors affecting consumption of insects, some leading to acceptance while others leading to rejection. Taste appeared to play a major role regardless of the dish having insects within it, at the same time misconceptions of the insect's origin also mattered as well as appearance of the insect and dish, and influence of peer groups and culture at large. Disgust towards the nature of the insect was also evident. Most barriers can likely be overcome by taking certain measures, although it also became evident that some factors are somewhat intertwined, thus addressing several aspects might be most beneficial. These findings suggest that if barriers are diminished, some children might be willing to adopt edible insects to their diet.

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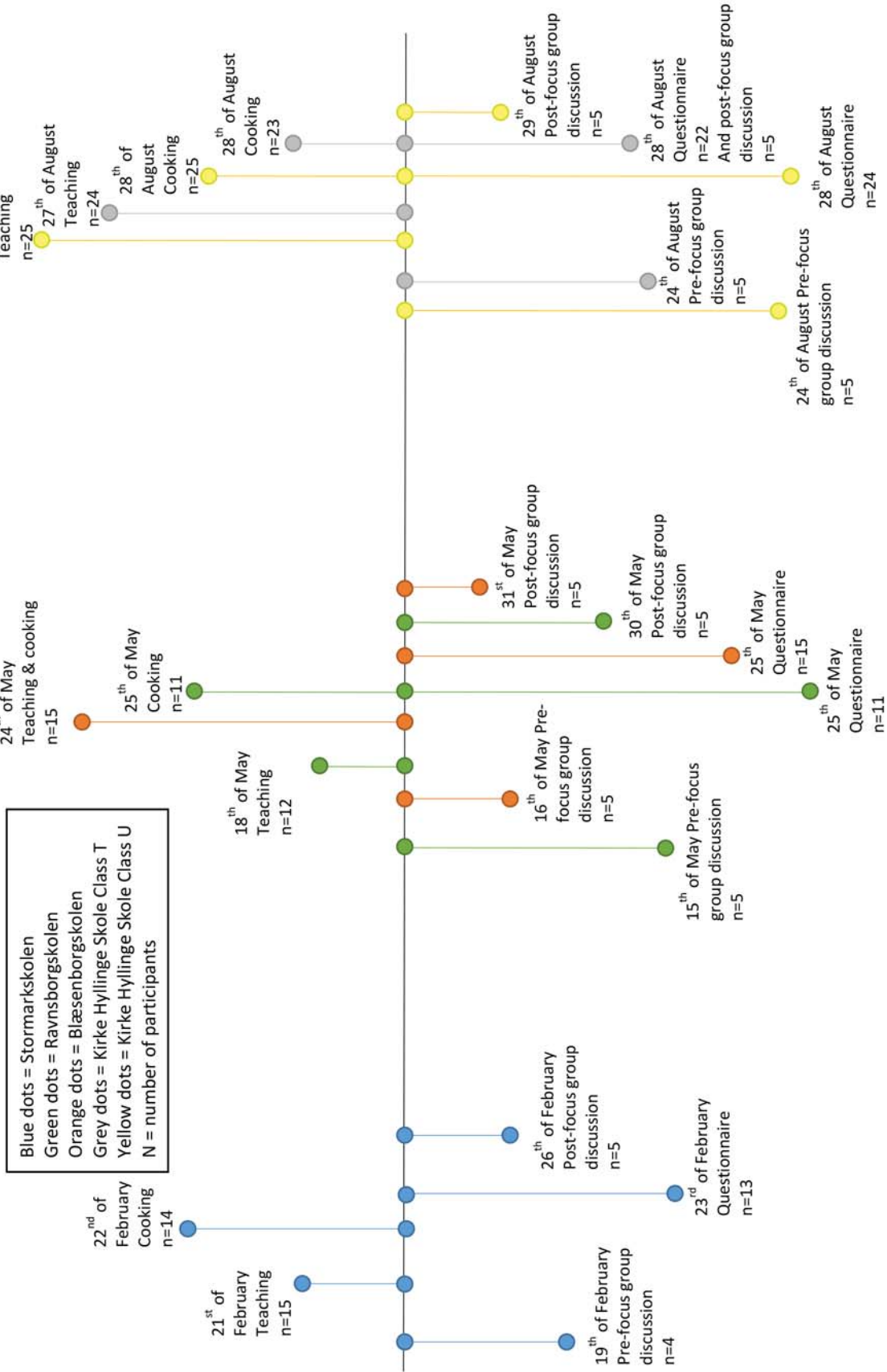
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8 Appendices

Appendix A: Timeline including dates for the various activities and number of participants



Appendix B: Recipes

Translated from Danish into English.

All recipes originate from or are inspired by recipes from Askov's (2017) cookbook *Insects on the Menu* [in Danish: *Insekter på menuen*] or from her website buglady.dk.

Mini omelettes with wax moth larvae – approximately 15 omelettes

Ingredients:

- 75 g defrosted wax moth larvae
- 2 tbsp. fresh ginger
- 1 clove of garlic
- 1 tbsp. Sriracha chili sauce
- ¼ dl whipping cream
- 1 egg white
- 1 tsp. Maizena
- ½ tsp. fine table salt
- 1-2 dl wheat flour
- ½ red onion
- 4 tbsp. rapeseed oil



Cooking:

1. Peel and finely chop the garlic and ginger
2. In a blender put: the wax moth larvae, ginger, garlic, chili sauce, whipping cream, egg white, Maizena, and salt. Blend to a smooth texture
3. Add 1-2 dl flour until the right texture is reached. The mix should not be too liquid
4. Finely chop the red onion and add to the mix in the blender. Blend for a second
5. Heat up a frying pan to medium heat and add oil. When the oil is heated, put small mini omelette portions of the mix on the pan
6. Fry the omelettes for about two minutes and flip them with a spatula and fry for another two minutes until golden
7. Arrange the mini omelettes on a plate

Sweet and spicy grasshoppers with sesame seeds and lime

Ingredients:

- 75 g grasshoppers (frozen)
- 2 limes
- 1 dl sesame seeds
- 1 tbsp. brown sugar
- 3 tbsp. soy sauce
- ½ tsp. salt
- 2 tbsp. Sriracha chili sauce



Cooking:

1. Start by removing all legs of the grasshoppers – preferably while frozen
2. Cut the limes in small wedges
3. Dry roast the sesame seeds on a frying pan at medium heat until golden and pour it into a bowl – be careful not to burn them
4. Heat a frying pan to medium heat and add brown sugar, soy sauce, salt, and chili sauce
5. When the brown sugar is dissolved and it starts bobbling, add the grasshoppers. Mix the grasshoppers with the sauce so that they are covered in the sauce and cook them while stirring for 7-8 minutes
6. While the grasshoppers are roasting, put a sheet of baking parchment paper on a baking tray and distribute *half* of the sesame seeds on the parchment paper
7. When the sauce is caramelised and the grasshoppers are roasted, pour the grasshoppers on the sesame seeds and add the rest of the sesame seeds on top of the grasshoppers
8. Separate the grasshoppers with two forks making sure they are covered in sesame seeds
9. Arrange the grasshoppers on a nice plate with the limes

Pimiento with mealworms

Ingredients:

- 10 carrots
- 2 cucumbers
- 150 g defrosted mealworms
- 3 red bell peppers
- 1 tbsp. olive oil
- ½ tsp. dried thyme
- ½ dl whipping cream – or more
- 1 dl almonds
- Salt
- Freshly ground black pepper



Cooking:

1. Preheat the oven to 180°C (fan-oven)
2. Wash and peel the carrots and cut them into 5 cm long thin pieces
3. Wash and cut the cucumbers into 5 cm long thin pieces
4. Put baking parchment paper on a baking tray and distribute the mealworms on the entire tray. Cook them in the oven for about 10 minutes until crisp – check them during cooking as they suddenly turn crisp
5. Wash the bell peppers and cut them into thin slices – throw out the seeds
6. Heat up a large frying pan to medium heat and add the oil and heat it
7. In the oil fry the bell peppers, thyme and 1 tsp. salt until the bell peppers turn soft – stir while frying
8. Add the whipping cream and let it boil for about 5 minutes until the mix is thickened – stir meanwhile
9. Put the baked mealworms and almonds in a blender and blend to a fine powder
10. Then add the cooked bell peppers and blend to a smooth texture
11. You can add more whipping cream to make the mix more creamy
12. Add salt and freshly ground pepper to taste
13. Arrange the pimiento in a bowl with the pieces of carrot and cucumber

Banana muffins with lesser mealworm flour – approximately 18 muffins

Ingredients:

- 1½ dl lesser mealworm flour
- 2 tsp. vanilla sugar
- 1 dl oats
- 1 dl graham flour
- 2 dl wheat flour
- 1½ tsp. baking powder
- 1½ dl sugar
- 100 g dark chocolate
- 3 *ripe* bananas
- 1 dl rapeseed oil
- 2 eggs
- 3 dl milk
- Muffin baking cups



Cooking:

1. Preheat the oven to 175°C (fan oven)
2. Finely chop the chocolate
3. In a large bowl mix: lesser mealworm flour, vanilla sugar, oats, graham flour, wheat flour, baking powder, sugar, and chocolate – mix well
4. Mash the bananas
5. In another large bowl mix: bananas, rapeseed oil, eggs, and milk – mix well
6. Add the dry ingredients to the bowl with the wet ingredients and mix everything thoroughly
7. Distribute the dough in approximately 18 muffin baking cups and place them on a baking tray
8. Bake them in the middle of the oven for about 20 minutes. Check if they are done by poking a knife in a muffin – if the dough does not stick, it is done

Egg salad with lesser mealworms

Ingredients:

- Rye bread
- Lettuce

Lesser mealworms with curry powder:

- ½ dl water
- ½ tsk salt
- ½ tsk curry powder
- 1½ dl freeze dried lesser mealworms

Egg salad:

- 6 eggs
- 2 pasteurised egg yolks (at room temperature)
- 1 tsp. Dijon mustard (at room temperature)
- 1 tbsp. lemon juice (at room temperature)
- 1 tsp. white wine vinegar
- Salt and freshly ground black pepper
- 2 dl rapeseed oil
- 1 tsp. curry powder



Cooking:

Lesser mealworms with curry powder:

1. Preheat the oven to 175°C (fan oven)
2. Bring water to a boil in a pot or a kettle and pour it in a bowl
3. Add salt, curry powder, and the lesser mealworms to the water
4. Put a sheet of baking parchment paper on a baking tray
5. When the lesser mealworms have absorbed the water, distribute them on the baking parchment
6. Bake them in the oven for about 10 minutes until they are crispy – check them during baking

Egg salad:

1. Put the 6 eggs in a pot and cover them in water. Bring them to a boil and boil them for 8 minutes. When the eggs have boiled for 8 minutes, cover them in cold water, peel them and cut them into small chunks

2. In a small bowl mix: pasteurised egg yolks, Dijon mustard, lemon juice, white wine vinegar, salt, and pepper. Whisk thoroughly for a minimum of one minute
3. Keep whisking while adding a tiny bit of oil – this keeps the mix from separating
4. Then add the oil in a thin stream while whisking thoroughly – keep adding oil until the right texture is reached – be careful not to separate the mix
5. Add curry powder and mix
6. Finally add the chopped eggs and mix everything

Half the slices of rye bread and arrange the egg salad on top of the bread with the washed salad and sprinkle with the lesser mealworms

Appendix C: Example of a questionnaire

Translated from Danish into English.

Questionnaire

Remember that this is anonymous and confidential – only Anita will be able to see your answers and she will not be able to tell who gave which answers

1. What is your sex? (tick only one)

- Girl
- Boy

2. What is your age? _____

3. Do you eat meat (e.g. chicken, beef, pork, fish)? (tick only one)

- Yes
- No

4. Prior to today, had you ever tried eating insects? (tick only one)

- Yes
- No

5. Which dish did your group prepare? (tick only one)

- Pimiento with mealworms
- Banana muffins with lesser mealworm flour
- Sweet and spicy grasshoppers with sesame seeds and lime
- Mini omelettes with wax moth larvae
- Egg salad with lesser mealworms

6. Did you taste pimiento with mealworms? (tick only one)

- Yes
- No

7. If no, why not? _____

8. If yes, how do you think pimiento with mealworms tasted? (tick only one)

- Super good
- Good
- Neither good nor bad
- Bad
- Super bad

9. If yes, would you taste pimiento with mealworms again? (tick only one)

- Yes

- No
- Maybe

10. Did you taste banana muffins with lesser mealworm flour? (tick only one)

- Yes
- No

11. If no, why not? _____

12. If yes, how do you think banana muffins with lesser mealworm flour tasted? (tick only one)

- Super good
- Good
- Neither good nor bad
- Bad
- Super bad

13. If yes, would you taste banana muffins with lesser mealworm flour again? (tick only one)

- Yes
- No
- Maybe

14. Did you taste sweet and spicy grasshoppers? (tick only one)

- Yes
- No

15. If no, why not? _____

16. If yes, how do you think sweet and spicy grasshoppers tasted? (tick only one)

- Super good
- Good
- Neither good nor bad
- Bad
- Super bad

17. If yes, would you taste sweet and spicy grasshoppers again? (tick only one)

- Yes
- No
- Maybe

18. Did you taste mini omelettes with wax moth larvae? (tick only one)

- Yes
- No

19. If no, why not? _____

20. If yes, how do you think mini omelettes with wax moth larvae tasted? (tick only one)

- Super good
- Good
- Neither good nor bad
- Bad
- Super bad

21. If yes, would you taste mini omelettes with wax moth larvae again? (tick only one)

- Yes
- No
- Maybe

22. Did you taste egg salad with lesser mealworms? (tick only one)

- Yes
- No

23. If no, why not? _____

24. If yes, how do you think egg salad with lesser mealworms tasted? (tick only one)

- Super good
- Good
- Neither good nor bad
- Bad
- Super bad

25. If yes, would you taste egg salad with lesser mealworms again? (tick only one)

- Yes
- No
- Maybe

26. Describe the lecture with Anita with 3 words: _____

27. Describe the cooking with 3 words: _____

Appendix D: Information about focus group discussions and participants

School	Date	Length of interview (without introduction)	Participants			
			Age	Sex	Eats meat (yes/no)	Tasted insects before (yes/no)
Stormarkskolen, Nakskov, Lolland	19 th of February 2018 (pre)	40 min.	12	Girl	Yes	No
			13	Girl	Yes	No
			12	Girl	Yes	No
			12	Boy	Yes	No
	26 th of February 2018 (post)	43 min.	12	Girl	Yes	No
			13	Girl	Yes	No
			12	Girl	Yes	No
			12	Boy	Yes	No
			12	Girl^a	Yes	? ^b
Ravnsborgskolen, Horslunde, Lolland	15 th of May 2018 (pre)	59 min.	13	Girl	Yes	Yes
			13	Girl	Yes	No
			13	Boy	Yes	Yes
			12	Boy	Yes	No
			13	Boy	Yes	Yes
	30 th of May 2018 (post)	52 min.	13	Girl	Yes	Yes
			13	Girl	Yes	No
			13	Boy	Yes	Yes
			12	Boy	Yes	No
			13	Boy	Yes	Yes
Blæsenborgskolen, Maribo, Lolland	16 th of May 2018 (pre)	41 min.	12	Girl	Yes	No
			13	Girl	Yes	Yes
			13	Girl^c	Yes	No
			12	Boy	Yes	No
			13	Boy	Yes	No
	31 st of May 2018 (post)	37 min.	12	Girl	Yes	No
			13	Girl	Yes	Yes
			12	Girl^d	Yes	Yes
			13	Boy	Yes	No
			13	Boy	Yes	No
Kirke Hyllinge Skole, Kirke Hyllinge, Zealand Class U	24 th of August 2018 (pre)	46 min.	12	Girl	Yes	Yes
			11	Girl	Yes	Yes
			11	Girl	Yes	Yes
			12	Boy	Yes	Yes
			12	Boy	Yes	No
	29 th of August 2018 (post)	47 min.	12	Girl	Yes	Yes
			11	Girl	Yes	Yes
			11	Girl	Yes	Yes
			12	Boy	Yes	Yes
			12	Boy	Yes	No

Kirke Hyllinge Skole, Kirke Hyllinge, Zealand Class T	24 th of August 2018 (pre)	47 min.	12	Girl	Yes	No
			11	Girl	Yes	No
			12	Boy	Yes	Don't know
			12	Boy	Yes	Yes
			11	Boy	Yes	Yes
	28 th of August 2018 (post)	71 min.	12	Girl	Yes	No
			11	Girl	Yes	No
			12	Boy	Yes	Don't know
			12	Boy	Yes	Yes
			11	Boy	Yes	Yes

a) This girl was unable to participate in the pre-focus group discussion; hence, she only participated in the post-focus group discussion

b) I do not know if this girl had tasted insects before

c) This girl was unable to participate in the post-focus group discussion; hence, she only participated in the pre-focus group discussion

d) This girl participated only in the post-focus group discussion, because the girl who participated in the pre-focus group was unable to attend

Appendix E: Interview guide from pre-focus group discussion

Translated from Danish into English.

1) Introduction

- Hi everyone and welcome to this meeting. Great that you wanted to participate. Please take a seat, where I have put a piece of paper with your name.
- My name is Anita – what is yours?
- So I am not sure how much you know about what will happen today, but I am basically in the process of writing my final paper at my studies, where I would like to find out what children think about edible insects, and this is why I am super interested in hearing about your thoughts and opinions. Are we all agreeing that this meeting can take up to one hour or have you been told otherwise?
- You are of course more than welcome to take whatever drinks and snacks placed on the table, but please make sure to do it quietly so it is not too noisy in the microphone. I hope you are all comfortable with me recording this discussion?
- In this meeting you are very welcome to bring forth both positive and negative thoughts you might have on the topic, there are no wrong or right answers and no stupid comments
- I would very much like you all to speak and you are very welcome to speak together and comment on what others say.
- Are there any questions that you cannot answer, then that is absolutely fine – I just want you to be completely honest.
- Do you have any questions along the way, then do not hesitate to ask. If there is anything that you do not understand, then just ask.
- And it is completely fine that you do not share the same opinions – that is normal.
- I also want to make sure that you all know that whatever you say today will be anonymised, meaning that when I write my paper I will not mention anybody by name, hence I will not write “Anita said”, instead I will give you a different name, perhaps a letter or a number.
- And do not forget, I am here to learn about your thoughts and opinions – you are the experts and I am very curious to know what you think about this!

Start recording

2) Opening questions

- a. In your little response booklet you may write you age and name – later I will ask you to write more in the booklet
- b. What is your favourite dish?

- c. Do you eat meat?

3) Introductory questions

- a. On page 2 in your booklet I would like you to answer the following question:
- What is the first you think about, when I say you can eat insects?
 - And would you like to share what you have written?
- b. On page 3 I would like you to tick off whether or not you have tried to eat insects
- Have you tried eating insects?
 - Perhaps: what insects have you tried?
 - Perhaps: Tell me about your experience with this?
- c. Would you like to taste insects?
- d. Why would you not like to try insects?

4) Transition questions

- a. Can you think of any reasons to why we should eat insects?
- b. Can you think of any reasons to why we should not eat insects?
- c. What do you think about these pictures? *(I show them 4 pictures of people eating insects)*
- Imagine it was you on one of these pictures and you were about to eat an insects, what would you do?

5) Key questions *(A photo of each dish is shown and a short description of what the dish contain is given – evaluate one dish at a time)*

- a. I will now show you five different dishes containing insects and in your booklet I will like you to tick off the box you find applicable. So, the question on how you think the dish tastes and if you would like to taste it.
- b. *(After they have answered the questions in their booklet, we discuss in plenum what they think about the dish and why they have answered what they have)*
- E.g. Some of you have rated this to be “super good” – how come you think this?
 - E.g. Some of you have rated this to be “super bad” – how come you think this?
 - Some of you have stated that you would like to taste this dish – how come?
 - Some of you have stated that you would not like to taste this dish – why not?

6) Ending questions

- a. *(I give a short recap of what has been discussed)*
- Does this give a good picture of what has been said or do you think something is missing?
- b. Thank you so much for participating – I very much appreciate it and I am looking forward to seeing you again.

Appendix F: Interview guide from post-focus group discussion

Translated from Danish into English.

1) Introduction

- Hi everyone and welcome to our second and last meeting. Great that you want to participate again. I hope you have enjoyed the course.
- Today will look very much like our last meeting and again today you will also be asked to rate the different dishes as you did last time and in the questionnaire. But because the questionnaire does not go into depth about what you thought about a particular dish, we will talk more about this today.
- Are we all agreeing that this meeting can take up to one hour?
- And just like last time, feel free to take whatever drinks and snacks I have placed on the table, but please make sure to do it quietly so it is not too noisy in the microphone. I hope you still feel comfortable with me recording the conversation?
- In case any of you have forgotten, what I said last time I will just mention a few things again:
- In this meeting you are very welcome to bring forth both positive and negative thoughts you might have on the topic, there are no wrong or right answers and no stupid comments.
- I would very much like you all to speak and you are very welcome to speak together and comment on what others say.
- Are there any questions that you cannot answer, then that is absolutely fine – I just want you to be completely honest.
- Do you have any questions along the way, then do not hesitate to ask. If there is anything that you do not understand, then just ask.
- And it is completely fine that you do not share the same opinions – that is normal.
- And once again, I also want to make sure that you all know that what you have said will be anonymised, meaning that when I write my paper I will not mention anybody by name.
- By the way, you all followed some recipes that I had given you. Did the dish turn out not to be good or as expected, it is likely not your fault. It is therefore okay to be honest about the dishes and say if there was something you disliked about a dish, without offending the one who made it.
- And do not forget, I am here to learn about your thoughts and opinions – you are the experts and I am very curious to know what you think about this!

Start recording

2) Opening questions

- a. In your little response booklet you may write your age and name
- b. And also tick off what dish you cooked

3) Introductory questions

- a. On page 2 in your booklet I would like you to answer the following question:
 - After an introduction in the form of a lecture and cooking, what do you now think about eating insects?
 - And would you like to share what you have written?
 - Are there any of the things you have learned or tried that would make you eat insects again?
 - ...Or not eat insects?
 - Did you talk with family or friends about what you experienced last week?
 - What did you tell?
 - How did they react?

4) Transition questions

- a. What do you think about these pictures? (*I show them 4 pictures of people eating insects*)
- b. Imagine it was you on one of these pictures and you were about to eat an insects, what would you do?

5) Key questions (*A photo of each dish that was made is shown - one dish is evaluated at a time*)

- a. I will now show you pictures of the five different dishes containing insects that we cooked the other day, and in your booklet I will like you to answer the questions starting from page 3. And do not forget that the person cooking the dish just followed a recipe, and it was not the person's fault if the dish was not a success, so remember to be honest about what you think
 - So tick off whether you tasted the dish
 - How you think the dish tasted
 - And if you would like to taste it again
- b. (*After they have answered the questions in their booklet, we discuss in plenum what they think about the dish and why they have answered what they have*)
 - E.g. It seems that many of you tasted this dish – how can this be?
 - E.g. It seems that many of you did not taste this dish – how can this be?
 - E.g. Some of you have rated this to be “super good” – how come you thought that?
 - E.g. Some of you have rated this to be “super bad” – how come you thought that?

- Some of you have stated that you would like to taste this dish again – how come?
- Some of you have stated that you would not like to taste this dish again – why not?

6) More key questions

- a. Would you in general like to eat insects again?
 - Perhaps:
 - Other dishes...
 - Other insects...
- b. What do you think about you cooking the food instead of having it served by for instance me?
- c. Did it in any ways influence you that you cooked the food together with your classmates?

7) Ending questions

- a. *(I give a short recap of what has been discussed)*
 - Does this give a good picture of what has been said or do you think something is missing?
- b. Thank you so much again for participating – I very much appreciate it.

Appendix G: Response booklet from pre-focus group discussion

Translated from Danish into English.

Name:

Age:

What is the first thing that comes to mind, when I say that you can eat insects? (write down a few words)

Have you tried eating insects before? (tick only one)

- Yes
- No
- I don't know

Dish number 1:

How do you think this dish tastes? (tick only one)

- Super good
- Good
- Maybe good or maybe bad
- Bad
- Super bad

Would you try this dish? (tick only one)

- Yes
- No
- Maybe

Dish number 2:

How do you think this dish tastes? (tick only one)

- Super good
- Good
- Maybe good or maybe bad
- Bad
- Super bad

Would you try this dish? (tick only one)

- Yes
- No
- Maybe

Dish number 3:

How do you think this dish tastes? (tick only one)

- Super good
- Good
- Maybe good or maybe bad
- Bad
- Super bad

Would you try this dish? (tick only one)

- Yes
- No
- Maybe

Dish number 4:

How do you think this dish tastes? (tick only one)

- Super good
- Good
- Maybe good or maybe bad
- Bad
- Super bad

Would you try this dish? (tick only one)

- Yes
- No
- Maybe

Dish number 5:

How do you think this dish tastes? (tick only one)

- Super good
- Good
- Maybe good or maybe bad
- Bad
- Super bad

Would you try this dish? (tick only one)

- Yes
- No
- Maybe

Appendix H: Response booklet from post-focus group discussion

Translated from Danish into English.

Name:

Age:

Which dish did you prepare?

- Pimiento with mealworms
- Banana muffins with lesser mealworm flour
- Sweet and spicy grasshoppers
- Mini omelettes with wax moth larvae
- Egg salad with lesser mealworms

After the introduction including theory and cooking regarding edible insects, what do you think about edible insects now? (write down a few words)

Dish number 1: Pimiento with mealworms

Did you taste pimiento with mealworms?

- Yes
- No

How did you think pimiento with mealworms tasted?

- Super good
- Good
- Neither good nor bad
- Bad
- Super bad

Would you taste pimiento with mealworms again?

- Yes
- No
- Maybe

Dish number 2: Banana muffins with lesser mealworm flour

Did you taste banana muffins with lesser mealworm flour?

- Yes
- No

How did you think banana muffins with lesser mealworm flour tasted?

- Super good
- Good

Neither good nor bad

Bad

Super bad

Would you taste banana muffins with lesser mealworm flour again?

Yes

No

Maybe

Dish number 3: Mini omelettes with wax moth larvae

Did you taste mini omelettes with wax moth larvae?

Yes

No

How did you think mini omelettes with wax moth larvae tasted?

Super good

Good

Neither good nor bad

Bad

Super bad

Would you taste mini omelettes with wax moth larvae again?

Yes

No

Maybe

Dish number 4: Sweet and spicy grasshoppers

Did you taste sweet and spicy grasshoppers?

Yes

No

How did you think sweet and spicy grasshoppers tasted?

Super good

Good

Neither good nor bad

Bad

Super bad

Would you taste sweet and spicy grasshoppers again?

Yes

No

Maybe

Dish number 5: Egg salad with lesser mealworms

Did you taste egg salad with lesser mealworms?

Yes

No

How did you think egg salad with lesser mealworms tasted?

Super good

Good

Neither good nor bad

Bad

Super bad

Would you taste egg salad with lesser mealworms again?

Yes

No

Maybe

Appendix I: Example of an informed consent form to pupils filling out the questionnaire

Translated from Danish into English.

Informed consent form to the pupil and home of 6th grade on Kirke Hyllinge Skole

Dear _____ and the home.

My name is Anita and I am doing a master in Environmental Studies and Sustainability Science at Lund University in Sweden. I am currently doing my master thesis dealing with edible insects among children. In this regard, I have been given the opportunity to visit both classes on year 6 on Kirke Hyllinge Skole through the subject home economics.

I will hold a lecture about edible insects on Monday the 27th of August 2018 and on Tuesday the 28th of August we will cook food with insects, in the company of their teacher Stine. These activities are part of their regular schedule and are therefore obligatory.

Whether the pupil would like to taste the food with insects on the 28th of August is completely voluntary/optional and there will be absolutely no force. The consumption of these insects holds no risk, **UNLESS** your child is **allergic** to seafood, house dust mites, or nuts, which can result in allergic reactions and thus he/she should not eat the insects.

Apart from the aforementioned obligatory parts, I wish to, through a questionnaire, to examine the children's experiences regarding the consumption of edible insects. The answers from this questionnaire will be dealt with confidentially and anonymous, meaning that no pupil will be mentioned by name. The data will be used in my thesis.

Consent form:

The pupil may fill out the questionnaire (sign with signature and date)

Pupil: _____ Parent/guardian: _____

If the pupil feels like it, he/she may eat the food with insects and has no known allergies towards the mentioned (seafood, dust mites, or nuts) (sign with signature and date)

Pupil: _____ Parent/guardian: _____

Please return the consent form to Stine before the 27th of August.

If you have any questions or comments don't hesitate to contact me via mobile number XXXXXXXX or
an1185ge-s@student.lu.se

Thank you so much.

Sincerely,

Anita Geertsen.

Appendix J: Example of an informed consent form to pupils filling out the questionnaire and participating in focus group discussions

Translated from Danish into English.

Informed consent form to the pupil and home of 6th grade on Kirke Hyllinge Skole

Dear _____ and the home.

My name is Anita and I am doing a master in Environmental Studies and Sustainability Science at Lund University in Sweden. I am currently doing my master thesis dealing with edible insects among children. In this regard, I have been given the opportunity to visit both classes on year 6 on Kirke Hyllinge Skole through the subject home economics.

I will hold a lecture about edible insects on Monday the 27th of August 2018 and on Tuesday the 28th of August we will cook food with insects, in the company of their teacher Stine. These activities are part of their regular schedule and are therefore obligatory.

Whether the pupil would like to taste the food with insects on the 28th of August is completely voluntary/optional and there will be absolutely no force. The consumption of these insects holds no risk, **UNLESS** your child is **allergic** to seafood, house dust mites, or nuts, which can result in allergic reactions and thus he/she should not eat the insects.

Apart from the aforementioned obligatory parts, I wish to, through a questionnaire and 2 focus group discussions (the first discussion takes place on the 24th of August and the second takes place on the 28th of August), to examine the children's experiences regarding the consumption of edible insects. The answers from the questionnaire will be dealt with confidentially and anonymous, meaning that no pupil will be mentioned by name. The focus group discussions will be audio recorded. Data from the discussions will be anonymised, and similarly to the answers from the questionnaires, no pupil will be mentioned by name. Data will be used in my thesis.

Consent form:

The pupil may fill out the questionnaire and participate in the focus group discussions (sign with signature and date)

Pupil: _____ Parent/guardian: _____

If the pupil feels like it, he/she may eat the food with insects and has no known allergies towards the mentioned (seafood, dust mites, or nuts) (sign with signature and date)

Pupil: _____ Parent/guardian: _____

Please return the consent form to Stine before the 24th of August.

If you have any questions or comments don't hesitate to contact me via mobile number XXXXXXXX or an1185ge-s@student.lu.se

Thank you so much.

Sincerely,

Anita Geertsen.