



## Development of Gateway Foods with Seaweeds targeted Children

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### Overview

- Seaweed
  - Examples with increasing accept of seaweed in Denmark
- Gateway foods
  - Familiarity, Novelty and hedonic response
- Smag for Livet
- Test methodology
  - Food Design Thinking and Creative Design methodology
  - Data collection from respondents
- Results
- Conclusions and perspectives

## Seaweed

- Algae – in particular Macro algae
  - Grow in all marine climate zones and up to high levels of salinity
  - Rely on photosynthesis for energy
- Around 10.000 species of macro algae
- Commonly used in a number of East Asian cuisines
- Sporadically used in traditional western food cultures
  - Ireland, Brittany (France), Iceland, Nova Scotia (Canada), Maine (USA)
    - Stigma associates with seaweed – food of poverty
  - Main use in Western cuisine
    - food additives (agars, carrageenans and alginates)
    - Medical and cosmetic purposes as stabilisers

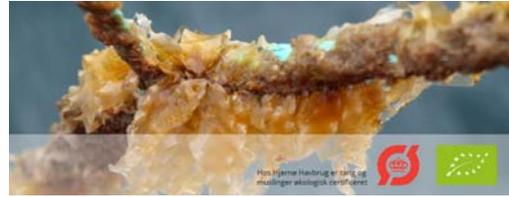
## Seaweed in Denmark

- Around 300 species of macro alae grow wild in the Danish waters
  - Only traditional uses: Roof thatching and agricultural fertiliser
- Danes' first experience with seaweed
  - Sushi
  - +300 sushi restaurants/takeouts



## Commercially grown or harvested seaweeds in Denmark

- Budding industry
  - Hjarnø Havbrug (Hjarnø Aquaculture)
  - Nordisk Tang (Nordic Seaweed)
  - Dansk Tang (Danish Seaweed)



# GATEWAY FOODS

## Gateway foods: Strike a balance between novelty and familiarity

- Omnivore's dilemma
  - Dual attraction and avoidance of familiarity and novelty
- Novelty, Familiarity and hedonic response
  - Craft beer: Optimum level of novelty
  - Tempe: Depends on cooking style, but more is better



### Food design approach

- Develop food with a high level of familiarity and add a novel ingredient, where its sensory properties contribute to the overall impression in clear and a meaningful way

## Smag for Livet

### Smag for Livet

- Dissemination and research centre
- Use taste and food as an entry for learning
- Develop teaching materials for children and youngsters
  - Lead with a good example, and make materials suitable for independent use in class room
- Dissemination-driven research
  - Learn a lot about our interaction with food from the interaction with our target group
- Current study is an example of research based on dissemination

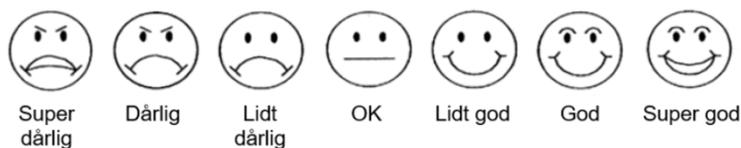


## Design and test methodology

- Design Thinking approach
  - Rooted in observation and knowledge of kids interaction with foods
  - Iterative fast cycle of prototyping and test
- Creative Design methodology
  - Selection and application of experimental design to systematically vary samples in key features:
    - Familiar products
    - Tasty with balanced seaweed flavours – distinct seaweed taste
    - High seaweed content – more than 3%
    - Use of different species
    - Easy to eat
- Developed a range of sample foods for tests – selected three:
  - Fruit bar – 8% dried granulated sugar kelp
  - Juice/smoothie – 3.2% macerated sugar kelp and ditto dashi
  - Falafel – 6.5% dried dulse and winged kelp

## Design and test methodology

- Neophobia-level modulates accept of foods
  - Test children's level of neophobia – novel instrument FNTT
  - 9 statement version
- Collative properties and hedonic response
  - Familiarity & Novelty in appearance and flavour
  - Willingness to taste
  - Hedonic rating – seven point hedonic smiley scale, anchors translated to Danish
  - Option: did not taste sample



## Respondents

- 4-7 graders (9-13 years old)
- Data collected over 3 days in three daily slots of 45 minutes. Maximum 38 children per slot

Gender	Number	Tasted seaweed before		
		No	Yes	Don't know
Girls	110	35	67	6
Boys	136	23	99	12
<b>Total</b>	<b>246</b>	<b>58</b>	<b>166</b>	<b>18</b>



## Results: Hedonic rating

- Large significant differences between versions

Sample	Version	Hedonic rating	Standard deviation
Fruit bar	+ seaweed	4.3	1.8
	- seaweed	5.4	1.6
Juice/smoothie	+ seaweed	2.7	1.4
	- seaweed	4.8	1.8
Falafel	+ seaweed	4.4	1.9
	- seaweed	5.3	1.7

## Results: Effects of Neophobia level on hedonic response

Respondents split in three approximately equal sized groups

No effect of stated previous seaweed exposure on hedonic response

High neophobia highly associated with no previous seaweed exposure

Sample	Neophobic Lowest FNTT group [9;30]	Medium Centre FNTT group [31;39]	Neophilic Highest FNTT group [40;45]	p-value
<b>Fruit bar +</b>	<b>4.1</b>	<b>4.4</b>	<b>4.4</b>	<b>0.012</b>
<b>Fruit bar -</b>	<b>4.8</b>	<b>5.5</b>	<b>6.0</b>	<b><math>3 \times 10^{-6}</math></b>
<b>Juice/Smoothie +</b>	<b>2.4</b>	<b>2.7</b>	<b>2.9</b>	<b>0.016</b>
<b>Juice/Smoothie -</b>	<b>4.0</b>	<b>5.1</b>	<b>5.2</b>	<b><math>1 \times 10^{-6}</math></b>
<b>Falafel +</b>	<b>3.9</b>	<b>4.5</b>	<b>4.9</b>	<b>0.001</b>
<b>Falafel -</b>	<b>4.7</b>	<b>5.4</b>	<b>5.8</b>	<b><math>4 \times 10^{-5}</math></b>

## Conclusions and perspectives

- Danish children respond positively to the developed foods with seaweed
  - But still lower accept than same foods without seaweed
  - Inconsistent pattern for age
  - Most familiar products were most liked
- Food Neophobia modulates accept
  - Highest neophobia level segment likes all samples less
  - Difference were more pronounced for samples without seaweed!
- First exposures only
  - Unknown how hedonic response develops
- Note: Quality problems with sugar kelp used for juice sample
  - Immature supply chain

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Thank you for your attention

## Photo Credits and References

Slides: 4: Jonas Drotner Mouritsen; 5: Producers; 7: Madfeed and Pixar

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