

Would you care for some freshly cultivated *Sashimi*? A survey into Japanese consumer attitudes towards cell-based seafood

Participant information sheet

Please note that you must be Japanese and over 18 years old to participate in the survey.

It takes about 10 minutes to complete the survey.

You can win a 3,000 YEN Amazon Japan gift voucher.

Animal Welfare Science, Ethics and Law, 2022, Pauline Braun, University of Winchester

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The aim of this research is to explore Japanese consumers' knowledge and attitude about cell-based seafood and fish. Cell-based fish is real fish tissue, grown from fish cells without the need to catch, raise or slaughter a large number of fish. Please take a look at Figure 1, which depicts the production process: cells are taken from a living fish (1) and put into a nutrient solution (2) where they grow into fish tissue (3). This is identical to the tissue of a real fish and can be consumed by humans (4).

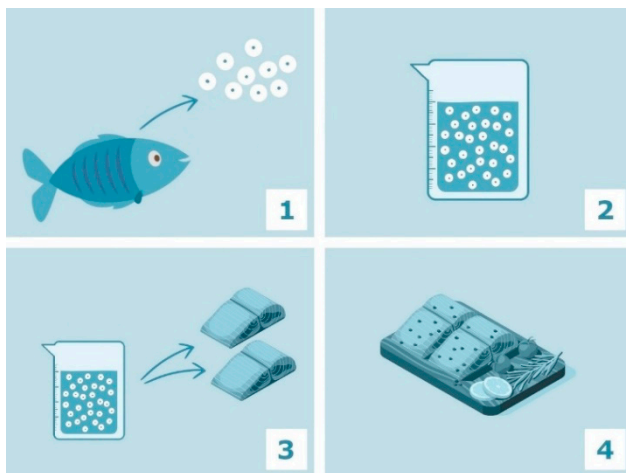


Figure 1. Simplified depiction of the production process of cell-based fish. © Łukasz Zielinski. After BlueNalu (2021)

Although currently still in development, cell-based fish and seafood products might be fully market-ready within a relatively short period of time and might become a viable alternative for their conventionally produced counterparts.



Figure 2. Cell-based salmon. © Anna Keeve

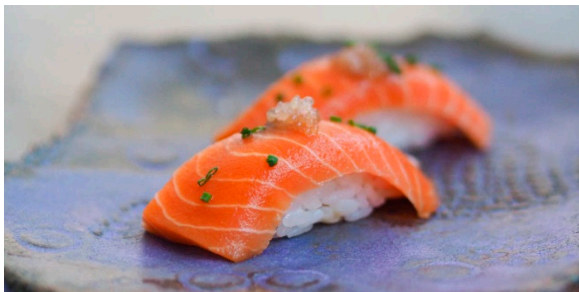


Figure 3. Sushi prepared with cell-based salmon. © Wildtype

Why is an alternative necessary?

Conventional seafood production contributes significantly to serious environmental problems and substantial animal welfare concerns. Although aquaculture production can address some of the problems of wild capture production, it brings along its own set of challenges; for example, establishing husbandry conditions which ensure high standards of animal welfare and do not necessitate excessive use of antibiotics as well as providing adequate feed without the use of fishmeal and fish oil derived from wild caught fish.

The development of alternative, cell-based products is seen as a promising approach to mitigate these problems and could become a 'game changer' on a global scale. Whether or not these alternative products will gain market share, depends considerably on acceptance by consumers. Therefore, consumer attitudes in countries with high seafood consumption such as your home country Japan are becoming an increasingly interesting field of research.

As part of my research project, I would like to question you about your knowledge and attitude concerning cell-based seafood. The questionnaire will be answered online. Your answers will be saved on my personal computer with a strong password, and they will not be passed on. All data will be deleted, when data analysis, the dissertation's marking process and any publication of summary results are completed.

The questionnaire will be answered anonymously, and no identifying data will be asked for. The research will be written up for a MSc dissertation and potentially as articles in the public domain. If you require any further information about this project, please contact me at the above email address. Your valuable participation in this research would be greatly appreciated.

Pauline Braun

Have you read the participant information sheet and are you happy to continue?

- Yes

How old are you?

- Under 18 years old ->
- 18-24 years old
- 25-34 years old
- 35-44 years old
- 45-54 years old
- 55-64 years old
- 65-74 years old
- 75 years or older

-> 'Sorry, but you cannot participate in this survey, as we are investigating attitudes of Japanese adults only. Thank you very much anyway and have a lovely day!'

What is your nationality?

- Japanese
- Other ->

-> 'Sorry, but you cannot participate in this survey, as we are investigating attitudes of Japanese adults only. Thank you very much anyway and have a lovely day!'

In which country do you currently reside?

- Japan
- Other ->

-> If 'Other' is chosen, please specify

How many people live in your town/city ?

- Less than 3,000
- Between 3,000 and 15,000
- Between 15,000 and 100,000
- Between 100,000 and 1 million
- Between 1 million and 10 million
- More than 10 million

What is your current gender identity?

- Male
- Female
- Other
- Prefer not to say

What is your highest level of completed education?

- No education
- Primary school
- High school
- College/undergraduate degree
- Postgraduate degree
- Other
- Prefer not to say

How many people live in your household?

- I live by myself

- 2
- 3
- 4
- 5
- 6
- More than 6

What is your annual household income (in JPY)?

- Less than 1.3 million ¹
- 1.3 – 1.99 million
- 2 – 2.99 million
- 3 – 3.99 million
- 4 – 4.99 million
- 5 – 5.99 million
- 6 – 6.99 million
- 7 – 8 million
- More than 8 million
- Prefer not to say

How often do you consume fish and seafood products?²

- Several times a day
- Once a day
- Four to six times a week
- Two to three times a week
- Once a week
- Sometimes
- Rarely
- Never ->

-> Why don't you consume fish and seafood products?

- I have an allergy
- I don't like the taste
- I'm vegan
- Other

¹ FOOT NOTES NOT INCLUDED IN DISTRIBUTED SURVEY. '1.3 million' was chosen, because according to the Japanese Ministry of Health, Labour and Welfare (2020), the poverty threshold in Japan lies at 1.27 million JPY annual household income. Hence, participants selecting the first answer would be considered as being poor or on the brink of being poor.

² Question proposed by BlueNalu staff

(If participants state to never eat seafood, the subsequent questions about consumption behaviour are skipped.)

Where do you usually consume seafood products? (Check all that apply)³

- At restaurants
- At home, prepared by myself or a family member
- At home, ready meals from the supermarket
- At home, take away from restaurants
- Other ->

-> If 'Other' is chosen, please specify

Consider your priorities when purchasing seafood products. How important are the following aspects to you?⁴

	Very important	Moderately important	Slightly important	Not at all important
Quality				
Price				
Source				
Species				

Had you heard of cell-based seafood before this survey?

- Yes
- No
- Unsure

Indicate the extent to which each of the following describes your spontaneous feelings about eating cell-based seafood.⁵

	Not at all	Slightly	Moderately	Very	Extremely
Excited					
Expectant					
Disgusted					
Interested					
Worried					

Would you be interested in tasting cell-based seafood?

³ Question proposed by BlueNalu staff

⁴ Question proposed by BlueNalu staff

⁵ Previous studies on cell-based animal products found these emotional states to be common among survey participants (Laestadius & Caldwell, 2015; Verbeke, Marcu et al., 2015).

- Yes
- No
- Unsure

How likely would you be to...?⁶

	Extremely likely	Likely	Neither likely nor unlikely	Unlikely	Extremely unlikely
...buy cell-based seafood regularly if it were sold in the grocery store?					
...replace all of your conventional seafood diet with cell-based products?					

Would you be willing to pay a higher price for cell-based products than for conventional seafood?

- Yes ->
- No

-> Would you be willing to buy cell-based products if the price was...?

- Much higher
- Moderately higher
- Slightly higher

Which cell-based products would you be interested in buying? (Check all that apply)⁷

- Salmon
- Bluefin Tuna
- Horse Mackerel
- Eel
- Seabream

⁶ Question proposed by BlueNalu staff

⁷ Question proposed by BlueNalu staff. These species (except zebrafish) appear to be the most popular, most consumed seafood species in Japan (Kamoey, 2015; Simmonds, 2017; Statista, 2021c). The for consumption rather unusual zebrafish was added as a reaction to Potter et al. (2020) suggesting that a more open approach is needed to improve and accelerate the development of cell-based seafood; along with overcoming a severe lack of transparency, the authors propose a change in the species targeted for production; instead of aiming entirely at producing traditionally consumed species of which scientific knowledge might be poor and whose cell-based versions might, therefore, be difficult to produce, they advise focusing on species that appear unusual for consumption but that are well researched. They propose the zebrafish, arguing that it is the most researched and best understood species in the life sciences.

- Pacific Saury
- Bonito
- Amberjack
- Scallops
- Octopus/Squid
- Shrimps/Prawns
- Zebrafish (Freshwater fish of the Cyprinidae native to India)
- ->Other

-> If 'Other' is chosen, please specify

To what extent do you agree or disagree with the following statements?⁸

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
'Progress in food development is good even if it means we might have to adapt our current diets.'					
'The sea and its creatures are a resource that should be treated with respect and care.'					
'Tradition and culinary cultural heritage are more important than the development of more sustainable food production methods.'					

How would you describe the development of cell-based seafood? (Check all that apply)⁹

- Unnatural
- Necessary
- Weird
- Ethical
- Scary
- Promising
- Superfluous
- Future-oriented

⁸ These three statements were chosen in order to offer respondents one statement that can be interpreted in favour of cell-based seafood, one statement against cell-based seafood and one neutral statement.

⁹ This question was added with the intention to compare results to results of former studies by Laestadius & Caldwell (2015), Verbeke, Marcu et al. (2015) and Bryant, Szejda et al. (2019) who found participants to describe their opinion on cell-based animal products using some of these terms. Finding out whether Japanese consumers also perceive cell-based products as something highly unnatural, promised to be interesting, as a perceived unnaturalness is believed to be one of the biggest obstacles to consumer acceptance (Bryant, Szejda et al., 2019)

- Harmful
- Fascinating
- Immoral
- Beneficial
- Other ->

-> If 'Other' is chosen, please specify

Final comments

Is there something about cell-based seafood that remains unclear to you? Please specify. *Optional*

Please finish one of the following sentences. *Optional*

- I would try cell-based seafood, if...
- I will not try cell-based seafood, because...

Image credits

Figure 1. Simplified depiction of the production process of cell-based fish. © Łukasz Zielinski. After BlueNalu (2021)

BlueNalu. (n.d.). Cell-cultured seafood to feed the world. A solution to the increasing need for sustainable seafood (Informational brochure obtained through personal contact).

<https://de.freepik.com/vektoren/wasser>">Wasser Vektor erstellt von freepik - de.freepik.com

<https://de.freepik.com/vektoren/abstrakt>">Abstrakt Vektor erstellt von starline - de.freepik.com

<https://de.freepik.com/vektoren/design>">Design Vektor erstellt von macrovector - de.freepik.com

<https://de.freepik.com/vektoren/lebensmittel>">Lebensmittel Vektor erstellt von macrovector - de.freepik.com

Figure 2. Cell-based salmon. © Anna Keeve

<https://www.businessinsider.com/wildtype-cultivated-cell-grown-salmon-looks-feels-tastes-real-2021-10>

<https://www.lifesalternateroute.com>

Figure 3. Sushi prepared with cell-based salmon. © Wildtype

<https://www.businessinsider.com/wildtype-cultivated-cell-grown-salmon-looks-feels-tastes-real-2021-10>



Figure 4. QR code invitation created to facilitate smart device access to the questionnaire

The QR code was deactivated on the survey's closing date. Translation: Would you care for some freshly cultivated *Sashimi*? A survey into Japanese consumer attitudes. It takes about 10 minutes to complete the questionnaire. You can take part in a gift lottery. You can win a 3,000 JPY Amazon Japan voucher. Participation is possible until the 15th of August.