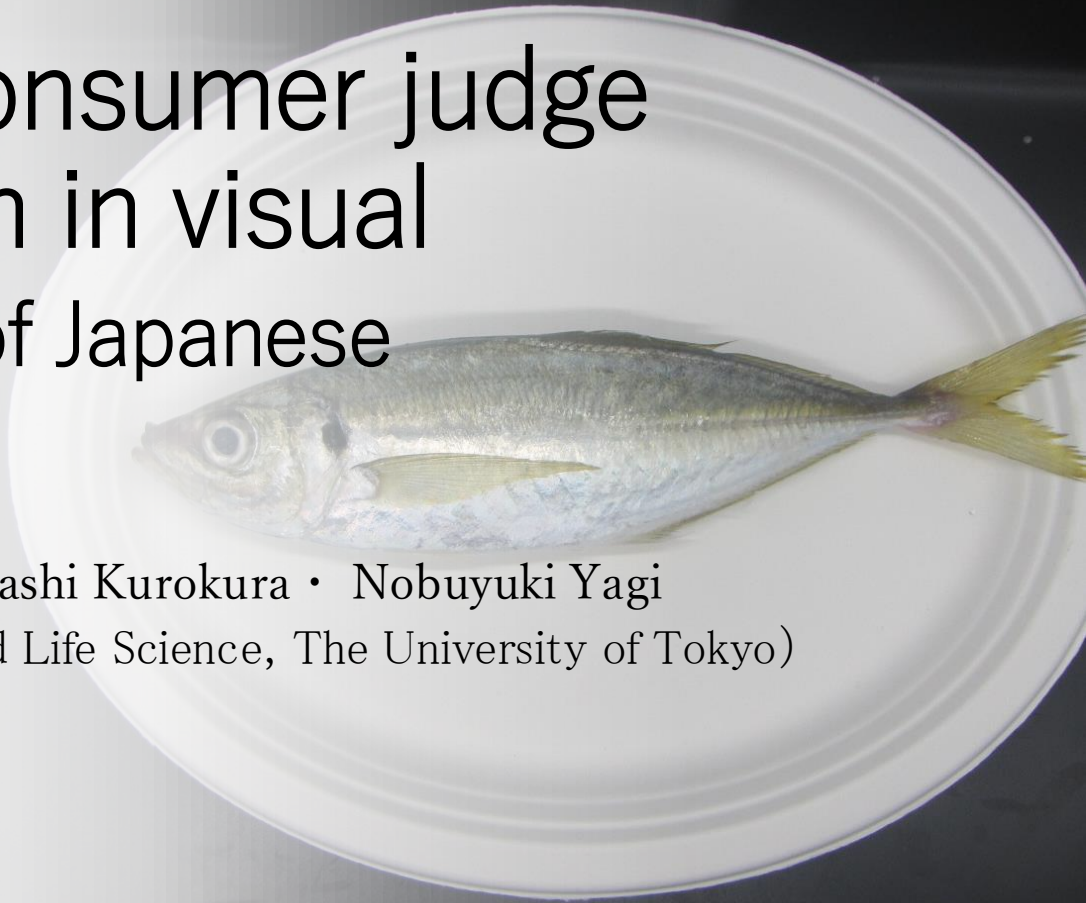# Can common consumer judge freshness of fish in visual way?-In the case of Japanese consumer

○Penglong Li・Yutaro Sakai・Hisashi Kurokura・ Nobuyuki Yagi
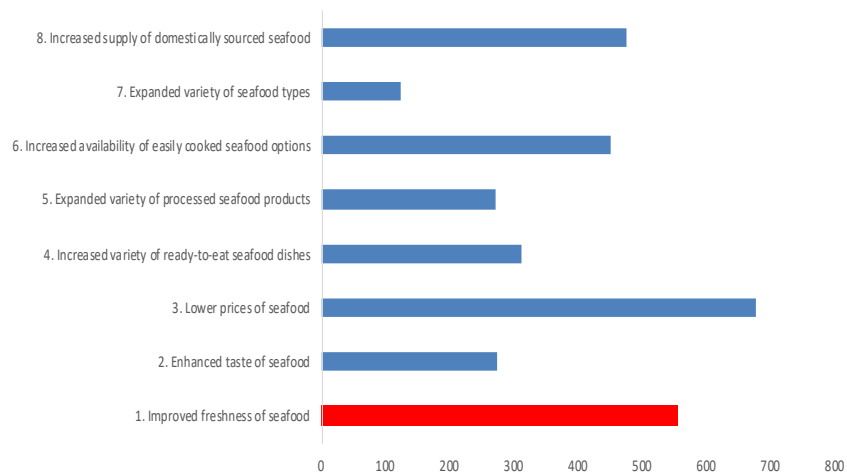（Graduate School of Agricultural and Life Science, The University of Tokyo）

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CONTENTS

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1:Freshness of fish is critical.

- Freshness is the most important quality for fish products.

- Especially in the situation of "魚離れ(decreasing interest in fish)" in Japan, freshness is very important to increase fish consumption.

Chart categories (top to bottom):
8. Increased supply of domestically sourced seafood
7. Expanded variety of seafood types
6. Increased availability of easily cooked seafood options
5. Expanded variety of processed seafood products
4. Increased variety of ready-to-eat seafood dishes
3. Lower prices of seafood
2. Enhanced taste of seafood
1. Improved freshness of seafood

To increase opportunities for consuming seafood dishes in our daily meals, what efforts are necessary
（Source： Ministry of Agriculture, Forestry and Fisheries, "Purchasing Behavior of Food Products"）

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2:Challenges in Assessing Freshness for Consumers

Current Methods:

1.Physical Tools:

1.Fish analyzer: A device that measures body impedance to observe quality.

2.Chemical Analysis:

1. K-value
2. Peroxide value
3. TVB (Total Volatile Base) value
4. P-value

Limitations: ➡ Complex and time-consuming. ➡ Not suitable for general consumers due to the technical expertise and equipment needed.

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3:The importance of Visual Judgement

•**Packaging in Stores:** Fish wrapped in plastic limits sensory assessment to sight.

•**Online Shopping:** Only photos and basic info are available.

•**The Reality:** Consumers largely depend on visuals to judge fish freshness.

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4:Privious Studies-fish freshness assess

- **Freshness Assessment (Chemical):**
  - P-value (Prabhakar et al., 2020).
  - K-value, TVB value (Hassoun and Karoui 2017)
- **Appearance-Based Assessment :**
  - Professionals' judgement based on appearance(Nakamura et al., 2011)
  - RGB color……………………………………   (Rocculi et al. ,2019)
  - Eye luminance ……….Murakoshi et al. (2013)
- **Technological Tools(Fish analyzer):**
  - utilized fish analyzers to assess the quality and distribution of freshness. (Sakai et al. ,2018)

➢ Lack of studies to focus on the general consumer's ability to judge fish freshness by appearance.

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5:Study Goals & Innovations

- **Study Goal:**
  - To investigate whether and how consumers can accurately judge fish freshness based solely on visual information.
- **Innovations :**
  - **Consumer Perspective:** First to focus on the general consumer's visual assessment of freshness.
  - **Visual Analysis:** A wider array of visual information (Color, Shape, Eye)
  - **Comparison with Technology:** Consumer judgments vs scientific data from fish analyzers

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2:Methods

2.1: Methods - Experimental Design

- Conducted an internet survey using photographs of horse mackerel.

- 529 participants from all age groups and prefectures in Japan.

- Participants chose the freshest fish from three photographs, repeated ten times.

Participant Experiment

Please select the one out of the following three horse mackerels that you think has the best freshness.

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2.2: Methods -Visual Information & Data Collection

•Luster was measured using Horiba IG 340 within 10 min of purchase(Fig1).

•Photos were taken in a standardized camera box for consistent visuals(Fig2).

•Freshness and fat content measured by Fish Analyzer Pro DFA110(Fig3).


Fig.1

Fig.2

Fig.3
Measure freshness and fatness using Fish analyzer

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## 2.3: Methods – Image Analysis & Extract informations

- Color information data---Analyzed six distinct body parts for color differences.
- Eye luminance value----calculated with the "imager" package in R.
- Shape information--- quantified using "shape" software.
- PCA (Principal Component Analysis)was used to quantify the color and shape information.
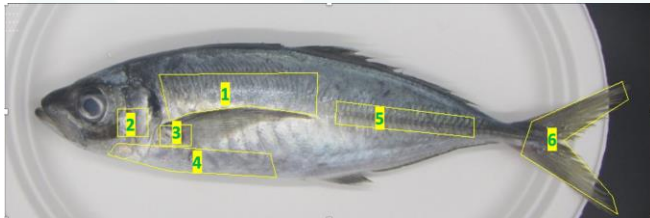
Six parts of Color
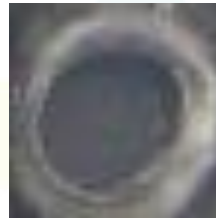
Separated eyes
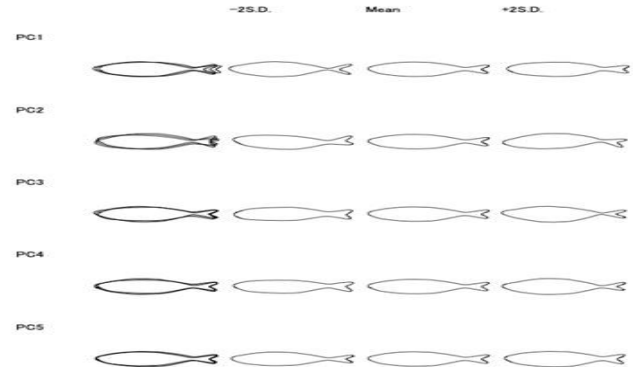
(Sample of Shape information)

2.4: Methods –Correlation analysis

- Using correlation analysis, we explore which visual factors are related to consumer judgment(Freshness score)

➢ Which factors do consumers utilize to determine freshness.

$$Score = \frac{number\ of\ selected\ times\ by\ participants}{number\ of\ times\ taked\ for\ alternative} \quad (1)$$

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3:Result

3.1: Result -Distribution of Correct Answers

-----Can consumers judge freshness?

• The average number of correct answers was 3.78(observed value)

• This average is higher than the random selection expected value of 3.33.

• Chi-square test confirmed the distribution differs from random (χ^2 = 53.48, critical value at α = 0.005 is 25.2).
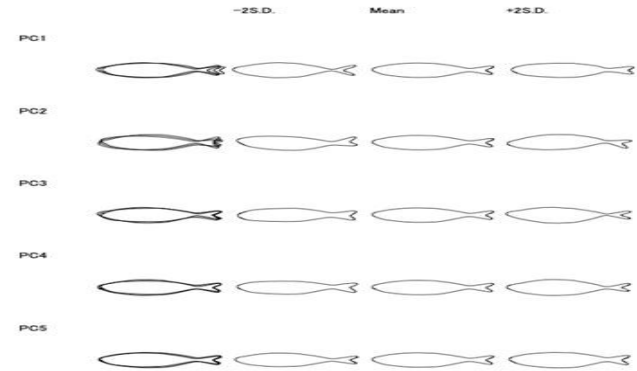

Distribution of participant with number of correct answer

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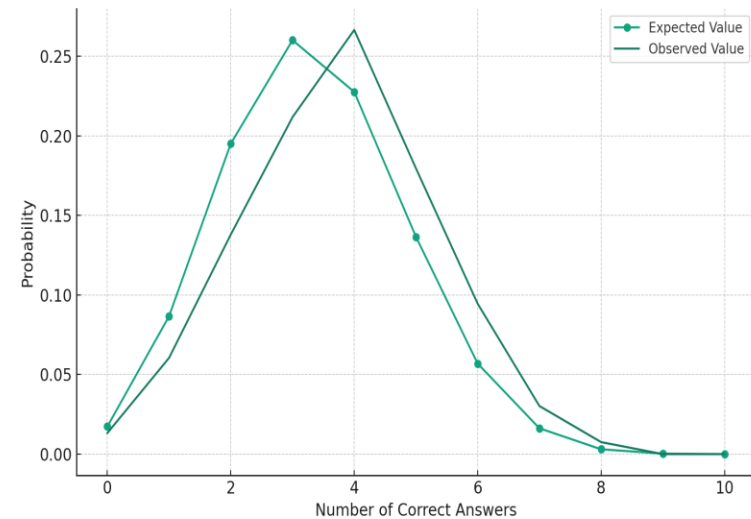
3.2: Result- principle component analysis
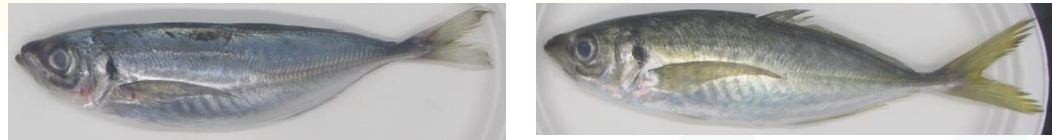
--How do they judge freshness

Extraction of Visual Information Components

- Ten principal components from color information and nine from shape information were identified. （PC1_C…PC10_C） (PC1_S…PC9_S)

(Sample of Shape information)

(Sample of Color information)

3.3: - Results –Correlation --How do they judge freshness

Table 1.Correlation
(visual informations and consumer freshness judgement)

•Eye luminance and color information exhibited notable correlations with consumer selection.

•   No significant correlation (statistically significant) between other visual information(shape, fat, size…)

Variable	Coefficient with Freshness Score	
Eye Luminance	0.59	***
PC1_C	0.17	***
PC2_C	-0.36	***
PC3_C	-0.18	***

PC1_S……PC9_S: Shape features
PC1_C…..PC10_C: Color features
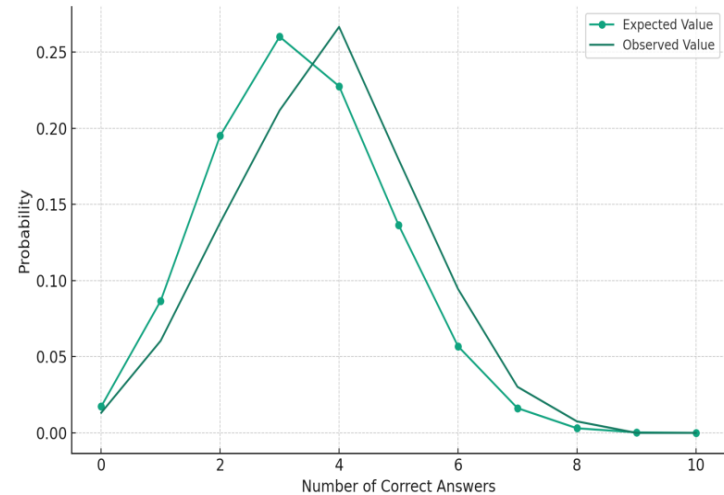***indicate statistical significance at the 1% levels, respectively.

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Discussion

4.1: Some Japanese could judge the freshness of fish based on appearance

➤ Observations are significantly larger than the expected value, and some consumers can judge the freshness from the pictures.

Distribution of participant with number of correct answer

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4.2: - Correlation

-------How do they judge freshness

- Most Japanese judge freshness by eye luminance and some color combinations.

- Shape information is not used in freshness judgment.

- There may be a subset of people with high accuracy in freshness judgment.

Table 2.Correlation (With Consumer Freshness Judgement score)

Variable	Coefficient with Freshness Score	
Eye Luminance	0.59	***
PC1_C	0.17	***
PC2_C	-0.36	***
PC3_C	-0.18	***

PC1_S......PC9_S: Shape features
PC1_C.....PC10_C: Color features

***indicate statistical significance at the 1% levels, respectively.

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7: Conclusion

7:Conclusion

•Japanese consumers can judge the freshness by visual cues.

•Japanese consumers mainly judge fish freshness by body color and eye luminance; other visual factors are less important.

•Assessment accuracy varies.

•The study highlights the role of visual presentation in seafood marketing and consumer choice.

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THE END

THANKS