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RESEARCH ARTICLE

An Analysis of Consumer Evaluations of the “Tagonoura Shirasu” Certification under the Japan Geographical Indication Protection System

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Abstract

Over time, the Geographical Indication (GI) protection system has been independently adopted in more than 100 countries worldwide. In Japan, the GI protection system has been operating since 2015 in response to a growing interest in local brands. Therefore, based on a questionnaire survey, we econometrically analyze the consumer evaluation of Shizuoka Prefecture's Shirasu “Tagonoura Shirasu,” which is registered under the GI protection system. Shirasu is a collective term for long and narrow larvae such as anchovy (*Engraulis japonicus*), sardine (*Sardinops melanostictus*), or red-eye round herring (*Etrumeus sadina*). Based on the contingent valuation method, we clarified that consumers' additional willingness to pay (WTP) for Tagonoura Shirasu was approximately 8.2% compared to the Shirasu produced in Shizuoka Prefecture, which has not been certified under the GI protection system. Moreover, eight characteristics of consumers with a high WTP were revealed: they have purchased Shirasu within the last year, attach importance to freshness when buying seafood, have a greater awareness of regional production standards when purchasing seafood, purchase foodstuffs linked to the revitalization of production areas and regions, show little regard for buying products as cheaply as possible when purchasing foodstuffs, know about the GI protection system in greater detail, are male, and have a high annual household income. To further enhance the economic value of Tagonoura Shirasu, it would be effective to target consumers with all eight characteristics for a high WTP.

Keywords: Geographical indication, Tagonoura Shirasu, Consumer evaluation, Japan

1. Introduction

Local brand initiatives are gaining increasing attention in Japan [1]. Regional brand initiatives are expected to contribute to the revitalization of regional economies by differentiating products from those of other regions and improving the local image by increasing the added value. However, as consumers' evaluations of a regional brand improve, so do the probability of damage to that evaluation and trust due to third parties free riding on those

regional brands. The need for appropriate legal protection for regional brands in Japan has been thus pointed out.

Therefore, in April 2006, a law partially amending the Trademark Act was implemented for trademark registration during the early stages of regional brand development, and the regional collective trademark system was launched. The regional collective trademark system is a system by which a trademark consisting of a region name and a product (service) name can be registered. That said, under the regional collective trademark system,

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product manufacturing methods and quality standards are voluntary and efforts to identify the unauthorized use of trademarks are to be made by the trademark holders themselves, while international trademark registrations must be made individually for each country (Table 1).

The operation of the Geographical Indication (GI) protection system in Japan begun in June 2015 [2]. As of November 2019, 86 products have been registered, including nine marine industry products. The GI protection is a system by which geographical indications can be registered nationally as intellectual property: for agricultural, forestry, and fishery

products possessing characteristics and traditions developed in a particular region and where quality and social regard are linked to the production area, a name is assigned to identify that link [3]. Unlike the regional collective trademark system, under GI protection system, the method of production and quality standards must be registered and adhered to (Table 1). Moreover, the state will act against the unauthorized use of certified products. Furthermore, when mutual protection is implemented between countries with GI protection systems, the registered products will also be protected in those countries.

Table 1. Differences between the GI protection system and the regional collective trademark system.

Item	GI protection system	Regional collective trademark system
Overview	Protected as an asset shared across an area. Protection for the name of products that have characteristics linked to the region.	Protection as a property (right) of the local organization. Protection for names which are well-known for their use by local organizations.
Name	If the area is specific, the name of the place need not be included.	“Area name” + “Product name,” etc.
Subject of protection	1. All edible agriculture, forestry, and fishery products. 2. 13 items*, namely agricultural, forestry, and fishery products not for consumption. 3. Products such as alcoholic beverages, pharmaceuticals, quasi-drugs, cosmetics, and regenerative medical products are excluded.	All products and services.
Registered entity	A group of producers or processors (non-corporate groups are also acceptable).	Agricultural cooperative associations, societies of commerce, chambers of commerce and industry Restricted to NPO corporations.
Destination of application	Ministry of Agriculture, Forestry and Fisheries.	Japan Patent Office
Key registration requirements	1. Possessing characteristics such as quality associated with the area of production. 2. Have a track record of continued production over a certain period (approximately 25 years).	1. There is a relationship between the name of region and the product. 2. The trademark is widely known among consumers.
Quality control	Yes. Registration of methods of production and standards of quality for the product, the subsequent addition of producer groups is also possible.	None. Producer standards are optional (may be freely set and changed), usage rights can be set arbitrarily.
Efficacy	Prohibition of the unauthorized use of geographical indications and other similar marks.	Prohibition of the unauthorized use of the registered trademark and other similar trademarks.
Regulatory measures	Government controlled.	Rights to be exercised by the individual.
Protection overseas	When mutual protections are implemented between two countries with geographical indication protection systems, these will be protected in both countries.	To be registered in each country individually.
Cost and protection period	Registration license fee: 90,000 yen. Protection period: Registered period.	Application fee: 3400 yen + (number of categories × 8600 yen). Registration fee: Number of categories × 28,200 yen. Protection period: 10 years.
Update	No procedure. No renewal fee required.	Procedures in place. Renewal fee: Number of categories × 38,800 yen.

Note: *The 13 items are ornamental plants, craft agricultural products, bamboo groves, ornamental fish, pearls, feed (limited to those produced or processed using agricultural, forestry, and fishery products as raw material), lacquer, bamboo, wood, charcoal, volatile oils, tatami mats, and raw silk.

Source: The Ministry of Agriculture, Forestry and Fisheries, compiled from “What is Geographic Indication Labeling?” (http://www.maff.go.jp/j/shokusan/gi_act/outline/index.html) and Japan Patent Office, “The Regional Collective Trademark System” (https://www.jpo.go.jp/system/trademark/gaiyo/chidan/t_dantai_syouhyou.html).

The [2] states that the GI protection systems aims to protect producers' interests by protecting local brands and points out that for the registration under GI for agricultural products, the following are evident: 1) counterfeit elimination, 2) increased trade, 3) increased supporters, and 4) increased price effects. However, a limited period of time has passed since the beginning of the operation of the GI protection system in Japan, and how consumers evaluate GI registered marine products is not yet necessarily fully understood.

The GI protection system is positioned as a form of intellectual property under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), one of the annexes of the WTO Agreement, and has been hitherto independently adopted in more than 100 countries [2]. For instance, the European Union introduced a standardized protection system in 1992. Europe has a history and track record of GI protection [4], and research on consumer evaluations of the GI protection system and products registered under GI protection systems is still ongoing [5]. Extant studies analyze the characteristics of consumers with a high awareness of the GI protection system and the characteristics of consumers highly motivated to purchase products registered under this system [6,7]. Concerning the economic value of products registered in the GI protection system [8], classify products according to consumer awareness and whether they target foreign or

domestic markets, and show the effects of price increases. Moreover, among GI protection systems, the strictly administered certification “Protected Designation of Origin” has a higher price premium than the loosely administered certification “Protected Geographical Indication” [9]. Further, the impact of different meat pieces on consumers' willingness to pay (WTP) has been analyzed [10]. As to the economic value of marine products registered in a GI protection system, the price premium of oysters [6] and of marine products as a whole is lower than those of other products [11]. [12] points out that products registered under a GI protection system can lead to the development of the tourism industry, which can be expected to revitalize the local economy.

However, few studies consider consumer awareness and intent regarding the Japanese GI protection system. To date, virtually no studies have analyzed how highly consumers evaluate marine products registered under the Japanese GI protection system, nor the characteristics of consumers who evaluate these marine products highly. In Japanese fisheries policy, the 2017 Basic Fisheries Plan promotes the efforts to protect the brand value of high-quality marine products by using the GI protection system [13].

Therefore, we clarify consumers' valuation of Shizuoka Prefecture's “Tagonoura Shirasu,” which was registered under Japan's GI protection system in 2017 (Fig. 1). Specifically, based on a survey of

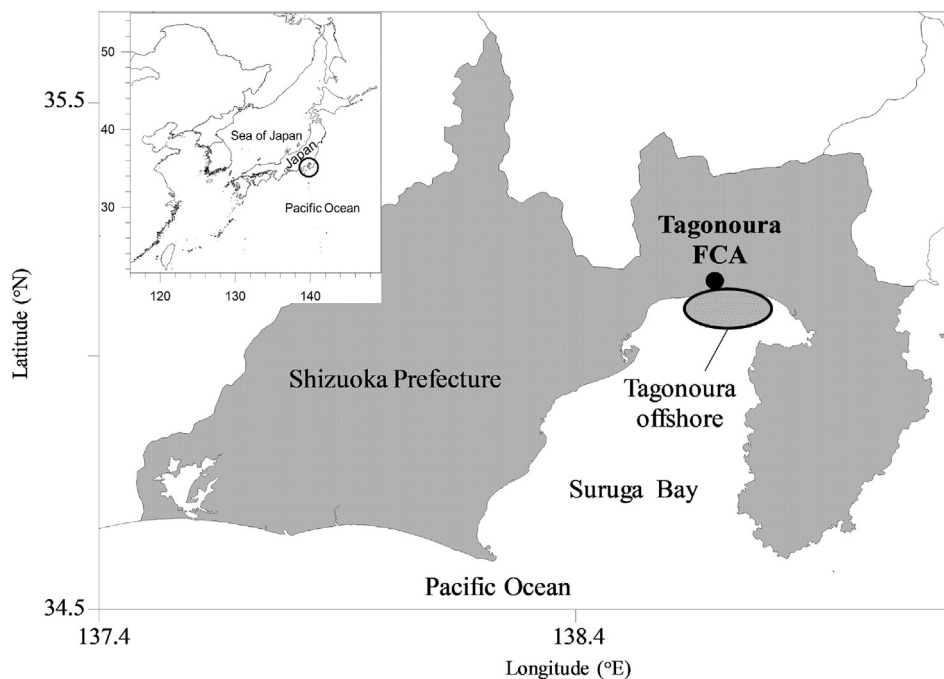


Fig. 1. Tagonoura fishery cooperative association and Tagonoura Shirasu's fishing ground.

Table 2. Production methods for Tagonoura Shirasu.

Item	Content
Fishing ground	Off Tagonoura, Shizuoka Prefecture (Off the coasts of Fuji City and Numazu City)
Fishing method	Shirasu single boat seine fishing
1. Fishing method	Immediately after catching the fish, the Shirasu is transferred to a colander to drain the water in the ship.
2. Freshness management	1) Use of colanders
	2) Ice packing work
	3) Prompt unloading
	A large quantity of ice is placed among the Shirasu that has been transferred to the colander, and stirred by hand to prevent damage to the Shirasu.
	Prompt return to port after fishing, and directly unloading at the market without being left in high-temperature locations for any length of time
Landing port	Tagonoura Port, Fuji City, Shizuoka Prefecture
Final product form	Fresh fish

Source: Compiled from [17].

consumers in Japan's major consumer areas, the Kanto and Kansai regions, along with measuring the economic value of Tagonoura Shirasu, we present the characteristics of consumers who regard its economic value to be high. To this end, we apply the contingent valuation method (CVM) to clarify the additional WTP permissible to consumers, as well as the consumer characteristics that affect the WTP (%) for Tagonoura Shirasu compared to Shizuoka Prefecture, where Shirasu that has not been certified under the GI protection system.

Shirasu is caught throughout Japan, the main catch areas being the Pacific coast below Fukushima Prefecture and the Kyushu west coast that faces the East China Sea and the Seto Inland Sea [14]. Shirasu is not the name of a fish, but rather a general term for fish that have extremely poor chromatophores in their early developmental stages, often referring to long and narrow larvae such as anchovy (*Engraulis japonicus*), sardine (*Sardinops melanostictus*), and red-eye round herring (*Etrumeus sadina*) [15,16]. The forms in which Shirasu is consumed are raw, boiled, and dried. Where sufficiently fresh, it is eaten raw. Salted Shirasu is used for boiled Shirasu, while dried Shirasu is prepared either by using a hot air dryer or sun-drying treatment.

Shizuoka Prefecture ranks second in terms of Shirasu production in Japan. It accounted for 14.1% (8,905 tons) of the Japanese Shirasu production in 2016 (63,180 tons) [14]. Tagonoura Shirasu represents only 1.7% (147 tons) of Shizuoka Prefecture's production (8,905 tons) [17]. Understanding its valuation by consumers from Japan's main

consumer regions, Kanto and Kansai, is expected to be highly significant to expanding the sales channels for Tagonoura Shirasu outside of Shizuoka Prefecture and investigating value-added sales.

2. Materials and methods

2.1. Tagonoura Shirasu¹

The Tagonoura Fishery Cooperative in Shizuoka Prefecture is the registered producer group for Tagonoura Shirasu under the GI protection system. Tagonoura Shirasu specifies everything from the fishing grounds to the final form of the product (Table 2). The fishing ground is off the coast of Tagonoura, within 30 min of Tagonoura Port (Fig. 1, [17]). It also specifies how to manage freshness, such as methods of fishing and ice packing following the catch. The landing site is only Tagonoura Port and the final product is fresh fish.

The fishing ground off Tagonoura can only be used by one ship at a time due to the steep terrain. However, since only small quantities can be caught by a single boat, Shirasu can be caught without harm. Moreover, because the fishing ground is close and the production methods for freshness management are also specified, even thawed raw Shirasu have a texture almost indistinguishable from freshly caught Shirasu. Boiled Shirasu is salted and bent at the neck, being plump and shaped like the letter L, and has a strong umami flavor.

Due to the freshness and qualities cited above, the average price for Tagonoura Shirasu at the time of

¹ Mainly compiled with reference to public registration notice no. 36 (http://www.maff.go.jp/j/shokusan/gi_act/register/36.html).



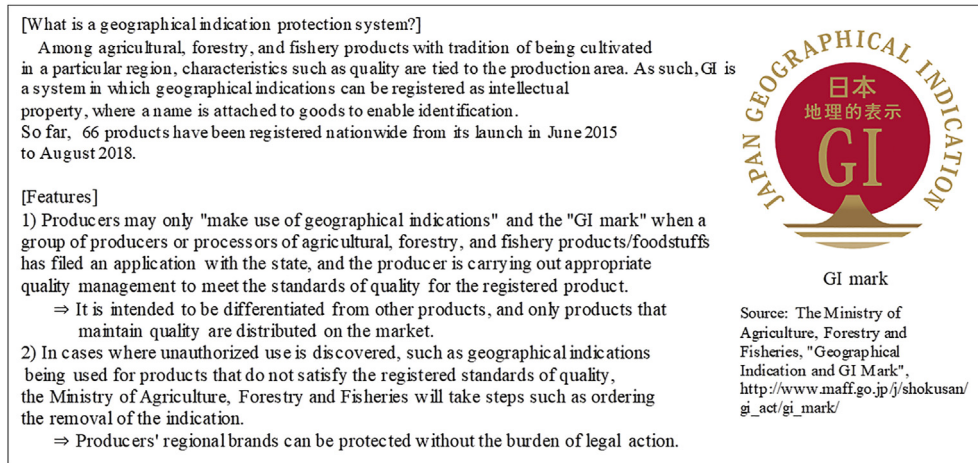


Fig. 2. Explanation of the GI protection system in the survey.

landing between 2007 and 2016 was 694 yen/kg, trading at 128 yen/kg above the average price at six ports within Shizuoka Prefecture, that is, at 556 yen/kg. Recently, distributors and processors in nearby Shirasu producing areas within Shizuoka Prefecture have begun purchasing Shirasu from Tagonoura. The average price at the time of landing for Tagonoura Shirasu in 2016 was 923 yen/kg and it received good reviews.

2.2. Consumer questionnaire

For the consumer questionnaire, in October 2018, internet research was conducted by a survey research company. The targets of the survey were assumed to be consumers who had the potential to become purchasers, being over 20 years old and the main person purchasing seafood in their household. Target regions for the survey were six prefectures and one metropolis in the Kanto region (Tokyo, Kanagawa, Saitama, Chiba, Ibaraki, Tochigi, and Gunma prefectures) and four prefectures and two metropolises in the Kansai region (Osaka, Kyoto, Hyogo, Shiga, Nara, and Wakayama prefectures), which are the major consumption areas in Japan. Data were collected according to the population distribution by age bracket and prefecture.

In the survey, in addition to awareness and behavior when purchasing foods and personal attributes, questions about the GI protection system and CVM were also included. Among the questions concerning the GI protection system and CVM, the GI mark was first shown and an overview of the GI protection system given, with its characteristics explained (Fig. 2). Additionally, a photograph of Tagonoura Shirasu was presented, and an overview of Tagonoura Shirasu's production area, product characteristics, links to the region, etc. given (Fig. 3).

Next, a hypothetical situation was presented to the respondent: "Suppose that two types of boiled Shirasu packs are now being sold at the fishmonger's counter at the supermarket, completely identical in freshness, appearance, taste, and weight. The first is boiled Shirasu certified as Tagonoura Shirasu under the GI protection system, and the packaging bears the GI mark. The other is boiled Shirasu from Shizuoka Prefecture that has not been certified under the GI protection system." For respondents answering they would purchase the Tagonoura Shirasu, the additional permissible WTP was inquired: "Considering your situation and your household, and comparing Tagonoura Shirasu boiled Shirasu which has been certified with the GI logo with other boiled Shirasu from Shizuoka Prefecture, up to what percentage difference in price would you continue to choose to purchase the Tagonoura Shirasu?" Additionally, respondents were informed that one pack of boiled Shirasu from Shizuoka Prefecture, which had not received GI certification (60 g), was 300 yen. With reference to [18,19]; and [20]; the available choices for the difference in the price were less than 3%, more than 3% but less than 5%, more than 5% but less than 10%, more than 10% but less than 15%, more than 15% but less than 20%, more than 20% but less than 25%, more than 25% but less than 30%, more than 30% but less than 50%, and more than 50% (nine categories).

2.3. Method of analysis and data

Of the 1000 collected responses, after excluding the resistant response sample, 889 were used in the analysis (i.e., an effective response rate of 88.9%). Resistant responses were considered those who did not wish to purchase Tagonoura Shirasu for reasons


[Characteristics of Tagonoura Shirasu]

○ Production area:
Off the coast of Tagonoura, Shizuoka Prefecture
(Off Fuji City/Off Numazu City)

○ Registered producer group:
The Tagonoura Fishery Cooperative Association

○ Product characteristics:
They are fresh and have a good appearance when unloaded, and are characterized by a clear and crisp texture.
Even when thawed from frozen, these are indistinguishable from those at the time of unloading. Since there is little damage due to its freshness, they take a letter L-shape when boiled, being plump and with a rich flavor.

○ Links to the region area:
The fishing ground is located in the northernmost part of Suruga Bay, which is rich in plankton due to the nutrients from Mt. Fuji and the Southern Alps, and the distance to the port of unloading is also short. In addition, Shirasu with good freshness and a good appearance is obtained by fishing using "shirasu one-boat net fishing," which can catch the Shirasu without causing damage and then thoroughly packing the catch in ice on the ship.



Tagonoura Shirasu

Source: The Ministry of Agriculture, Forestry and Fisheries, "Ministry of Agriculture, Forestry and Fisheries GI Registered Product - Public Notice of Registration List (Registration No.36)", http://www.maff.go.jp/j/shokusan/gi_act/register/36.html

Fig. 3. Explanation of Tagonoura Shirasu in the survey.

Table 3. Variable definitions.

Variable	Definition	Number of responses	Frequency	
SHIRA	Purchased Shirasu within the past year	1 = yes	185	20.8%
		0 = otherwise	704	79.2%
CHEAPER	Purchases food as cheaply as possible	1 = disagree	51	5.7%
		2 = somewhat disagree	110	12.4%
		3 = neither agree or disagree	232	26.1%
		4 = somewhat agree	294	33.1%
		5 = agree	202	22.7%
FRESH	Emphasizes freshness when purchasing seafood	1 = emphasizes	356	40.0%
		0 = otherwise	533	60.0%
LEVEL	The level of awareness of the name of the production area when purchasing seafood	1 = does not care at all about the production area, be it domestic or foreign	271	30.5%
		2 = prefers domestic production	434	48.8%
		3 = cares about the name of the prefecture	139	15.6%
		4 = cares about the names of municipalities in the area and the names of fishing ports	22	2.5%
		5 = cares about the producer name	23	2.6%
KASSEI	Purchases food linked to the revitalization of production areas and regions	1 = disagree	63	7.1%
		2 = somewhat disagree	150	16.9%
		3 = neither agree or disagree	390	43.9%
		4 = somewhat agree	226	25.4%
		5 = agree	60	6.7%
GININCHI	To what extent do you know about the GI protection system?	1 = Not at all	676	76.0%
		2 = I know only the term	139	15.6%
		3 = I know the term and what it means	74	8.3%
GENDER	Gender	1 = male	303	34.1%
		0 = female	586	65.9%
INCOME	Household annual income	100 = less than 2 million yen	117	13.2%
		300 = 2–4 million yen	249	28.0%
		500 = 4–6 million yen	210	23.6%
		700 = 6–8 million yen	144	16.2%
		900 = 8–10 million yen	88	9.9%
		1250 = 10–15 million yen	58	6.5%
1750 = 15 million yen or over	23	2.6%		

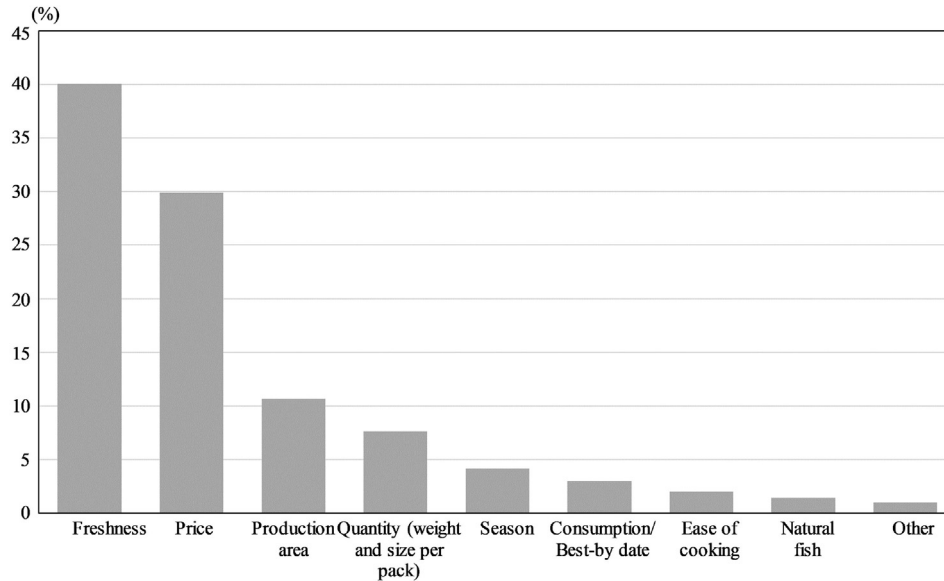


Fig. 4. Points emphasized when purchasing seafood. Note: n = 889.

that bore no relation to WTP, such as not understanding the question.

The available choices for the price difference (relatively high) were presented as WTP brackets that included the respondent's WTP. By taking the midpoint of the bracket as the respondent's WTP, it was possible to apply ordinary least squares (OLS). However, where the respondent's expected WTP value was not equal to the midpoint of the brackets presented, applying OLS will engender estimate biases [21].

We therefore applied a grouped data regression model, in which each available price difference (relatively high) option had a bracket; in other words, it was possible to estimate the aggregated WTP valuation function [18–22]. The valuation function was established as follows:

$$\ln WTP_i = \alpha + \chi_i' \beta + \epsilon_i.$$

Here, WTP_i is the WTP of respondent i , α a constant term, χ_i the attribute column vector for

Table 5. Distribution of respondents' WTP (n = 889).

Interval	WTP (Yen/60g)	Number of responses	Distribution
0–3%	$0 \leq WTP < 9$	309	34.8%
3–5%	$9 \leq WTP < 15$	128	14.4%
5–10%	$15 \leq WTP < 30$	195	21.9%
10–15%	$30 \leq WTP < 45$	120	13.5%
15–20%	$45 \leq WTP < 60$	61	6.9%
20–25%	$60 \leq WTP < 75$	33	3.7%
25–30%	$75 \leq WTP < 90$	16	1.8%
30–50%	$90 \leq WTP < 150$	18	2.0%
More than 50%	$150 \leq WTP$	9	1.0%

each explanatory variable, β the coefficient column vector of χ_i , and ϵ_i independent and expresses the error term that follows a normal distribution with mean of zero and variance σ^2 . Parameters were estimated using the maximum likelihood method, with the average value of WTP being $\exp(\hat{\alpha} + \chi_i' \hat{\beta} + \sigma^2/2)$ and the median value $(\hat{\alpha} + \chi_i' \hat{\beta})$. \wedge represents the estimated value of the parameter.

Table 4. Methods to obtain information about the geographical indications of Tagonoura Shirasu desired by respondents.

Item	Number of responses	Percentage
Display information on the tray pack	353	39.7%
Display information at the store	264	29.7%
Display on devices such as touch panels	29	3.3%
Information can be obtained on smartphones or computers	29	3.3%
You can ask the store clerks for information	17	1.9%
If it has obtained the GI certification (GI mark), then there is no need to know further information	43	4.8%
Other	154	17.3%
Total	889	100.0%

Table 6. Result of the grouped data regression model.

Variable	Estimated value	SE	Mean
SHIRA	0.2933***	0.0977	0.7919
CHEAPER	-0.1100***	0.0338	3.5467
FRESH	0.2095***	0.0771	0.4004
LEVEL	0.1304***	0.0432	1.9786
KASSEI	0.1076***	0.0387	3.0787
GININCHI	0.1719***	0.0596	1.3228
GENDER	0.1607**	0.0805	0.3408
INCOME	0.0003***	0.0001	544.6007
CONST	0.6053***	0.2274	
σ	1.0319***	0.0335	
Sample size	889		
Maximum log-likelihood	-1528.4692		
Mean WTP	8.2445%		
Median WTP	4.8413%		

Note: ** and *** denote statistical significance at the 5% and 1% levels, respectively.

The explanatory variables include the frequency of purchasing ingredients and fresh fish, points emphasized when purchasing seafood, conscientiousness and behavior when purchasing seafood, extent of awareness of the Japanese GI protection system and expected effects, as well as the personal attributes of the respondent.

3. Results

Among the candidate explanatory variables in section 2.3 and as subsequently described, the characteristic points of survey response results ($n = 889$) are explained using the results from the grouped data regression model, focusing on statistically significant variables (Table 3).

Within the past year, 20.8% of respondents had purchased Shirasu (SHIRA). Unlike livestock, there are many types of seafood and, with about 20% of respondents having purchased Shirasu within the past year, the frequency of Shirasu purchase by consumers cannot be considered low. Overall, 55.8% of respondents answered “true” or “somewhat true” to purchasing food as cheaply as possible (CHEAPER). In other words, more than half of respondents are conscious of price when purchasing food.

Regarding the level of awareness of the name of the production area when purchasing seafood, 48.8% of respondents preferred domestically produced products, while this choice extended to the names of producers for just 2.6% of respondents (LEVEL). In other words, when purchasing seafood at the supermarket, respondents typically emphasize whether the products were domestically produced and few respondents emphasized more detailed production information.

Overall, 32.1% of respondents responded with “true” or “somewhat true” to the statement that purchasing foodstuffs is linked to the revitalization of the producer area or region (KASSEI). In other words, for more than half of the respondents, the revitalization of producer areas and regions is not a source of motivation when purchasing food.

Regarding the level of awareness of the GI protection system, 76.0% of respondents did not know about it (GININCHI). Only 8.3% of respondents knew both the term and its significance. Only 8.3% of respondents knew both the term and its significance. At the time this survey was carried out (October 2018), about three years had passed since the start (June 2015) of the Japanese GI protection system, which means the extent of respondents' awareness of the system can be said to be low.

Table 3 shows the responses regarding freshness as a point emphasized when purchasing seafood (FRESH). In the survey, the respondents selected the most important points from among nine items: production area, quantity, freshness, price, season, natural fish, consume by/expiration date, ease of cooking, and others (Fig. 4). Among the nine items, the most important (%) were freshness, (40.0%), price (29.9%), and production area (10.7%). In other words, respondents placed the highest emphasis on freshness when purchasing seafood. In previous studies, most respondents also emphasized freshness when purchasing fresh fish [23] and vegetables [19]. When purchasing fresh ingredients, such as seafood and vegetables, consumers are thought to place the highest emphasis on freshness. Furthermore, the order of priorities when purchasing fresh fish and vegetables, like the results of this paper's analysis and in order starting with the highest percentage share, are freshness, price and production area.

Table 4 shows the methods by which respondents wished to obtain information about Tagonoura Shirasu's geographical indication (e.g., production area, product characteristics, ties to the region). Most respondents wanted information to be displayed on the tray packaging (39.7%), followed by displaying information within the store (29.7%). Few respondents wished to obtain information by other means. In other words, rather than act independently by using a computer or inquiring from store clerks to obtain information about geographical indication, respondents wished to be able to obtain such information when shopping easily and directly.

We explain the results on respondents' additional permitted WTP (%) by comparing Tagonoura Shirasu to Shizuoka Prefecture's boiled Shirasu, which

has not received certification under the GI protection system (300 yen/60 g) (Table 5). Respondents with a WTP of 3% or less (9 yen/60 g) were most numerous, at 34.8%. Respondents with a WTP of 15% or less (45 yen/60 g) comprised 84.6% of respondents, with few respondents being willing to pay more than a 15% price premium.

Table 6 shows the results of applying a grouped data regression model to the characteristics of the consumers that evaluate the economic value of Tagonoura Shirasu highly. For consumer characteristics, eight parameters were statistically significant at the 1% or 5% levels.

SHIRA, *FRESH*, *CHEAPER*, *LEVEL*, and *KASSEI* are the variables concerning awareness and behavior when respondents usually purchase food. *SHIRA*, *FRESH*, *LEVEL*, and *KASSEI* are positive, and the more frequently a respondent has purchased Shirasu within the past year, the greater the emphasis he/she places on freshness when purchasing seafood was, the greater awareness of detailed production standards when purchasing seafood and the more respondents purchased foodstuffs linked to the revitalization of producer areas and regions, the higher their WTP was. *CHEAPER* was negative, meaning the less regard a respondent showed for price when purchasing foodstuffs, the higher their WTP. In previous research, consumers who are conscious of purchasing food as cheaply as possible tend to value the added value of certified foodstuffs lowly [24]. The negative result for *CHEAPER* is therefore consistent with these previous results.

Among the variables concerning the assessment of the Japanese GI protection system, *GININCHI* is statistically significant and positive, meaning that the more a respondent knew details about the GI protection system, the higher their WTP was.

GENDER and *INCOME* are variables related to the personal attributes of respondents. Both are positive, with males and respondents with high annual household incomes having a high WTP.

The additional average WTP for Tagonoura Shirasu, measured based on the results of the grouped data regression model, was around 8.2%. In other words, the WTP of the Tagonoura Shirasu certified under the GI protection system was around 8.2% higher than that of the uncertified Shizuoka Prefecture Shirasu. We assumed in the survey that the price of Shizuoka Prefecture's boiled Shirasu, which had not been certified under the GI protection system, was 300 yen/60 g. As a result, respondents were found to remain willing to purchase Tagonoura Shirasu at a price around 24.7 yen higher (about 8.2%), that is, at 324.7 yen.

4. Discussion

Tagonoura Shirasu was evaluated as having an average WTP 8.2% higher than Shizuoka Prefecture's Shirasu, which had not been certified under the GI protection system (Table 6). This result is not particularly high compared to the average price premium of 16% for marine products registered under the EU GI system [11]. However, the Japanese GI protection system has been only recently launched and its recognition is still low (Table 3).

In Japanese fisheries policy, the 2017 Basic Fisheries Plan promotes the efforts to protect the brand value of high-quality marine products by using the GI protection system [13]. To promote the protection of regional brands using the GI protection system, from an economic perspective, producers must be able to achieve value-added sales and increase their incomes by registering marine products in the system. As stated above, the [2] points out that registering agricultural products under the GI protection system mainly has price increasing effects.

From our analysis, the consumers with a high WTP for Tagonoura Shirasu are those that have purchased Shirasu within the past year (*SHIRA*), emphasize freshness when purchasing seafood (*FRESH*), have more detailed knowledge of production area standards when purchasing seafood (*LEVEL*), purchase foodstuffs linked to the revitalization of production areas and regions (*KASSEI*), have little regard for purchasing the cheapest possible foodstuffs (*CHEAPER*), have more knowledge on the GI protection system (*GININCHI*), are male (*GENDER*), and have a high annual household income (*INCOME*) (Table 6). In the future, it is thought that appealing Tagonoura Shirasu targeting consumers with a high WTP will be effective in promoting Tagonoura Shirasu.

For example, 1) the more detailed a respondent's knowledge of the GI protection system (*GININCHI*), the higher their WTP for Tagonoura Shirasu is. In other words, to increase the WTP for Tagonoura Shirasu, it is important to first enable consumers to understand the GI protection system and its characteristics (Table 3). 2) The greater the emphasis placed on freshness by a respondent when purchasing seafood (*FRESH*), the higher their WTP for Tagonoura Shirasu is. It is therefore important to appeal strongly to consumers that Tagonoura Shirasu has a high degree of freshness due to its production method (Table 2), product characteristics, as well as its links to the local region (Table 4). 3) The higher the respondents' awareness of detailed production area standards (*LEVEL*) and their purchase

of foodstuffs linked to the revitalization of production areas and regions (*KASSEI*), the higher their WTP for Tagonoura Shirasu is. Therefore, there are effects in addition to the fact that the GI protection system can protect regional brands, Tagonoura Shirasu's characteristics (production area, registered producer group, product characteristics and links to the region) can strongly appeal to consumers by emphasizing who made the product, where it was made, and how it was made (Table 4).

Shirasu is not only caught in a particular area in Japan, but in various regions. Moreover, it is caught naturally and it is thus difficult to control production using techniques such as improved feed as with farmed fish. Therefore, in addition to the high degree of freshness of Tagonoura Shirasu, it is thought that strong emphasis of it being a regional brand with tradition and characteristics nurtured within a specific region, as well as how it is differentiated from the Shirasu in other regions, will be effective in the appeal to consumers. A such, utilizing the characteristics of consumers with a high WTP for Tagonoura Shirasu in this study is expected to contribute to increased incomes for producers and the spread of the GI protection system.

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Conflict of interest statement

The authors declare no conflict of interest.

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