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Article

Consumer Acceptance of Eco-Labeled Fish: A Mexican Case Study

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Abstract: Fish eco-labeling is a market-based incentive program for sustainable fisheries. This paper examines consumers' acceptance of eco-labeled fish by using data from a pilot study conducted in a coastal area of northwestern Mexico. An ordered probit model was applied, using 364 observations. The results show that most respondents favor the idea of eco-labeled fish as a sustainable option and know that this is a costlier option. Income level, consumers' occupation and frequency of fish consumption are factors taken into account in the buying decision. Price was not a statistically significant factor affecting purchase decision. The study suggests that employed consumers with knowledge of labels may prioritize their demand for eco-labeled fish. Thus, providing a clear definition of sustainability that increases consumer awareness might be a promising strategy in developing the market for eco-labeled fish. The results and their implications could be employed as an element for future development of consumer policies related to fish sustainability.

Keywords: eco-labeling; seafood; dolphin-safe; MSC certification; consumer preferences; probit model

1. Introduction

In the last two decades, independent and private schemes have emerged with a view toward rewarding sustainable and well-managed fisheries by means of market-based incentives. Eco-labeling is one of the market-driven initiatives relying on voluntary compliance with certain desired standards. The aim of eco-labeling is to establish a market where consumers have selective purchasing power and prefer eco-labeled products rather than products that are not eco-labeled. Under this model, eco-labeling represents environmental, economic and administrative policy in emerging niche markets [1].

Eco-labels may refer to a single attribute of the fishery or to several attributes. The single-attribute labels focus on one environmental issue, such as the "dolphin-safe" label, created in 1990 by the American Earth Island Institute to deal with the controversy over capturing dolphins in the Pacific that was associated with tuna fishing. Although criticized for not using a consistent global standard [2], in the U.S. market, the label was successful in increasing market share for canned tuna brands that displayed it, owing to consumer willingness to pay more in exchange for a reduction in the dolphin mortality rate [3].

Multiple-attribute eco-labels target a specific species, but also focus on protection of marine ecosystems. The multiple-attribute eco-labels often involve an elaborate process of third-party certification that guarantees that seafood meets the sustainability standards against which it is evaluated. Currently, the Marine Stewardship Council (MSC) label is the most widespread worldwide, with 220 certified fisheries accounting for about 10% of the global catch, and it has a large presence in the marketplace of developed countries [4]. Retailers, such as Sainsbury's, Tesco, Marks and Spencer, Wal-Mart and Whole Foods Market, are selling MSC-labeled products [5].

Having originated in developed countries, consumer studies of seafood eco-labeling have shown little engagement with developing countries, where few fisheries have been awarded an eco-label [5]. The studies addressing consumers' willingness-to-pay (WTP) for eco-labeled seafood often are based on contingent valuation survey data. They find that consumer preference for eco-labeled seafood depends on socio-demographic issues, as well as product features [6–8]. Acceptance in the U.S. is related to fish species and consumers' geographic region (coastal or interior) [6]. In the U.K. and Norway, price is the most influential factor for the consumer, but the source of the label (government or private scheme, name) is also important [7]. Jaffry *et al.* [8] find that the origin of the fish has a significant effect on supporting consumer interest in eco-labeled seafood in the U.K. In China, a probit model shows that consumers' demographics and knowledge of the labeled products affect purchase intention and WTP [9]. A choice experiment argues that Japanese consumers consider news of fish stock status and wild *vs*. farmed origin as factors defining willingness to buy eco-labeled seafood [10].

Studies of specific fisheries seeking the MSC label show that consumers are willing to pay a higher price for pollock (France) [11] and lobster (U.S.) [12]. Brécard *et al.* [13] find that French and Belgian consumers are familiar with fish eco-labels and that the harvesting process (wild *vs.* farmed) and the price are factors influencing the decision to buy. Surveys indicated that when price increases, consumers are less likely to choose eco-labeled products [7,8,12]. Roheim *et al.* [14] show a higher consumer demand and a 14.2% price premium on MSC-labeled processed frozen pollock than non-MSC fish products in the U.K. marketplace.

Considering MSC eco-labeling and marketing as a pathway to improve the fish stocks' health by creating economic incentives for producers [15], the question is: does eco-labeling have a future in developing countries' markets? This paper presents evidence of consumer empathy for eco-labeled fish in Mexico, in terms of willingness to demand sustainable fish. Fisheries in Mexico account for about 1.5 million tons per year, worth about US$ 1.3 billion [16]. Most harvest is sold in the national market where annual per capita fish consumption is about 10 kg [17]. Currently, there are five MSC-certified Mexican fisheries, but MSC-labeled fish products are not available in the local market [4]. It would be helpful for policy makers, fisheries managers, retail managers and eco-labeling organizations to know whether consumers are willing to demand eco-labeled fish.

This paper is organized into the following sections. The second section describes the survey and the econometric model. The third section explains the main findings, such as the characteristics of respondents, their potential acceptance of eco-labeled fish and the various factors determining it. Finally, while the study was carried out in a small Mexican city, the conclusions may be transferable to other locations in Mexico and other emerging countries.

2. Methods

2.1. Survey Design and Application

This study is meant to evaluate consumers' potential acceptance of fish product eco-labeling initiatives by focusing on the MSC label. Since MSC-labeled products are sold in the developed nations by the retail industry, this study considered that retailers, such as supermarket chains, may facilitate fish eco-labeled product access by promoting consumer acceptance [5,9,18–20].

Survey data were gathered from 364 consumers during the summer of 2011 in six supermarkets of Los Cabos, Mexico, an important coastal and tourist city. The sample size was determined based on the population size of the area [21] and the infinite population formula [22]: $n = (Z^2 \times p \times q)/e^2$, where n is the sample size; $Z = 1.96$; $p = 0.5$; $q = 1 - p$; $e = 0.05$.

The face-to-face voluntary and anonymous participation survey consisted of fifteen questions in Spanish. The survey began with a question used as a filter to separate fish consumers from non-consumers and a statement explaining why the subsequent questions were being asked. Since the term seafood implies fish, shellfish and roe, irrespective of the origin (cultivated or wild, marine or freshwater), to avoid consumer confusion, the study deals only with the term fish from any source.

The survey was designed to capture information on four sections: (1) frequency of fish consumption and the major factors that affected consumers' existing choice of fish products; (2) knowledge of food labels; (3) consumer acceptance of eco-labeled fish; and (4) the socio-demographics of the participants (Appendix 1). Based on previous studies [6–9,12,13], demographics include origin, gender, age, education, occupation and income.

The research was carried out in six days (one day per supermarket). Respondents were those intercepted outside supermarket locations who were willing to be interviewed. The first author conducted all of the data collection at several times of the day to maximize the coverage of the different consumer segments.

2.2. Ordered Probit Model

The consumer's decision about a set of alternatives relies on the utility theory of economics. Within this framework, if a consumer expresses his or her preferences for eco-labeled fish based on a decision process where the utility is ordinal, the random utility is specified as:

$$U_i^* = x_i'\beta + z_i'\gamma + \varepsilon \quad (1)$$

where the consumer reveals a censored version of U_i^* through an endogenous variable y that takes the value of 0 if the consumer chooses the first option, the value of 1 if the consumer chooses the second option, and so on, until the last alternative. The endogenous variable (acceptance of eco-labeled) is analyzed through an ordered response model [23–25]. In this study, the question constituted by the endogenous variable was: If a fish product with a consumer label showing that it came from a sustainable fishery were available for sale with a price variation up to 15% compared to non-labeled fish products, would you prefer the labeled product rather than the non-labeled? At this point, the survey establishes that "attributes, such as taste and freshness, are the same in labeled fish and unlabeled fish" (Appendix 1). In order to avoid inaccuracy from the consumers, a sustainable fishery was defined as "a fishery that uses procedures to prevent overfishing to ensure future supply of fish" before the question was posed.

The premium "up to 15%" was based on previous studies that show consumer WTP between 5%−11% for eco-labeled fish [11] and a 10%−14.2% price premium on MSC-labeled fish [14,19,26]. The endogenous variable was ordered through a Likert scale that measures attitudes, preferences and perceptions of respondents toward a specific statement [27]. Since attitudes are unobservable, they could be inferred through human behavior. When individuals show a positive attitude toward a specific statement, such as acceptance of eco-labeled fish, there is greater likelihood that they make the purchase. The five-point Likert scale consists of two negative options (strongly dislike and mildly dislike), a neutral (indifferent) and two positive ones (strongly prefer and mildly prefer).

Several explanatory variables are included in the model, such as frequency of fish consumption, major factors that affected consumers' existing choice of fish products and socio-demographics of the participants (origin, income level, occupation). Most of them are underlined as important variables in previous studies [7–9,13]. Additionally, the independent variables—(1) knowledge of organic labels; and (2) knowledge of the dolphin-safe logo—were considered as indicators of the consumers' information regarding the environmental impact of the product. The model assumes that consumer assessment during the decision-making process is defined as a latent variable represented as:

$$y_i^* = x_i\beta_1 + \varepsilon_i = z_i + u_i \quad (2)$$

where $U_i^* = y_i^*$; x is a matrix of size $n \times k$ that contains independent variables without an intercept; β is a column vector of parameters to be estimated of size $k \times 1$; ε_i is the stochastic error term, independent and identically distributed with zero mean; and the subscript I denotes an individual observation. The response variable is a categorical variable, which takes $J + 1$ possible ordered outcomes. The threshold levels can be expressed as:

$$y_i = \begin{cases} 0. Strongly\ dislike\ If\ y_i^* < \mu_1 \\ 1. Mildly\ dislike\ If\ \mu_1 \le y_i^* < \mu_2 \\ 2. Indifferent\ If\ \mu_2 \le y_i^* < \mu_3 \\ 3. Mildly\ prefer\ If\ \mu_3 \le y_i^* < \mu_4 \\ 4. Strongly\ prefer\ If\ y_i^* > \mu_4 \end{cases} \quad (3)$$

where the thresholds are unknown parameters to estimate by satisfying the condition $\forall j \in J : \mu_{j+1} > \mu_j$ and μ_j includes the set of real numbers $\mu_0 = -\infty$ and $\mu_1 = +\infty$. According to the ordered endogenous variable, higher values mean greater acceptance of eco-labeled fish.

This study considers that the category chosen by consumers maximizes their utility as an approach to face problems in the decision-making process, which may not result in ordinal utilities. When the endogenous variable values range between μ_j and μ_{j+1}, the consumer maximizes their utility by choosing *J*. The probability that the *i*-th respondent chooses *J*-option represents an optimization problem, since the consumer tries to maximize his/her utility by choosing a specific product. The probability that the *i*-th respondent chooses *J*-option and the threshold levels are calculated by the area under the density function using the form:

$$\begin{gathered} \Pr = \left(y_i = j \middle| x_i\right) = \Pr\left(\mu_j < y_i^* \le \mu_{j+1} \middle| x_i\right) = \Pr\left(\mu_j < x_i\beta + \varepsilon_i \le \mu_{j+1} \middle| x_i\right) \\ \Pr\left(\mu_j - x_i'\beta < \varepsilon_i \le \mu_{j+1} - x_i\beta \middle| x_i\right) \\ F\left(\mu_{j+1} - x_i'\beta\right) - F\left(\mu_j - x_i'\beta\right) \end{gathered} \quad (4)$$

where $F(\bullet)$ is the cumulative distribution function with a standard normal distribution (ordered probit) or logistic distribution (ordered logit) [28]. The models were run using Stata 12.0 (StataCorp, College Station, TX, USA) for maximum likelihood. The marginal effects for selected variables were also estimated.

Ordered logit and probit models were tested. The estimation results of the ordered logit model are shown (Appendix 2), but not discussed, because of the limitations mentioned by Train [29]. The limitations are: (1) logit cannot represent random taste variation (differences in tastes that cannot be linked to observed characteristics); (2) logit shows restrictive replacement patterns because of the independence from irrelevant alternative properties; and (3) logit cannot be used with panel data when unobserved factors are correlated over time for each decision maker. Thus, the probit model was used because it meets the conditions: (1) random taste variation; (2) flexible forms of substitution across alternatives; and (3) application where unobserved factors are correlated over time.

A chi-square distribution was carried out to test the hypothesis that all of the threshold values in the model are equal. The likelihood ratio was carried out to test the null hypothesis of the equality of coefficients across response categories. This is called the proportional odds assumption or the parallel regression assumption, because the relationship between all *J*-values is the same; there is only one set of coefficients. If the null hypothesis is not rejected, there is no need to estimate a different model for each threshold [25].

3. Results and Discussion

This section is presented in two parts. The first part focuses on the quantitative results from the survey. The second part explains consumers' acceptance of eco-labeled fish and the implications of these results for potential implementation of fish eco-labeling programs in the Mexican market.

3.1. Consumer Characteristics from All Surveys

Table 1 describes the set of variables surveyed. Respondents were mainly women (54%) between 18 and 39 years old (62%); 97% were born in the State of Baja California Sur and the other states of Mexico. Most consumers (77%) had post-secondary school instruction, and 28% showed the highest monthly household incomes (>US$1240).

The modal frequency of fish consumption was eight or more times per month. A very high proportion (85%) of buyers preferred fresh fish, locally caught rather than imported. Freshness was the most important factor when buying fish (51%), followed by protein intake (22%), taste (19%) and price (8%). About 42% of respondents expressed knowledge of the organic label, but only 35% were able to recognize the dolphin-safe eco-label.

Table 1. Descriptive statistics of the variables collected.

Variable Name	Definition	Observations	Mean	S.D.	Min	Max
Income_1	US$140–289/month	363	0.0634	0.2439	0	1
Income_2	US$290–619/month	363	0.2479	0.4324	0	1
Income_3	US$620–949/month	363	0.2507	0.4340	0	1
Income_4	US$950–1239/month	363	0.1598	0.3669	0	1
Income_5	US$>1240 per month	363	0.2782	0.4487	0	1
Occupation_1	Student	363	0.0606	0.2389	0	1
Occupation_2	Homemaker	363	0.1708	0.3769	0	1
Occupation_3	Professional	363	0.1680	0.3744	0	1
Occupation_4	Employee	363	0.3939	0.4893	0	1
Occupation_5	Self-employed	363	0.1763	0.3816	0	1
Occupation_6	Retired	363	0.0303	0.1717	0	1
Origin_bcs	Born in the State of Baja California Sur	363	0.3967	0.4899	0	1
Origin_mex	Born in other states of Mexico	363	0.5785	0.4945	0	1
Origin_ab	Born abroad	363	0.0248	0.1557	0	1
Gender	Male	363	0.4656	0.4995	0	1
Age_1	18−29 years old	363	0.3085	0.4625	0	1
Age_2	30−39 years old	363	0.3113	0.4637	0	1
Age_3	40−49 years old	363	0.2231	0.4169	0	1
Age_4	50−59 years old	363	0.1074	0.3101	0	1
Age_5	≥60 years old	363	0.0496	0.2174	0	1
Scholar_1	Elementary	363	0.0716	0.2582	0	1
Scholar_2	Middle school	363	0.1625	0.3694	0	1
Scholar_3	High school	363	0.3003	0.4590	0	1
Scholar_4	University	363	0.4463	0.4978	0	1
Scholar_5	Graduate education	363	0.0193	0.1377	0	1

Table 1. *Cont.*

Variable Name	Definition	Observations	Mean	S.D.	Min	Max
Frequency_1	Eat fish once a month	363	0.1763	0.3816	0	1
Frequency_2	Eat fish twice a month	363	0.2424	0.4291	0	1
Frequency_3	Eat fish four times a month	363	0.2562	0.4371	0	1
Frequency_4	Eat fish eight times a month	363	0.3251	0.4690	0	1
Presentation_1	Canned fish	363	0.0579	0.2338	0	1
Presentation_2	Fresh fish	363	0.8512	0.3563	0	1
Presentation_3	Frozen fish	363	0.0909	0.2879	0	1
Local	Fish locally caught	363	0.8567	0.3508	0	1
Factor_1	Price is the most influential	363	0.0771	0.2672	0	1
Factor_2	Protein contribution is the most influential	363	0.2231	0.4169	0	1
Factor_3	Taste is the most influential	363	0.1873	0.3907	0	1
Factor_4	Freshness is the most influential	363	0.5096	0.5006	0	1
Factor_5	Overfishing is the most influential	363	0.0000	0.0000	0	0
Factor_6	Fishing harming the environment is the most influential	363	0.0028	0.0525	0	1
Organic	Knowledge of organic labels	363	0.4215	0.4945	0	1
Dolphin	Knowledge of dolphin-safe eco-label	363	0.3471	0.4767	0	1

3.2. Acceptance of Eco-Labeled Fish

The test based on the chi-square distribution to test the hypothesis that the threshold values are equal was rejected (χ^2 (2) = 65.91). Those individuals who may prefer eco-labeled fish are statistically different from those who may not prefer this fish option. A likelihood ratio test based on the equality of coefficients across response categories was not rejected.

Consumer preferences for the strongly dislike option were null, so the value of zero was assigned to the mildly dislike option up until the strongly prefer option with the value of three (Equation (3)). Based on the results of the model (Table 2), demographic factors and frequency of fish consumption were significant implications concerning adopting eco-labeling. About 9% of the sample was represented by students, as well as retirees with a higher-than-average education level. This group was followed by business owners and homemakers, who were more likely to demand eco-labeled fish. The more highly educated respondents were associated with acceptance of eco-labeled fish. The results were consistent with studies where a high education level is positively correlated with acceptance of eco-labeled food [30–32]. Nevertheless, studies reported that education did not show a significant effect on the probability of choosing eco-labeled seafood products across all species [6] or paying a higher price for eco-labeling [11].

Consumers' area of origin also influenced their decision to choose eco-labeled products. In this survey, people born abroad accounted for 3.42% of the sample, and it was expected that the sign of its coefficient was positive. Most Mexican respondents (77.4%; Table 4) sympathized with the idea of buying eco-labeled fish as a sustainable option. We assume that few people would acknowledge being unsympathetic to the idea of sustainable fisheries. Even though the face-to-face method may prompt respondents to look

for a good answer, the survey provided a definition of sustainability and the purpose of labeling. Therefore, the social desirability bias may be limited.

Table 2. Ordered probit model results (n = 363). Count R^2 = number of correct predictions/n.

Variable	Coefficient	z-statistic	$p>z$
Income_1	Ref.		
Income_2	0.3123	1.04	0.300
Income_3	0.6382	2.03	0.042
Income_4	0.6500	1.89	0.059
Income_5	0.8213	2.43	0.015
Occupation_1	Ref.		
Occupation_2	−0.4897	−1.35	0.177
Occupation_3	−0.7479	−2.05	0.040
Occupation_4	−0.8785	−2.39	0.017
Occupation_5	−0.3030	−0.84	0.401
Origin_ab	−1.0347	−2.32	0.020
Factor_1	−0.5640	−1.71	0.087
Factor_2	−0.6161	−2.37	0.018
Factor_3	Ref.		
Factor_4	−0.4740	−2.04	0.042
Factor_6	−1.0406	−0.97	0.333
Organic	0.0370	0.18	0.860
Dolphin	−0.2722	−1.30	0.195
Frequency_1	Ref.		
Frequency_2	0.2914	1.28	0.199
Frequency_3	0.4757	2.07	0.038
Frequency_4	0.5607	2.46	0.014
Age_4	−0.5007	−2.12	0.034
Dolphin × Ocupation_4	0.5485	1.66	0.096
Organic × Ocupation_4	0.1980	0.61	0.541
Sex	0.0939	0.55	0.581
μ1	−1.6811	−3.57	0.000
μ2	−1.3835	−2.96	0.003
μ3	−0.9403	−2.02	0.041
Likelihood ratio test of proportionality of odds		49.07	0.181
McFadden's R^2		0.081	
McKelvey and Zavoina's R^2		0.201	
Cragg−Uhler (Nagelkerke) R^2		0.149	
Count R^2		0.769	
Log likelihood		−257.836	
Restricted log likelihood		−280.468	
Likelihood ratio statistic	45.263		0.002
AIC	565.672		
BIC	663.032		

Considering the survey specificities and approaches used, Mexican consumers' acceptance of eco-labeled fish as a costlier option was comparable to results of U.S. surveys [6,7], some European countries [11,13,33] and some Asian nations [9,34]. However, most surveys were conducted in countries where MSC-labeled products are offered in the marketplace. In France, for example, 81% of those surveyed may be willing to pay a premium of 11% of the average initial kilogram price of eco-labeled pollock [11], while 58% of Maine's seafood consumers are willing to pay a small premium price for eco-labeled lobster [12]. In the U.K., 86% of respondents prefer eco-labeled seafood instead of products without such labeling; 40% may be willing to pay 5%–10% more for eco-labeled products [35]. In the Japanese marketplace, 80% of consumers are willing to purchase eco-labeled fish and pay a premium [34].

The model supported the hypothesis that consumers in the high-income group are more willing to demand eco-labeled fish. Respondents with lower income were more price sensitive, refusing to pay a higher price for eco-labeled fish. The result was consistent with Oishi *et al.* [34].

Respondents that consider taste to be the most important factor were more likely to choose eco-labeled fish compared to those who chose price, protein contribution, freshness, overfishing and the harmful fishing practices as the key factors in purchasing decisions. This finding is in line with Goyert *et al.* [12], whereby the authors found that consumers' taste for lobster is the most important concern, whereas overexploited fishing and health issues related to eating seafood were seen as the least concern of consumers. In some seafood eco-labeled studies, price is not the only factor determining preferences for eco-labeled products [9–11]. Since taste is one of the driving factors influencing fish consumption [36–38], we can suggest that some people may choose the eco-labeled product because of its inherent features, rather than its cost.

The form of the fish product that was purchased and the origin of fish (locally caught) were not significant factors to demand eco-labeled fish. However, the frequency of fish consumption was a key indicator of the demand for eco-labeled fish, since individuals who eat more fish were willing to choose eco-labeled fish. This runs contrary to the result obtained by Johnston *et al.* [7] in the U.S. and Norway, where the frequency of seafood consumption did not influence consumers' choices of labeled seafood. As observed by the authors [7], consumer acceptance of "environmentally friendly" products and factors involved in it often differ between countries. In this study, there is a positive relationship between frequency of fish consumption and acceptance of eco-labeled fish. Those individuals who eat fish less frequently are less likely to accept eco-labeled fish, because food habits routinely influence decisions [39]. If consumers do not usually eat fish, they might not be interested in eco-labeled fish. Given that eco-labeled fish is a costlier option and consumers face budget constraints, the average off-loaded price of a kilogram of fresh fish (US$3.00–7.50) may explain what respondents in the surveyed city stated to accept eco-labeled fish.

It is noteworthy that there are no specific studies on typical protein-based dietary choices of the respondents. Given that the surveyed location is a coastal area, seafood plays an important role as a protein source, and fish consumption is higher than the national average [40]. Other protein sources are available at local markets. At the national level, meat is usually more expensive compared to several fish species [40]. The price and preference for fish may, therefore, be dependent on the availability of protein substitutes in the marketplace [41].

To assess the relative importance of label knowledge on consumers' choices, the model included two variables: (1) knowledge of organic labels; and (2) knowledge of the dolphin-safe label. These variables were not significant. However, when knowledge of the dolphin-safe label interacted with the Occupation_4 variable (employee people), which represents 39% of the sample, it showed that those employees who are informed about labels may prioritize their demand towards eco-labeled fish. This result may be related to the public's awareness of dolphin protection and because the dolphin-safe label is one of the most recognized food labels in North American studies [3,42]. It is significant, however, that most brands of canned tuna sold in Mexico are labeled as dolphin-safe, so consumers have very little choice.

This attitude toward eco-labeling is in line with tendencies reported in other emerging countries where knowledge of labels affected purchase intention by interacting with other variables [9]. Several studies [7,13,42–44] have reported that consumers' knowledge of labels may influence the demand for eco-labeling. According to Brécard *et al.* [13] and Valor [45], knowledge may impact consumers' environmental awareness. For example, in Japan, consumers expressed willingness to buy, as well as WTP for eco-labeled seafood once they were informed about the status of fish stocks [10]. When consumers do not use, understand or trust eco-label information, on the other hand, green consumption is not likely to be achieved [46]. D 'Souza *et al.* [47] found that consumers' satisfaction with labels is correlated with label accuracy: eco-labeling initiatives should provide accurate, clear and easily legible label design. Providing inaccurate information has the potential effect of negative purchasing decisions, in the same way that the absence of eco-label information has. In this case, eco-labels without an accompanying education program will likely have a limited impact.

This survey did not measure consumer trust of eco-labels. Nevertheless, stating a definition of sustainability and the purpose of eco-labeling could facilitate consumer understanding, thereby increasing the level of acceptance. A communication strategy to inform the public about eco-labeled products in an objective manner may encourage consumers' credibility by promoting the value-added services.

Gender was not a statistically significant factor affecting consumer acceptance. Respondents belonging to the highest age group (50−59 years old) were less willing to demand eco-labeled fish (Table 2). International studies concluded that older-aged citizens are more reluctant to pay premiums for improvements in environmental or ecological product attributes [48–51].

Table 3 provides marginal effects from the ordered probit model. The marginal effects measure the impact of each variable on the probability of a specific outcome on the ordered endogenous variable. Thus, the description of variables focuses on the strongly prefer option with the value of three. As expected, income had a positive impact on acceptance of eco-labeled fish. The marginal effect indicated that respondents with higher net income (Income_5; US$>1,240 per month) were 22% more likely to pay a 15% price premium for eco-labeled fish, whereas those respondents belonging to the middle-income group (Income_2; US$290–619/month) were 10% more likely to demand eco-labeled fish and pay a premium. Frequency of fish consumption also had a positive impact on the acceptance of eco-labeled fish. Analysis indicated that respondents with the modal frequency of fish consumption were 17% more likely to demand eco-labeled fish. Comparison of predicted probabilities of *J*-options and their observed frequencies appear in Table 4.

Table 3. Marginal effects.

Variable	Ordered Probit			
	0	**1**	**2**	**3**
Income_2	−0.0494	−0.0213	−0.0317	0.1024
Income_3	−0.0812	−0.0395	−0.0651	0.1858
Income_4	−0.0820	−0.0401	−0.0662	0.1883
Income_5	−0.0924	−0.0474	−0.0818	0.2215
Occupation_2	0.1229	0.0329	0.0331	−0.1888
Occupation_3	0.2093	0.0449	0.0361	−0.2904
Occupation_4	0.2575	0.0486	0.0333	−0.3394
Occupation_5	0.0693	0.0213	0.0241	−0.1146
Origin_ab	0.3178	0.0504	0.0263	−0.3946
Factor_1	0.1464	0.0369	0.0351	−0.2184
Factor_2	0.1636	0.0395	0.0360	−0.2390
Factor_4	0.0673	0.0310	0.0487	−0.1470
Factor_6	0.3202	0.0504	0.0260	−0.3966
Organic	−0.0070	0.0192	−0.0035	0.0131
Dolphin	0.0612	−0.0026	0.0221	−0.1025
Frequency_2	−0.0467	−0.0200	−0.0295	0.0962
Frequency_3	−0.0675	−0.0311	−0.0489	0.1474
Frequency_4	−0.0751	−0.0356	−0.0575	0.1683
Age_4	0.1263	0.0335	0.0334	−0.1932
Dolphin × Ocupation_4	−0.0741	−0.0350	−0.0563	0.1654
Organic × Ocupation_4	−0.0337	−0.0138	−0.0198	0.0673
Sex	−0.0171	−0.0066	−0.0091	0.0328

Table 4. Descriptive statistics of the alternatives.

	Variable	**Mean**	**S.D.**	**Min**	**Max**
Ordered probit	p0	0.079010	0.076291	0.000968	0.563781
	p1	0.046579	0.027369	0.001569	0.116415
	p2	0.100115	0.042289	0.006620	0.175369
	p3	0.774297	0.141559	0.183695	0.990844
	0	0.079890	0.271497	0	1
	1	0.046832	0.211570	0	1
	2	0.099174	0.299308	0	1
	3	0.774105	0.418748	0	1

The survey exposes that people would respond positively to the idea of purchasing eco-labeled fish, but it does not report what respondents would do in reality when exercising their purchasing power in the supermarket. The following considerations should be taken into account: (1) eco-labeling may not represent the most desirable aspects of seafood in purchase decision-making, regarding factors, such as taste, price, brand and market promotions [12]; (2) only specific sectors of consumers are likely to choose eco-labeled fish ([6–13,33,34], this study); (3) consumers may be less likely to demand eco-labeled products when they have to consider non-economic criteria, such as spending time or effort [45,52]. Even though some studies reported price as a significant factor affecting the purchase decision of

eco-labeled products, there is evidence of consumers agreeing to pay higher prices for eco-friendly options [10,11,13]. As mentioned previously, the survey reveals that price was not a statistically significant factor related with high-income and maybe with the off-loaded price of a kilo of fish. On the other hand, this study shows the consumers' stated intentions, which do not always match their response in the marketplace, as had been shown for other green products [45,53,54].

4. Conclusions

At the international level, efforts directed towards establishing markets for eco-labeled seafood have increased in recent years. These efforts are mostly prevalent in developed countries, where supermarket chains are the main drivers of seafood eco-labeling initiatives. In Mexico, the market niche for eco-labeled seafood is not well consolidated, as is the case of other tropical, developing countries.

This study shows a moderate level of demand for eco-labeled fish products in Mexico, because many respondents favor the idea of eco-labeled fish as a sustainable option and know that this is a costlier option. Results were similar to those obtained in previous studies conducted in some European and Asian countries. The econometric model points to a new and supportive sector of eco-labeled fish consumers, mostly with advanced education and higher-than-average net income, that often consume fish and are knowledgeable about food labels. A guide to direct marketing efforts toward specific consumer groups is recommended.

Eco-labeling initiatives are not the only path to sustainable fisheries, but they may be successful marketing strategies in the retail food sector. Nevertheless, it is necessary to encourage end-consumer participation as an agent for change in the exploitation of fish resources.

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Author Contributions

Mónica Pérez-Ramírez, Marco A. Almendarez-Hernández and Luis F. Beltrán-Morales designed the survey format and wrote the paper. Mónica Pérez-Ramírez conducted all of the data collection. Marco A. Almendarez-Hernández conducted the analysis with input from Gerzaín Avilés-Polanco. All authors checked the statistical results and extensively updated the paper. All authors read and approved the final manuscript, analyzed the data and took part in the discussion conjointly.

Appendix 1

(1) How often do you eat fish?
□ 0 Never
□ 1 Once a month
□ 2 Twice a month
□ 3 Once per week (4 times a month)
□ 4 Two or more times per week
(*If respondent answers "never" in question 1, then survey finishes and you do not qualify for this study*)
(2) What kind of fish presentation do you buy more often?
□ 1 Canned
□ 2 Fresh
□ 3 Frozen
(3) Do you usually buy imported fish?
□ 0 Yes
□ 1 No
(4) Please choose the most important factor that you take into account when purchasing fish:
□ 1 Price
□ 2 Protein contribution
□ 3 Taste
□ 4 Freshness
□ 5 Whether fish is overfished, that is, catching so many that the species is being depleted
□ 6 Whether the fish is caught in a way that may harm the ocean environment
(5) Do you know or have any reference to the *dolphin-safe label* on canned tuna? This guarantees that fishing activity does not cause the death of dolphins.
□ 0 Yes
□ 1 No
(6) Do you know or have any reference to the *organic product label*? This guarantees that producing methods avoid the use of pesticides, herbicides and fertilizers.
□ 0 Yes
□ 1 No
(7) If a fish product with a consumer label showing that it came from a sustainable fishery was available for sale with a price variation up to 15% compared to non-labeled fish products, would you prefer the labeled product rather than the non-labeled? All other factors (taste, freshness, *etc.*) between the two types of fish are the same.
Definition of sustainable fishery for purposes of this study: a fishery that uses procedures to prevent overfishing to ensure future supply of fish.
□ 0 Strongly dislike
□ 1 Mildly dislike
□ 2 Indifferent
□ 3 Mildly prefer
□ 4 Strongly prefer

(10) What is your age?
□ 1 18−29 years old
□ 2 30−39 years old
□ 3 40−49 years old
□ 4 50−59 years old
□ 5 60+ years old
(11) Sex:
□ 1 Female
□ 2 Male
(12) What was the last level of schooling you completed?
□ 1 Elementary school
□ 2 Secondary school
□ 3 High school
□ 4 University
□ 5 Graduate school
(13) What is your current occupation?
□ 1 Student
□ 2 Homemaker
□ 3 Professional
□ 4 Employee
□ 5 Self-employed
□ 6 Retired
(14) In which of the following ranges does your total household income fall? (Monthly)
□ 1 US$140–289
□ 2 US$290–619
□ 3 US$620–949
□ 4 US$ 950–1,239
□ 5 More than US$ 1,240
(15) Please list the state and country where you live:

Appendix 2

Table A1. Results ordered logit model. n = 363, count R^2 = number of correct predictions/n.

Variable	Description	Ordered Logit		
		Coefficient	z-statistic	$P > z$
Income_1	US$140–289 per month	Ref.		
Income_2	US$290–619 per month	0.6096	1.17	0.243
Income_3	US$620–949 per month	1.0930	2.01	0.044
Income_4	US$ 950–1,239 per month	1.2506	2.07	0.038
Income_5	More than US$ 1,240 per month	1.5827	2.65	0.008

Table A1.*Cont*.

Variable	Description	Ordered Logit		
		Coefficient	z-statistic	*P* > z
Occupation_1,6	Student and retired	Ref.		
Occupation_2	Homemaker	−0.8083	−1.23	0.217
Occupation_3	Professional	−1.2474	−1.87	0.061
Occupation_4	Employee	−1.4592	−2.22	0.027
Occupation_5	Self-employed	−0.4040	−0.60	0.548
Origin_ab	Born abroad	−1.9215	−2.58	0.010
Factor_1	Price	−1.1312	−1.89	0.059
Factor_2	Protein contribution	−1.2151	−2.44	0.015
Factor_3	Taste	Ref.		
Factor_4	Freshness	−0.9845	−2.19	0.028
Factor_6	Fishing harm to environment	−1.8083	−1.14	0.256
Organic	Knowledge of organic labels	0.0093	0.03	0.980
Dolphin	Knowledge of dolphin-safe eco-label	−0.4634	−1.25	0.212
Frequency_1	Eat fish once a month	Ref.		
Frequency_2	Eat fish twice a month	0.4405	1.11	0.266
Frequency_3	Eat fish four times a month	0.8176	2.03	0.043
Frequency_4	Eat fish eight times a month	0.9756	2.40	0.017
Age_4	50−59 years old	−0.7570	−1.72	0.085
Dolphin × Ocupation_4		1.0302	1.73	0.084
Organic × Ocupation_4		0.3622	0.62	0.533
Sex		0.1049	0.35	0.728
μ1		−2.9748	−3.50	0.000
μ2		−2.4150	−2.87	0.004
μ3		−1.6265	−1.95	0.050
Likelihood ratio test of proportionality of odds		51.13		0.133
McFadden's R^2		0.082		
McKelvey and Zavoina's R^2		0.201		
Cragg−Uhler(Nagelkerke) R^2		0.151		
Count R^2		0.766		
Log likelihood		−257.569		
Restricted log likelihood		−280.468		
LR statistic		45.798		0.002
AIC		565.138		
BIC		662.498		

Conflicts of Interest

The authors declare no conflict of interest.

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