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Consumer Preferences With Regard To Local and Sustainable Seafood

Dylan Cowley
Colby College, dscowley@colby.edu

Jesse R. Coulon
Colby College, jrcoulon@colby.edu

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1. Introduction

Seafood is an important global commodity, and one that has doubled in global demand over the last thirty years (2). Historically, Seafood represents an energy efficient and environmentally friendly source of meat, which can be relatively inexpensive to catch. Additionally, seafood represents an important source of protein, as over three billion people worldwide rely on seafood for at least 15% of their total protein intake.

Over the past few decades, seafood has become a cultural symbol of health and wellness. In the 1990s, when it became widely known that seafood contains high levels of omega-6 fatty acids as well as other vital micronutrients, the growing demand from the 1970s seemed surged higher (d1). However, this swell in demand came with adverse environmental costs. For example, Tuna began to be severely overfished, and has faced a decreased in global population by 80% since 1970. In an effort to meet increased demand, large-scale commercial fishing techniques such as bottom trawling have had detrimental effects on the Marine ecosystem and fish species within it. These techniques have contributed to the widespread depletion of bio-diversity throughout many marine ecosystems.

In the late 1980s, Non Governmental Organizations (NGO) and other environmental advocacy groups became aware of the harmful effects of overfishing. In an effort to raise consumer awareness, these NGOs promoted consumer education campaigns that aimed to prevent overfishing, protect endangered species, and preserve marine habitats. These campaigns were largely successful, and even fueled American consumer demand for transparency, and information concerning the seafood they were purchasing. As a result, the practice known as eco-labeling was born. Eco-labels are a measure of sustainability directed towards consumers, and are intended to make it easy to take environmental concerns into account when shopping. Labeling campaigns like “Dolphin Safe” tuna in 1992 effectively stressed the importance of environmentally friendly caught fish, while also increasing sales of the product.

In 2005, consumer demand for eco-labeled seafood became so prevalent that the Federal Government passed regulation that mandated the use of eco-

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labels that indicate the origin of catch. However, this initiative was limited. Origin of catch was not required to be more specific than "United States" or "North Atlantic". Other shortcomings of the 2005 regulation include that the labels did not need to state how the seafood was caught, and similarly require additional certification to include the designation of "sustainable". This lack of regulation allowed almost any restaurant or fish market to label their product as sustainable without any backing from a certified outside entity. As trust in the integrity of the eco-label floundered, the supply and demand of sustainable seafood suffered. As any catch could be labeled as "environmentally friendly", suppliers lacked financial incentive to utilize pricey sustainable fishing practices. Similarly, consumers were not willing to pay a premium for the certification of third parties including the Marine Stewardship Council (MSC), when the less expensive fish was also labeled as sustainable.

In a renewed effort to promote sustainable fishing practices, NGOs have primarily focused on alleviating supply-side failures. These interventions include providing subsidies for sustainably caught fish, as well as limits on catch size. However, there exists little research regarding demand side failures, specifically how much consumers are willing to pay for sustainable and for certifiably sustainable fish. One such study, *Consumer Choice for Quality and Sustainability in Seafood Products: Empirical Finding from United Kingdom* (Roth et al 2001) determines if individuals living within the UK and Denmark are prepared to pay a premium for seafood that is either, a) of higher quality or b) from a sustainable managed fishery. For this study 600 in-home interviews, done in a choice experiment format stratified by regional distributions, were carried out in each of the two case study countries (Denmark and UK). The study found that people's willingness to pay for sustainable seafood was significantly tied to income, education level, and age.

Just like Roth et al 2001, our study evaluates consumer's willingness to pay for the certification of sustainability in seafood. However, unlike (Roth et al 2001) we distributed out survey though Google surveys distributed through a rolling reputational sample. Out survey is designed to see peoples willing to pay for certified sustainably and locally caught seafood at restaurants.

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2. Literature Review

a. Topic 1

To make utility maximizing decisions with regard to seafood preferences, consumers must have access to all information relevant to their decision making process. However, specific environmental attributes related to a product's production are often difficult for the individual to conceptualize or assess without guidance. As Lucas, Salladarre, and Brecard acknowledge in their 2012 study "Green Consumption and Peer effect: An Application to Seafood Products in France", social norms can largely influence consumer behavior and thus consumer willingness to pay a premium for labeled products. More specifically, the authors focus on the influence of the peer's behaviors on the probability to have a positive willingness to pay a premium for labeled seafood products. Although eco-labeled seafood demand has been widely studied, the authors differentiate their study by focusing their research on the role of social interactions in consumer willingness to pay a premium for eco-labeled seafood products. Similarly, In their study "Consumer Preferences and Willingness to Pay for Food Labeling: A Discussion of Empirical Studies", McCluskey and Loureiro discuss empirical research on consumer preferences and willingness to pay for several types of food quality or attribute labeling. Just as Lucas, Salladarre, and Brecard identified, the use of food labeling has become increasingly important in recent years. Fueled by the demand for healthier, safer, and more environmentally friendly food products, the use of credible and recognized labels allows firms to promote quality, or the presence of specific desirable attributes, and consequently generates the potential for premiums based on this signal.

The results suggest that being surrounded by people interested in eco-labeled fish increases the probability of willingness to pay a premium for a labeled seafood product. According to Lucas, Salladarre, and Brecard, when consumers were asked, "if you choose a labeled product, would you be willing to pay more for the guarantees it provides", around 70% of the 655 respondents agreed to pay a premium for a labeled product. Furthermore, McCluskey et al. analyzed factors that affect Japanese consumers' willingness to pay price premiums for beef labeled as BSE-tested and estimated the mean willingness to pay for this product using data obtain from a consumer survey in Japan. The authors discovered that food safety and environmental attitudes, reduction in

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beef consumption following the BSE outbreak, and being female all have a statistically significant positive effect on the willingness to pay for BSE-tested beef. In their sample, consumers were willing to pay an average of 56% premium for BSE-tested beef.

Although this study focuses exclusively on willingness to pay for food quality and attribute labeling, it can be applied to my focusing on preferences with regard to local and sustainable seafood. McCluskey and Loureiro determined that consumers are willing to pay a premium for BSE-tested beef, especially in light of the "mad cow disease" outbreak. When these findings are coupled with those of Sterenn Lucas, Frederic Salladarre, and Dorothee Brecard (that consumers are heavily influenced by repetition of usual consumption habits), I hope to further evaluate how beef preferences influence seafood consumption choices.

b. Topic 2

As Cathy Wessels, Robert Johnston, and Holger Donath explain, in their study "Assessing Consumer Preferences For Ecolabeled Seafood: The Influence Of Species, Certifier, And Household Attributes", ecolabeling initiatives offer information regarding seafood quality and production, while also creating a market based approach to address environmental issues. As Wessels, Johnston, and Donath point out, even though recent studies suggest that both a demand for and an awareness of information pertaining to environmental product attributes exist, they are contingent upon consumer awareness of the label and consumer acceptance of the label. Specifically, consumer awareness is determined by "(a) the credibility of the agency providing a label or certification, (b) consumers' understanding and perception of the link(s) between product choices and environmental impact, and (c) an accurate and clearly understood meaning of the certification".

Similar to our initiatives, Wessels et al. evaluate consumer's possible acceptance of an eco-labeling program for seafood products based on a contingent choice survey, in which respondents chose between a variety of certified and uncertified seafood. In addition to the contingent choice questions, respondents were asked questions concerning their household's geographic location, trust in specific certification agencies, household seafood and grocery budgets, memberships in environmental organizations, perceptions of the status

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of Pacific salmon and Atlantic cod stocks, education level, and a variety of other factors.

As the authors acknowledge, if market based initiatives such as eco-labeling are to encourage sustainable fisheries, it is imperative that consumers be aware of and have a demand for these certifications. In order to influence consumer behavior to affect fisheries, consumers must be able to understand the connection between sustainable fisheries and seafood purchase decisions.

Just like the studies conducted in "Assessing Consumer Preferences For Ecolabeled Seafood: The Influence Of Species, Certifier, And Household Attributes", Shabbar Jaffry, Helen Pickering, Premachandra Wattage, David Whitmarsh, and Julian Frere explore growing interest in the potential use of product differentiation through eco-type labeling as a means of promoting and rewarding the sustainable management and exploitation of fish stocks in their study "Consumer Choice for Quality and Sustainability in Seafood Products: Empirical Findings from United Kingdom". More specifically, Jaffry, Pickering, Wattage, Whitmarsh, and Frere present empirical results of a study undertaken in the UK, which evaluated whether UK consumers are prepared to pay a premium for seafood products that are differentiated based on quality and sustainability.

Just like our study, as well as that conducted by Wessels, Johnston, and Donath, the authors of "Consumer Choice for Quality and Sustainability in Seafood Products: Empirical Findings from United Kingdom" evaluate how household income, as well as education level, effect consumers' preferences with regard to sustainable seafood. As Jaffry et al. conclude, "it would appear that socio-economic factors have the greatest influence on product choice". Household incomes of £15,000 or more significantly increase the probability of the targeted fish and fish products being bought, relative to household incomes of less than this. Also, the possession of qualifications (additional education) by members of the household increases significantly the probability of choice. Both of these two observations are significant at the 99% level of significance. Lastly, incomes of £25,000 to £39,999 and the possession of CSE, 'O' level, 'A' level, postgraduate and professional qualifications in a household carry the most influence on the choice of the products targeted by the survey.

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c. Survey Instrument

Our survey was designed through cross-disciplinary cooperation. Specifically, we designed our survey and econometric analysis around a colleague's environmental studies research. Prior to distribution, we conducted a focus group of ten Colby College Sodexo food managers in order to refine the phrasing and structure of our survey.

Our final survey contained seven questions per survey version, and was followed by 17 demographic questions. Our survey was designed in a choice experiment format. Three versions combined different values for the three respective attributes of sustainability, locality of the catch, and price. In other words, each of the versions represented a different combination of the different levels of each of the three attributes seen in Figure 1. Next, we expanded our choice experiment into six different versions, and included a key to a clone version of the original three survey versions to provide definitions for sustainability, certified sustainability, and locality (this key is represented by Figure 2). The survey versions were randomly assigned by birth month, with two months assigned to each survey version.

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Figure 1

Choice experiment attributes:

Attribute	Number of Levels	Levels
Sustainable	**3**	• Not sustainable • Sustainable • Very Sustainable
Local	**3**	• Not Local • Local • Very Local
Price	**4**	• 4 evenly distributed ranges ($10, $15, $20, $25)

Figure 2.a

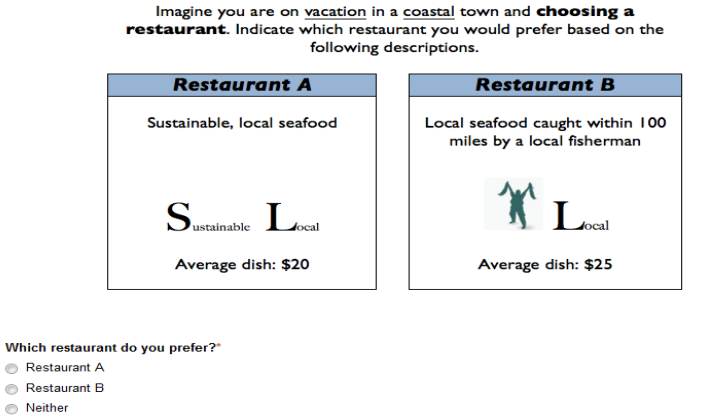
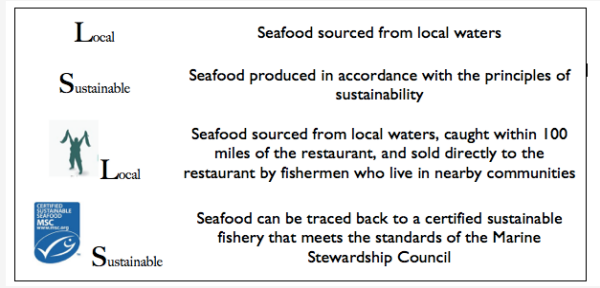


Figure 2.b



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3. Methods

To explain the econometric analysis for our paper we used the follow paper titled "Derivation of the model to estimate discrete choice data," written by Sahan Dissanayake.

The foundation of this study is a choice experiment that aims to uncover willingness to pay for local and sustainable seafood. Choice experiments are based upon consumer demand theory, which assumes that utility to customers derives from the characteristics of these goods. This idea is based on the notion that individuals are not only interested in different attributes, but the different levels of said attributes. The choice experiment used in our surveys presented customers with sets of alternative combinations of attributes with regard to preferences for local and sustainable seafood, asking individuals to choose their most preferred alternative. The choices by individuals from sets of alternatives reveal the trade-offs they are willing to make between attributes. Each individual was asked to choose one alternative from each choice set. This choice is modeled as a function of the attributes of that implementation design.

The standard multinomial logit model assumes that the respondents are homogeneous with regard to their preferences (the βs are identical for all respondents). This strong assumption is no typically valid and recent literature has started using the mixed multinomial logit model (MMNL)[1] as one of the standard methods to analyze discrete choice data. The MMNL incorporates heterogeneity of preferences (Hensher and Greene. 2003, Carlsson, et al. 2003). The following is a summary of the derivation of the MMNL estimator and the calculation of the WTP.

Assuming a linear utility, the utility gained by person *q* from alternative *i* in choice situation *t* is given by

$$U_{qit} = \alpha_{qi} + \beta_q X_{qit} + \varepsilon_{qit} \qquad (1)$$

where X_{qit} is a vector of non-stochastic explanatory variables. The parameter α_{qi} represents an intrinsic preference for the alternative (also called the alternative specific constant). Following standard practice for logit models we assume that ε_{qit} is independently and identically distributed extreme value type I.

[1]This approach is also referred to as the mixed logit, hybrid logit, random parameter logit, and random coefficient logit model.

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We assume the density of β_q is given by $f(\beta \mid \Omega)$ where the true parameter of the distribution is given by Ω. The conditional choice probability of alternative *i* for individual *q* in choice situation *t* is logit[2] and given by

$$L_q(\beta_q) = \prod_t \frac{\exp(\alpha_{qi} + \beta_q X_{qitq})}{\sum_{j \in J} \exp(\alpha_{qj} + \beta_q X_{qjt})}. \quad (2)$$

The unconditional choice probability for individual *q* is given by

$$P_q(\Omega) = \int L_q(\beta) f(\beta \mid \Omega) d\beta. \quad (3)$$

The above form allows for the utility coefficients to vary among individuals while remaining constant among the choice situations for each individual (Hensher, et al. 2005, Carlsson, et al. 2003, Train. 2003). There is no closed form for the above integral; therefore P_q needs to be simulated. The unconditional choice probability can be simulated by drawing R random drawings of β, β_r, from $f(\beta \mid \Omega)$[3] and then averaging the results to get

$$\tilde{P}_q(\Omega) = \frac{1}{R} \sum_{r \in R} L_q(\beta_r). \quad (4)$$

In the choice experiment questions, option A and option B are both restoration options that can be viewed as being closer substitutes with each other than with option C, the status quo option (Haaijer, *et al.* 2001; Blaeij et al. 2007). One method to incorporate this difference in substitution between options is to use an econometric specification for the mixed multinomial logit model that contains an alternative specific constant (ASC) that differentiates between the status quo option and choices that represent deviations from the status quo. This can be achieved by using a constant that is equal to one for alternative A or alternative B.

The coefficient estimates for the mixed multinomial logit model cannot be interpreted directly. Therefore, we calculate average marginal WTA for a change in each attribute *i* by dividing the coefficient estimate for each attribute with the coefficient estimate for the payment term, as given in (9) (Dissanayake, 2014).

[2] The remaining error term is iid extreme value.

[3] Typically $f(\beta \mid \Omega)$ is assumed to be either normal or log-normal but it needs to be noted that the results are sensitive to the choice of the distribution.

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$$MWTA_i = \frac{\beta_i}{\beta_{cost}} \quad (9)$$

In order to run our cologit and mixlogit models we needed to alter the data to make it easier to work with. For the variable "education level" we changed education level from an ordinal variable to a binary variable. The choices "Some College" and "High School degree" were coded as "lower education; and "bachelors degree" and "masters Degree" was coded as "higher education". We did a similar coding process for many of our variables. We changed "How close do you live to the ocean" from an ordinal variable to a binary one by coding the responses into "near the ocean" and "far from the ocean". We transformed the variable "Income Level", from an ordinal variable to a binary variable represented by "low income" and "high income". We transformed the variable "Local Produce", from an ordinal variable to a binary variable represented by "not often eat local produce" and "often eat local produce." We used the cologit model for all but the "how close do you live to the ocean" variable. This is because the "how close do you live to the ocean variable" had a wide range of area in both "far from the ocean" and "close to the ocean" responses so we wanted to see if the distance from the ocean within those two possible responses had a significant difference in regards to how much more individuals would be willing to pay for both sustainable and local seafood. For no other of our variable was the mixlogit model necessary in this way.

4. Results

We received 219 completed surveys collected through Google Surveys. Due to the nature of rolling reputational sampling[4] we received a diverse pool of respondents including respondents from eight different countries. Using a mixlogit model we found that for our respondent pool sustainability and locality were both positive and statistically significant. On average peoples were willing to pay $5.43 dollars extra for sustainable seafood and $0.90 dollars more for locally caught seafood. The complete mixlogit output can be seen in Figure 3.

[4] A rolling reputational sample occurs when a survey is given out to colleagues of those individuals that are distributing the survey and the individuals that receive the survey will then forward the survey to their colleagues and so one until the survey snowballs into a large respondent pool.

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With these statistical significant results for locality of seafood we then ran mixlogit and cologit regression on different demographics to see how individuals willingness to pay changes from along demographic lines. The five demographics that we focused on were income level, how far your home is from an ocean, education level, if you purchase locally grown produce, and if the information key seen in figure three was attached to your survey.

Figure 3

	ConditionalLogit	MixLogit	MixLogitWTP
	Choice2	Choice2	Choice2
main			
Price	0.146***	0.154***	
	(0.0105)	(0.0116)	
Sustainability	0.809***	0.837***	5.429***
	(0.0564)	(0.0644)	(0.304)
Locality	0.0984*	0.140*	0.905*
	(0.0457)	(0.0591)	(0.406)
SD			
Locality		0.386***	
		(0.0756)	
Sustainability		-0.0555	
		(0.0727)	
Price		-0.0277*	
		(0.0116)	
Observations	3906	3906	3906

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We ran a cologit model on education level to see if there was a difference between how much people are willing to pay for sustainability and locally caught seafood based on their education level. To see the education level of our respondent see figure 4. The results from the “lower education” showed that those individuals were willing to pay $0.43 dollars more for sustainable seafood and $.78 dollars more for locally caught seafood. While “higher education” individuals were willing to pay $.012 dollars more for locally caught seafood and $1.05 dollars more for sustainable seafood. This cologit model shows use that people in our sample who have “lower education” are willing to pay more for locally caught seafood than those who have “higher education” but are willing to pay less for sustainable seafood than those with “higher education”.

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Figure 4

Variable	**Cologit Model** (p-value)	**Mixlogit Model** (p-value)
Education		
1. "lower Education"		
locality	.43159(.000)	
sustainability	.78094(.000)	
2. "higher Education"		
locality	.12646(.000)	
sustainability	1.0517 (.000)	
How close do you live to the ocean		
1. "near the ocean"		
Mean		
locality		.12106(.105)
sustainability		.81963(.000)
SD		
locality		.41825 (.000)
sustainability		.04701(.611)
2. "far from the ocean"		
Mean		
locality		.14635(.088)
sustainability		.87302(.000)
SD		
locality		.20106(.157)
sustainability		.00940(.949)
Income		
1. "low income"		
locality	.23772(.000)	
sustainability	.93060(.000)	
2. "high income"		
locality	2..15562(.000)	
sustainability	1.0936(.000)	
Purchase of Local Produce		
1. "almost never"		
locality	.11788(.146)	
sustainability	.82253(.000)	
2. "almost always"		
locality	.16254(.052)	
sustainability	.84883(.000)	
Survey Information		
1. "with info"	.12891(.112)	
locality	.70731(.000)	
sustainability		
2. "without info"		
locality	.11624(.153)	
sustainability	1.0737(.000)	

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The mixlogit that we ran for the demographic question "How close do you live to the ocean" to see if the distance from the nearest ocean effected how much people are willing to pay for both locally caught and sustainable seafood. The regression results from "near the ocean" and "far from the ocean" can be seen in figure 5. For both regressions we used a mixlogit model to see if the distance within the two subgroups "near the ocean" and "far from the ocean" mattered in regards to how much people were willing to pay for sustainable and locally caught seafood. The Standard deviation effects for locality seen in figure 5 show us that there is a significant relationship between people willing to pay more for locally caught seafood and the distance they are located from the water. The summary of how far our respondents live from the water can be seen in figure 6.

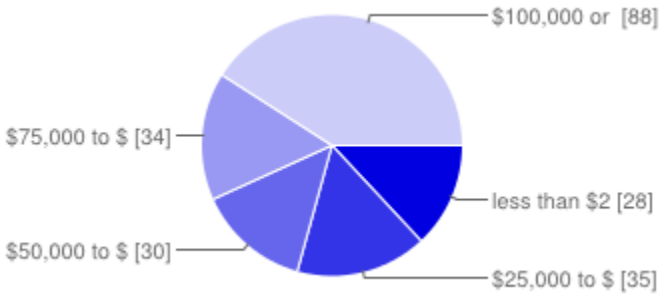

Figure 5

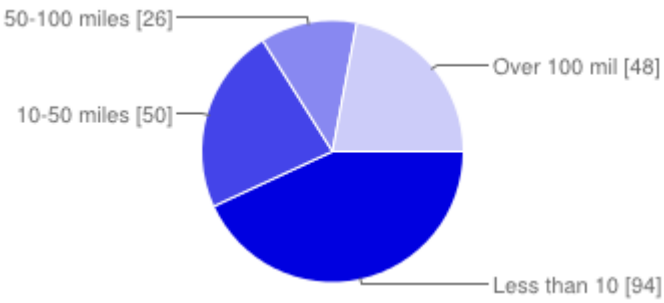

Figure 6

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To find the regression results for our income variable we used a cologit model. The results of the regression show that those individuals with higher income are willing to pay more for both sustainability and locally caught seafood than those with lower education. For "How Often Do You Consume Local Produce", we also ran a cologit model in find our results. Consumers who "almost always" consume sustainable local produce were more likely to prefer local and sustainable seafood. However, the effects of produce consumption preferences on seafood preferences were only statistically significant at the 5% with regard to preferences for sustainable seafood, and not local. The final regression that we ran was on the variable "survey info". This variable is a binary variable and is represents if the individual that took the survey had the information key (represented by figure 3) attached to each of their survey questions. The outcome of this regression was that individuals were willing to pay $0.23 more for sustainability and $.01 less for locally caught seafood if they had the additional information. The results from the cologit regressions of "survey info", "income" and "How Often Do You Consume Local Produce" can be seen in figure 6.

5. Conclusion

As global health trends have seen a shift toward clean and healthy protein sources, the demand for seafood has surged. New innovations and techniques have improved fishing efficiency and scale, making seafood relatively inexpensive to catch. In order to educate consumers about the environmental effects of production and consumption of seafood and its environmental global effects, eco-labeling agencies began to brand exclusive product that meet specific requirements. Through our research, we aimed to evaluate the premium that consumers are willing to pay for eco-labeled seafood product. More specifically, we sought to evaluate how consumer education level, income, proximity to ocean, as well as preferences with regard to local produce effect consumers choices towards consuming local and sustainable seafood.

Our survey results indicate that people who have "lower education" are willing to pay more for locally caught seafood than those who have "higher education" but are willing to pay less for sustainable seafood than those with "higher education". This discrepancy may exist because consumers with lower

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levels of education live in one specific area for longer periods of time, and do not relocate frequently. As a result, they will be willing to pay a higher premium for locally caught seafood than their more educated counterparts. This may also imply that less educated consumers do not fully understand the ramifications and of unsustainable fishing practices, and are not wiling to pay a premium for to support an abstract concept. We also found that people are willing to pay more for locally caught seafood the closer they live to the ocean, individuals with higher income are willing to pay more for both sustainability and locally caught seafood, and lastly consumers who "Often or Always" consume sustainable or local produce were more likely to prefer local and sustainable seafood.

These results indicate that the socio-economic characteristics, related eating preferences with regard to produce, as well as proximity to ocean influence a consumers' willingness to pay a premium for local and sustainable seafood. Through effective eco-labeling, seafood certification agencies can ensure the existence of local and sustainable seafood consumption trends. Specifically, marketers and eco-labeling agencies can promote local and sustainable eating habits by understanding the demographic make-up of their consumer base. For example, food markets may increase sales by selling sustainable seafood and produce in proximity to one another, as consumers who buy sustainable produce are also more likely to be willing to pay a premium for sustainable seafood. Also, labeling agencies including the Marine Stewardship Council may increase local and sustainable eating habits by stressing the locality and sustainability of seafood sold near the ocean. In this way, labeling agencies, as well as food distributors, can use these results to effectively reach an optimal consumer base.

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