

AN ABSTRACT OF THE THESIS OF

Robert C. Fonner for the degree of

Master of Science in

Economics presented

on December 10, 2007

Title: Consumer Preferences for Seafood Information Attributes

Abstract approved:

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Gilbert R. Sylvia

Changes in consumer preferences have created a need for developing differentiated and higher valued seafood products. Providing consumers with more information about seafood products at the time of purchase has been suggested as a way of differentiating seafood and promoting healthy fisheries. A discrete choice experiment conducted at high-end grocery stores in Portland, Oregon investigated consumer preferences for information about the quality, safety, origin and environmentally friendliness of seafood they consume. Results show that 'Sustainability Certification' was the most important information attribute influencing purchasing decisions, closely followed by 'Locally Harvested by Oregonians'. Also, significant relationships are identified between the information attributes and respondent characteristics. Overall, the study indicates an opportunity for local fishermen to further develop 'local' brands while continuing the effort to market 'eco-friendly' seafood choices.

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Consumer Preferences for Seafood Information Attributes

by Robert C. Fonner

A THESIS

submitted to

Oregon State University

in partial fulfillment of  
the requirements for the  
degree of

Master of Science

Presented December 10, 2007

Commencement June 2008

Master of Science thesis of Robert C. Fonner

Presented on December 10, 2007

APPROVED:

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Major Professor, representing Economics

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Director of the Economics Program

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Dean of the Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Robert C. Fonner, Author

## ACKNOWLEDGEMENTS

The author expresses sincere appreciation to Gil Sylvia for providing guidance and the opportunity to work on his research project. The author also conveys deep gratitude to Randy Rosenberger, whose input and assistance were invaluable in conducting this research. Finally, the author thanks Lynne Fonner, and the rest of his family for their time and support in completing this project.

## TABLE OF CONTENTS

	<u>Page</u>
Introduction.....	1
Literature Review.....	2
Research question.....	6
Expectations.....	6
Methods.....	7
Theory.....	8
Procedure.....	13
Sample.....	15
Measures.....	19
Monthly seafood consumption.....	19
Seafood purchasing experience.....	19
Favorite species.....	19
Preferred provider of information.....	20
Seafood vendor choice.....	21
Information channels.....	22
Perceptions of world fishery status.....	23
Health implications.....	23
Consumer knowledge.....	24
Choice experiment methodology.....	26
Ranking of attributes.....	30
Results.....	31
Attribute coding.....	31
Species main effects.....	33
Pooled main effects.....	36
Interaction effects.....	37

Expectation testing.....	38
Willingness to pay for attributes.....	40

# TABLE OF CONTENTS (continued)

	<u>Page</u>
Discussion.....	40
Main effects by species.....	41
Main effects pooled.....	41
Expectations .....	42
Future directions.....	43
Bibliography.....	44
Appendices.....	46
Appendix I. Respondent demographics.....	44
Appendix II. Survey questions.....	50

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Respondent income by store.....	18
2. Favorite species of Pacific Northwest seafood.....	20
3. Trusted safety certifications.....	21
4. Factors influencing seafood vendor choice.....	22
5. Perceptions of world fishery status.....	23
6. Knowledge index scores.....	25
7. Choice experiment format.....	28
8. Ranking of the choice experiment attributes.....	31
9. Respondent gender.....	46
10. Respondent age.....	47
11. Respondent income.....	47
12. Number of people in household.....	48
13. Highest level of education.....	48
14. Ethnicity.....	49
15. Marital status.....	49



## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Mean and median age of respondents at the four survey locations.....	17
2. Choice experiment attributes.....	28
3. Main effects model by species.....	34
4. Log likelihood ratio test for pooling data by species.....	35
5. Pooled main effects model.....	36
6. Moderating variables.....	39
7. The interaction effects model.....	39
8. Willingness to pay for attributes.....	40

## Consumer Preferences for Seafood Information Attributes

### **Introduction**

In the United States and abroad, fisheries and seafood consumers are faced with a variety of challenges. Fishermen pursue limited stocks of fish while facing strict harvest regulations and quotas. Worldwide, more than 75% of fish stocks for which data are reported are fully exploited or over exploited (The Food and Agriculture Organization of the United Nations, 2006). While dealing with decreasing harvests, competition from the burgeoning aquaculture sector has also impacted the seafood industry. The uniform products produced by ‘farm raised’ aquaculture have increased competition and spurred seafood producers to develop more differentiated products (Wessells, 2002).

In addition to supply-side issues, consumer preferences are also driving transition in the seafood industry. Rising consumer interest about the safety, origin, and environmental friendliness of the seafood they consume has generated the need for seafood to be marketed according to a variety of attributes in addition to price. Researchers have suggested “eco-labeling,” or labeling seafood harvested in an ecologically sustainable way, as a means of addressing the environmental issues related to seafood as well as bolstering consumer value for seafood products (Wessells et al., 1999).

In addition to eco-labeling, other labels may be important to seafood consumers. Local, quality and safety information labeling may also be viable strategies for developing differentiated seafood products. The goal of this study is to examine the extent to which consumers value and base their seafood purchasing decisions on information provided at the time of purchase. This is a particularly crucial issue to explore since understanding how information affects consumer decisions will lead to the development of more desirable and valuable seafood products.

### **Literature Review**

Consumer preferences for eco-labels are well documented in the economic literature. Recent studies by Wessells et al. (1999), Johnston et al. (2001) and Jaffry et al. (2004) have all assessed consumer preferences for eco-labeling using choice experiments that ask respondents to choose between alternative seafood products based on their attributes and price. Wessells et al. (1999) conducted a telephone survey of 1,640 US households where respondents chose between shrimp, salmon, or cod products differentiated only by the price and the presence or absence of an eco-label. Results demonstrated that consumers prefer eco-labeled products to non-labeled products and fueled further research. Johnston et al. (2001) conducted a similar telephone survey of 2,039 Norwegian consumers and compared them to Wessells' (1999) results. Analysis showed that preferences differed between Norwegian and U.S. consumers, though both samples were affected by price, species, and certifying agency. An unpublished work by Roheim et al. (2004) used an attribute based mail

survey (contingent ranking) of 432 Connecticut households to investigate tradeoffs between eco-labels and species choice. Results indicated consumers were willing to pay significant amounts for an eco-label but also indicated consumers were not willing to sacrifice their most favored species in order to obtain a less-favored species bearing an eco-label. This suggests that although consumers valued eco-labels, they more strongly value seafood species.

Finally, Jaffry et al. (2004) conducted 600 in-home surveys in the United Kingdom to investigate consumer preferences for eco-labeling. Using paired seafood comparisons, investigations showed that preferences differed not only by eco-label and price, but also by species, product form, type of certification (certified for safety vs. certified for quality), certifying agency, origin of the seafood (domestic vs. foreign), and brand and production method (wild vs. farmed). The study found that quality and ecological sustainability labels had the greatest effect on product choice, with origin and mode of production labels also significantly influencing seafood preferences.

Evidence of consumer preferences for eco-labeling can be found in today's seafood market. Consumer demand for eco-labeling coupled with over-fishing concerns led to the development of the Marine Stewardship Council's (MSC) sustainability certification program in 2000 (Wessells, 2003). Through the identification and labeling of sustainable seafood products, the MSC intends to harness consumer preferences for environmentally friendly seafood. While the effects

of the MSC's program are not yet fully understood, prospects are bright and partnerships with restaurants and the Whole Foods grocery chain have led to increased visibility (Wessells, 2003).

In addition to environmental concerns, media attention to the health risks of seafood (e.g. mercury, PCBs) has fueled increased consumer awareness about the safety of seafood consumption. Safety assurance labeling is one approach to satisfy consumers wary of seafood health risks, while also adding value to seafood products. Wessells and Anderson (1995) conducted a valuation survey of seafood safety assurances among 55 Rhode Island residents. Respondents were asked to rank order a list of various safety assurances and then state how much they would be willing to pay beyond a base price for flounder carrying their most preferred safety assurance. Results indicated that consumers had clear preferences about safety assurances and were willing to pay a premium for seafood products with such assurances. Another study by Wessells et al. (1996) modeled consumer safety ratings of the nations seafood supply based on the results from phone survey of 156 Rhode Island residents. The authors used respondent characteristics and opinions to explain consumer safety ratings and model results revealed that seafood consumers who rated seafood as 'somewhat unsafe' were more likely to increase seafood consumption as a result of positive safety information.

Despite a recent focus on the value of eco-labeling and safety assurance, less attention has been given to consumer preferences for information about seafood origin. Jaffry et al. (2004) found that consumers in the UK preferred domestically

caught fish over fish caught abroad. However, their study did not identify whether specifying regional information (i.e. locally harvested) would influence consumer choice. Increased consumer demand for highly differentiated products and a desire for cultural identification have created a growing market for products carrying a strong identification with a state or region (McCluskey and Loureiro 2003). In Oregon, salmon, crab and other seafoods are identified with local culture and consumers may prefer Oregon caught seafood products for cultural identification. Also, purchasing locally produced goods supports local businesses and economies, and may be perceived as environmentally friendly since fewer resources are used to transport the goods to consumers. It has even been suggested that local labeling of food is gaining traction in the same way that 'organic' labeling did in the 1990's (New York Times, 2006). Despite these market trends, little attention has been paid to consumer preferences for labels identifying locally made or harvested goods.

While studies have shown consumer preferences for seafood quality, sustainability, origin, and safety information, no study has compared relative consumer preferences across all of these attributes. Jaffry and his colleagues (2004) compared the desirability of quality certification vs. sustainability certification, and foreign vs. domestic origin attributes, but did not examine the value of safety assurances. Given the increasing importance placed on the origin of seafood, further study is warranted on the significance of origin information in seafood purchasing decisions. This study seeks to measure the relative importance of seafood information attributes most significantly related to consumer-purchasing decisions. Assessing

which attributes consumers desire most may lead to recommendations for creating more valuable and desirable seafood products. Additionally, evaluating the comparative value of each of these attributes will provide a fuller picture of the weighted value of each attribute in influencing seafood-purchasing decisions.

Hence, this study seeks to investigate the following research question.

**Research Question:** Which seafood information attributes are the most influential in determining consumers' purchasing decisions?

Additionally, the study will examine several expectations about relationships between respondent characteristics and preference for seafood information attributes.

Introducing interactions into the model later tests these expectations.

Many of the warnings about contaminants in seafood are targeted at pregnant women and women with small children, thus we expect the following.

**Expectation 1:** The relationship between the safety attribute and perceived seafood value will be influenced by gender, such that the safety attribute has a more pronounced effect on seafood choice for female compared to male respondents.

Additionally, based on the greater health risks associated with tuna consumption compared to other species, the following relationship is predicted.

**Expectation 2:** The influence of safety information on consumer purchasing decisions will be moderated by species type, such that tuna purchases will be

influenced to a greater degree by the safety attribute than choices involving other species.

As individuals who are concerned with the world's fisheries are likely to be influenced by information provided about the sustainability of the environment, the following relationship is expected.

**Expectation 3:** The relationship between sustainability and perceived seafood value will be moderated by the extent to which consumers are concerned about the world's fisheries.

Finally, a less intuitive relationship is predicted. Many individuals who perceive themselves as highly knowledgeable about seafood health concerns may not find safety assurances to be as instrumental in making purchasing decisions. Consumers who feel they personally have the necessary information to make informed choices may not be as heavily influenced by safety assurances.

**Expectation 4:** The relationship between the safety attribute and perceived seafood value should be moderated by consumers' demonstrated and self reported knowledge of seafood safety. Consumers who perceive themselves as highly knowledgeable will be less influenced by attribute labels than will those who are less knowledgeable.

## Methods

This section outlines the economic theory utilized to create the model, the procedure used to collect information and data, the sample, measures used in the



survey questionnaire, and finally, the design for the seafood choice experiment portion of the survey.

### *Theory*

This study is based on the theoretical foundations of choice theory. Attribute based choice theory relies on Lancaster's 1966 model of consumer theory, which proposes that the utility derived from a good can be separated into the utilities derived from the attributes of that good. The theory allows for products to be viewed as not only a single good, but as the aggregate utilities of a bundle of attributes, which in turn represents the utility associated with the entire good. Lancaster's theory provides the theoretical basis for deriving part-worth utilities for attributes of goods.

McFadden (1974) placed discrete choice analysis on more solid economic footing using Thurstone's (1927) random utility model. Random Utility Maximization (RUM) theory was developed as a basis for explaining dominance among paired comparison choices. The theory assumes that consumers make choices to maximize their utility, and if faced with a paired comparison, would choose the option yielding the highest utility contingent upon time and budget constraints. Furthermore, the theory assumes utility to be the sum of two components, the observable, systematic components ( $v$ ), and the unobservable, random components ( $e$ ). In equation (1),  $U_1$  equals the true but unobservable utility of option 1, and  $e_1$  is a random error term with mean zero.  $V_1$  represents the systematic, observable component of utility and is a function of a vector of attributes defining alternative 1 ( $x_1$ ), the cost of alternative 1 ( $p_1$ ), and a vector of preference parameters ( $B_1$ ). As

consumer choice is assumed to be deterministic and without error, the error term in random utility theory represents factors affecting choice that are unobservable to researchers, but that guide decision makers' choices.

$$(1) \quad U_1 = v(x_1, p_1; \beta) + \varepsilon_1$$

The multinomial logit model is briefly outlined following the notation used by Holmes and Adamowicz (2003). Assuming that utility is linear in parameters, we can write the utility function for alternative 1 containing attribute k as (2). This represents the decision maker's preference for alternative one based its price and attributes.

$$(2) \quad U_1 = \sum_{k=1}^I \beta_k x_{1k} + \beta_p p_1 + \varepsilon_1$$

By incorporating a random component into consumers' utility functions, random utility theory allows researchers to make probabilistic statements about consumers' behavior. As will be discussed further, the current study asked respondents to choose between two seafood products, and assumed they would choose the one yielding the highest utility. Thus, generalizing the equation from (1) to include alternatives i through j, and given a set of alternatives C, we can express the probability of a respondent choosing seafood product i as the probability that the utility returned by seafood product i is larger than the utility provided by seafood product j.

$$(3) \quad P(i|C) = P(U_i > U_j) = P(v_i + \varepsilon_i > v_j + \varepsilon_j)$$

This expression in (3) can be rearranged to reveal an interesting result. The expression in equation (4) indicates that in the RUM model, seafood product choice is

based on differences across alternatives. Thus, respondent demographics and other variables that are constant across alternatives, drop out of the model.

$$(4) P(i|C) = P(v_i - v_j > \varepsilon_j - \varepsilon_i)$$

Specification of probability models is contingent on assumptions made about the distribution of the error term ( $\varepsilon$ ). In specifying a conditional logit model, this study makes the standard assumption that error terms are independently and identically distributed (IID) following a type one extreme value distribution. The unlabeled nature of the current choice experiment increases the likelihood this assumption will be satisfied (Hensher et al., 2005). Making the IID type one assumption, the probability of choosing seafood product one can be expressed as (5), where  $\mu$  is a scale parameter assumed to equal one.

$$(5) P(i|C) = \frac{\exp(\mu v_i)}{\sum_{j \in C} \exp(\mu v_j)}$$

Given an additive and separable specification of utility, (5) can be written as (6).

$$(6) P(i|C) = \frac{\exp\left(\sum_{k=1}^1 \beta_k x_{ik} + \beta_p p_i\right)}{\sum_{j \in C} \exp\left(\beta_k x_{jk} + \beta_p p_j\right)}$$

By defining dummy variable  $y_{in}$ , that equals one when alternative  $i$  is chosen and equals zero otherwise, the multinomial logit model likelihood function (7) can be defined where  $n$  is equal to the sample size.

$$(7) \quad L = \prod_{n=1}^N \prod_{i \in \epsilon} P_n(i)^{y_{in}}$$

Finally, substituting (6) into (7) and taking the natural log of the function yields the following expression, which is the MNL likelihood function in linear parameters.

$$(8) \quad \ln L = \sum_{n=1}^N \sum_{i \in C} y_{in} \left( \sum_{k=1}^1 \beta_k x_{ikn} + \beta_p p_{in} - \ln \sum_{j \in C} \left( \sum_{k=1}^1 \beta_k x_{jkn} + \beta_p p_{jn} \right) \right)$$

With the likelihood function defined, maximum likelihood estimation (MLE) may be utilized to maximize the likelihood function, and thus estimate a vector of preference vectors B for attributes k and prices p.

In this choice experiment of seafood consumer preferences, the utility function expressed theoretically in (1) is empirically defined as (9) and (10) in the main effects model.

(9)

$$U(\text{product}_{-1}) = \beta_{safe} x_{safe} + \beta_{eco} x_{eco} + \beta_{local} x_{local} + \beta_{quality} x_{quality} + \beta_{price} p_{\text{product}_{-1}} + \varepsilon$$

(10)

$$U(\text{product}_{-2}) = \beta_{safe} x_{safe} + \beta_{eco} x_{eco} + \beta_{local} x_{local} + \beta_{quality} x_{quality} + \beta_{price} p_{\text{product}_{-2}} + \varepsilon$$

Using the MLE process, the main effects specification models the probability of a particular product being chosen based on price, and the presence or absence of

safety, eco-friendliness, local origin, and quality information attributes. In the experiment, paired seafood alternatives were identical with the exception of the presence or absence of the information attributes. As equation (4) implies, attributes common among alternatives—such as being wild caught—drop out of the model, and thus the main effects utility functions properly define respondent choice decisions. Still, not all determinants of choice are observable, and these affects are captured in the error term ( $\epsilon$ ), which is assumed to be distributed similarly across alternatives.

No constant term is specified in (9) or (10) to reflect the generic nature of seafood alternatives in the choice experiment (Hensher et al., 2005). In the study, product profiles presented to respondents in the survey were unlabeled (e.g. Salmon fillet 1 vs. Salmon fillet 2), aside from the additional information that was provided according to the experimental manipulation. Given that only  $(J - 1)$  constants may be estimated by the model (where  $J$  equals the number of alternatives, equal to two in the current study), adding a constant to either (9) or (10) would estimate a model where alternative 1 and 2 are modeled differently, when in fact they are identical except for the levels of particular attributes. Hence using a constant term violates the implied generic nature of the experiment.

Welfare measurements can be derived from the model coefficients in the form of compensating variation. Compensating variation (CV), or marginal willingness to pay, measures the amount of money that must be given to or taken from an individual to make him or her just as well off as before a specified change. In the current study, the specified change is from a state when no information is provided about an

attribute ( $V^0$ ) to a state where the attribute is present ( $V^1$ ). The attribute coefficients ( $B_s$ ) represent the marginal utility of moving from  $V^0$  to  $V^1$ , or  $V^1 - V^0$ . The price coefficient in choice models represents the marginal utility of money, a measure of consumer price sensitivity that is represented as  $\lambda$  in (11). In this study, the price variable was estimated as percent price increase over a base market price. Thus, the price increase coefficient multiplied by the base market price of the product yields the marginal utility of money. CV is defined generally in (11), as the ratio of the marginal utility of an attribute over the marginal utility of money. This ratio also can be defined as the marginal rate of substitution between the information attribute and price attribute. In the study, marginal willingness to pay estimates were derived using (12), where  $B_{\% \text{ price increase}}$  is the price coefficient,  $B_{\text{attribute}}$  is the information attribute coefficient and  $P_{\text{seafood product}}$  equals the base market price of the seafood product in question.

$$(11) CV = (1 / \lambda_y) * [V^1 - V^0]$$

$$(12) CV = (1 / \beta_{\% \text{ price increase}}) * \beta_{\text{attribute}} * P_{\text{seafood product}}$$

Next the procedure, sample, and survey measures will be discussed.

Following these sections, the experimental choice experimental design is outlined.

### *Procedure*

A survey instrument containing a choice experiment was used to gather the

data for this study. To assist with the development of the survey, consumer preferences for seafood information were investigated in two focus groups. Natural food shoppers who consumed seafood were recruited to participate in focus group sessions regarding seafood purchasing decisions at the Seafood Innovation Center in Portland, Oregon. Participants were recruited on Craigslist and screened based on being regular seafood consumers (eat at least once monthly) and high-end grocery shoppers. Participants were asked a number of questions to identify what factors influenced their seafood purchasing decisions and took a short exit survey. The sessions revealed that the four information attributes most influential in seafood purchasing decisions are sustainability/eco-friendliness, origin, safety, and quality, as indicated by freshness, smell, and appearance. Focus group participants voiced preferences for seafood that was locally harvested, but did not mention preferences for U.S. vs. foreign caught seafood as documented by Jaffry et al. (2004). Based on the focus groups and subsequent meetings with local retailers, a consumer survey was designed beginning with a questionnaire to gauge respondents' seafood consumption habits and attitudes (see Appendix 2). The latter part of the survey included an attribute-based choice experiment. Respondents were asked to make eight choices between paired seafood products that differed only by price and labels representing the following four attributes mentioned above: quality, safety, local origin, and sustainability.

A consumer intercept survey was conducted at four locations of a high-end grocery store in Portland, Oregon. Participants were recruited during seventeen four-

hour surveying sessions held at Zupan's locations on SE Belmont (5 sessions), W Burnside (5 sessions), SW Macadam (4 sessions) and in SW Raleigh Hills (3 sessions). Surveys were administered to respondents on laptop computers placed near the store exit. Incentives of a \$5 store gift certificate and a can of premium tuna were offered to customers willing to participate in the short, anonymous survey. Shoppers met the criteria to participate if they indicated that they were at least 18 years of age, lived in Oregon or SW Washington, and ate seafood at least once a month.

### *Sample*

High-end national grocery chains such as Wild Oats and Whole Foods have gained popularity in the U.S. partially by selling products to consumers who value eco-friendly and local labeling. As these consumers are the target market for highly differentiated seafood, Portland-area high-end grocery shoppers were selected as the target population to sample for this study. In addition to the national high-end grocers, Portland also has a number of local high-end grocery chains. One of these local chains, Zupan's Market, graciously offered their four Portland area stores as venues for conducting this study. While Zupan's shoppers do not represent the entire population of Portland area high-end seafood consumers, sampling at a number of store locations allowed the study to capture a broader sample of high-end consumers. Compared to other high-end markets, Zupan's focuses on the quality attributes of their foods more than eco-friendly or local attributes.



Overall, 500 participants completed the survey. Responses were distributed relatively evenly across store locations, although the greatest number of responses were collected from the Belmont and Burnside locations. Response per four-hour surveying session was greatest at the Macadam location, with an average of 32.5 responses per session, and lowest at the Burnside location with an average of 25.4 responses per session. An exact response rate is not available, as we did not keep track of the number of people who were asked to participate but did not wish to do so.

Of the 500 surveys administered, 464 responses were useable in the choice analysis. If respondents failed to select an alternative in any of the 8 choice sets, their responses were discarded to maintain orthogonality in the design. In addition, a few responses were discarded to ensure an equal number of block-one and block-two responses so that the data contained only whole choice designs. Data was collected on five species, Albacore Tuna, Chinook Salmon, Dungeness Crab, Dover Sole, and Pink Shrimp; however, only 22 Pink shrimp and 4 Dover sole experiments were administered. These responses were not included in the choice analysis as there was insufficient data to estimate models specific to these species.

The questionnaire sample consisted of 500 respondents, including 280 women, 214 men and 6 not reporting gender. See the Appendix I for graphs representing the demographic attributes of the sample. The mean age of the sample was 44.5 years ( $SD = 15.26$ ), the mean age of women was 46.0 years ( $SD = 14.97$ ), and the mean age of men was 42.6 years ( $SD = 15.48$ ). Respondent age in the sample resembled a bimodal distribution, with proportionately fewer middle-aged

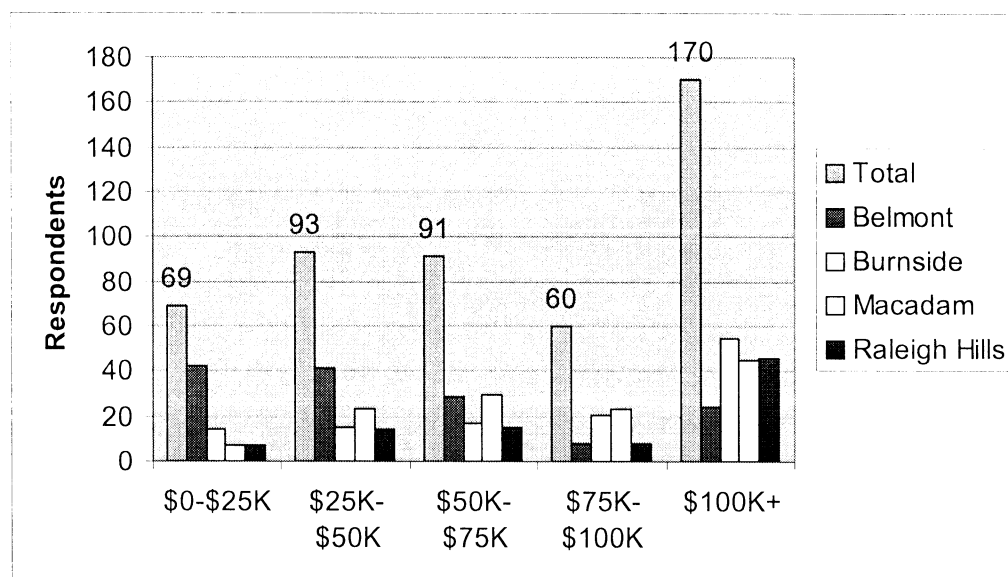
respondents and seniors. Comparing among stores, Table 1 shows the mean and median age of shoppers surveyed at E Belmont was lower than at other stores.

Table 1  
Mean and Median age of respondents at the four survey locations

	<i>Store</i>				
	<b>E Belmont</b>	<b>W Burnside</b>	<b>SW Macadam</b>	<b>SW Raleigh Hills</b>	<b>Total</b>
Number of					
Respondents	151	127	130	92	500
Median age	36.5	50	46	52	47
Mean Age	40.6	45.7	46.0	47.15	44.5
Standard Deviation	15.00	16.17	13.62	15.64	15.27

Over a third of the sample reported annual household incomes over \$100,000, and nearly two thirds reported incomes of \$50,000 and above, indicating the sample is relatively wealthy compared with the Portland and Vancouver, WA combined median income of \$44,373 (U.S. Census American Community Surveys, 2006). The Belmont store had lower income respondents than the other locations while the Macadam location had the highest frequency of incomes in the \$50K-\$75K and \$75K-\$100K ranges . Figure 1 outlines the income of respondents at each store location.

Figure 1  
Respondent income by store



Of the 500 respondents, 38% reported graduate or professional school as their highest level of education and over 70% were college graduates. This is a highly educated sample compared to Portland and Vancouver as a whole, where only 35% percent of residents hold a Bachelor's degree or higher (U.S. Census American Community Surveys, 2006).

Sixty eight percent of respondents reported living in households of two or less persons. The average respondent household was 2.24 persons ( $SD = 1.10$ ), the combined Portland and Vancouver average is 2.32.

The sample consisted primarily of Caucasian respondents (88%), and there was relatively low representation of Asian (3%), Hispanic (2%), African-American (1%), and Pacific Islander (1%) respondents. Also, 5% did not report their ethnicity. In

comparison, 79% Portland and Vancouver residents are Caucasian. Generally, the demographic profile of respondents fits expectations for high end grocery shoppers.

### Measures

The survey included a variety of questions to measure respondents' seafood consumption and attitudes.

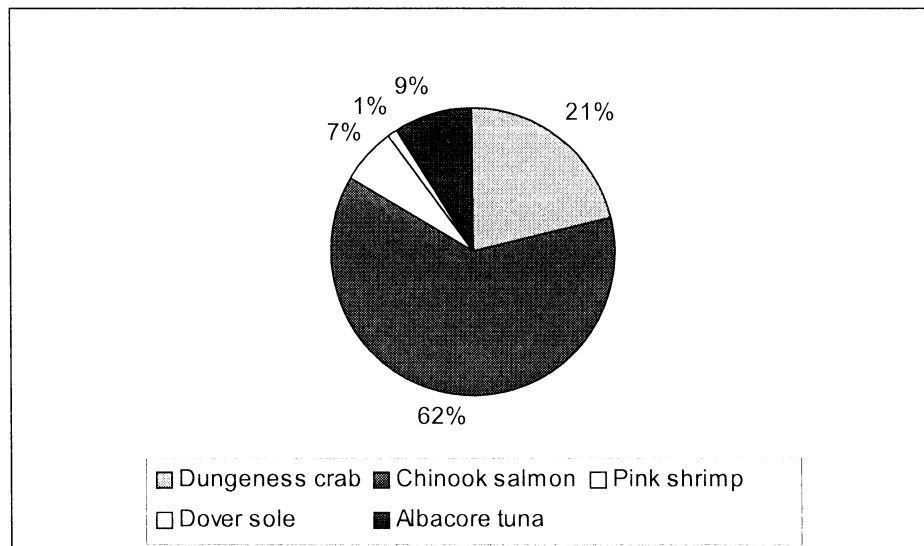
*Monthly seafood consumption.* Participants were asked to indicate how many six-ounce servings of seafood they consume in a typical month. On average, respondents reported consuming 7.34 six-ounce servings per month ( $SD=4.92$ ) or around 33 lbs per year. This figure is well above the national average of 16.5 lbs per year (NOAA, 2007)

*Seafood purchasing experience.* Respondents were also asked to report the extent to which they were the primary purchaser of the seafood consumed in their household. Over 71% of the sample reported purchasing all, or almost all of the seafood consumed by their household, while only 5.6% reported purchasing none of the seafood consumed by their household. This indicates that respondents to the survey were relatively experienced seafood shoppers.

*Favorite species.* In order to gauge respondents' local seafood preferences, the survey asked respondents to rate five species of seafood local to the Pacific Northwest according to their preference. Choices included Chinook Salmon, Dungeness Crab, Dover Sole, Pink Shrimp, and Albacore Tuna. The choices that respondents were presented with in the latter part of the survey were dependent upon their favorite species rating. For example, respondents who chose Chinook Salmon as

their favorite species were presented with paired comparisons of Chinook Salmon fillets in the choice experiment at the end of the survey. Figure 2 shows that over 80% of respondents chose either Chinook Salmon or Dungeness Crab as their favorite seafood, with 62% and 21% choosing salmon and crab, respectively.

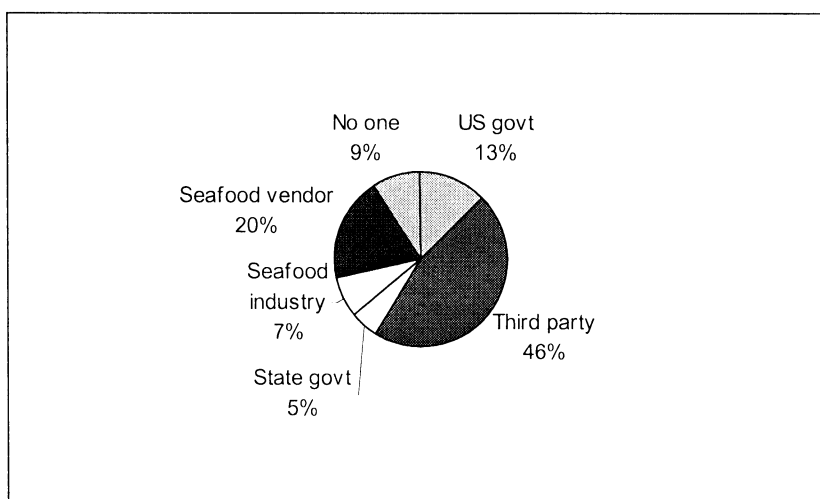
Figure 2  
Favorite Species of Pacific Northwest Seafood



*Preferred Provider of Information.* Participants were asked to select the entity they trusted most to provide information about their seafood from a list of six choices, including a third party, the U.S. government, the state government, the seafood vendor, the seafood industry, or no one at all. The certification agency of the respondent's choice was then used as the certifying agency of information attributes in the choice experiment section of the survey. If a respondent did not trust anyone on the list to certify information, the certifying agency of information presented in the

choice experiment was chosen at random. Figure 3 shows that 46% of respondents trusted a third party to certify information most and 9% did not trust anyone. Also, 21% of respondents trusted their seafood vendor most to certify information, making it the second most chosen response. This result implies a high degree of trust between high-end grocery shoppers and their seafood vendors.

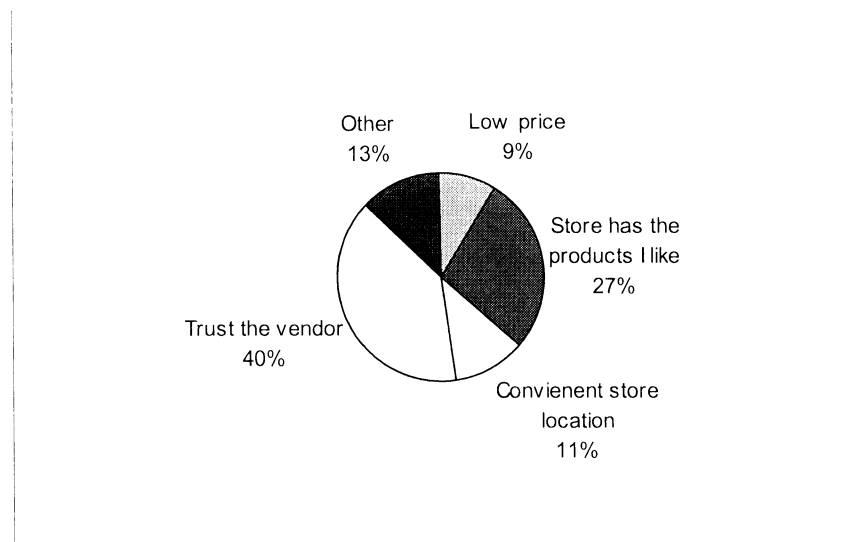
Figure 3  
Most trusted to certify information



*Seafood vendor choice.* Respondents were also asked to identify the most important factor in deciding where to purchase seafood, from a list of five choices, including low price, the store has seafood the respondent likes, the store is in a convenient location, the respondent trusts the vendor, and other. Figure 4 indicates that 40% of respondents chose vendor trust as the most important factor, reinforcing the information gathered in the focus groups. Many focus group participants stated that they don't have time to search for information about their seafood products and

instead trust the vendor to provide them with desirable products. One implication of is that seafood consumers choose high-end outlets not only because of preferences for the products they sell, but also because they trust that the values and preferences of their retailer correspond with their own values and preferences.

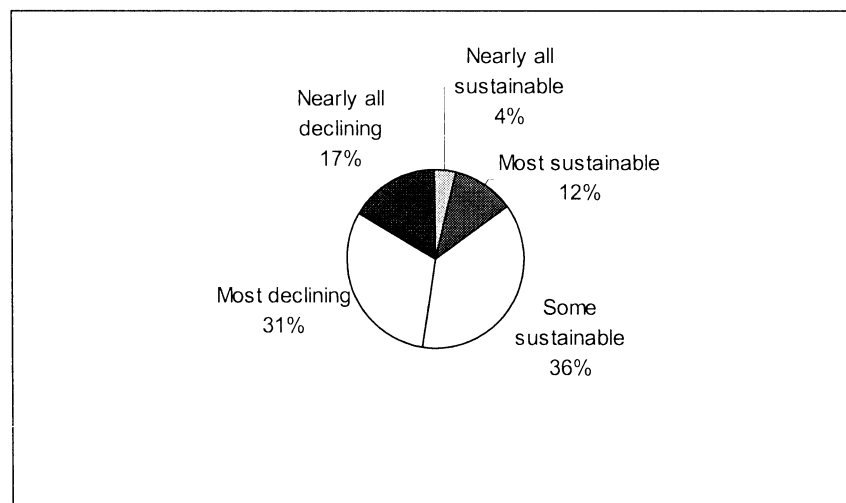
Figure 4  
Factors influencing seafood vendor choice



*Information channels.* Respondents were also asked whether they would rather receive information about their seafood from a label, a web kiosk, an available store employee, or by some other means. Overall, 49% percent preferred to receive information on a label, while 42% percent preferred information from an employee, and 6% preferred the web kiosk option. This result indicates that while labeling is an effective means of conveying information about seafood products, some consumers prefer to get information directly from a trusted vendor.

*Perceptions of world fishery status.* Respondents were also questioned about their general perception of the state of the world's fisheries. They were asked to select the statement best describing their general impression, which ranged from viewing fisheries as nearly all sustainable to nearly all declining. Figure 5 shows that nearly 50% of the sample believed that most, or nearly all of the world's fisheries are declining. Individuals who are especially concerned or pessimistic about the state of the world's fisheries might be willing to pay more to ensure they are consuming seafood harvested in a sustainable way.

Figure 5  
Perceptions of world fishery status



*Health implications.* To determine the extent to which respondents' purchasing decisions are linked to their perceptions of health issues, the survey asked respondents to select the statement that best reflected their general impression of the health benefits and risks of eating seafood. Fifty five percent of consumers surveyed

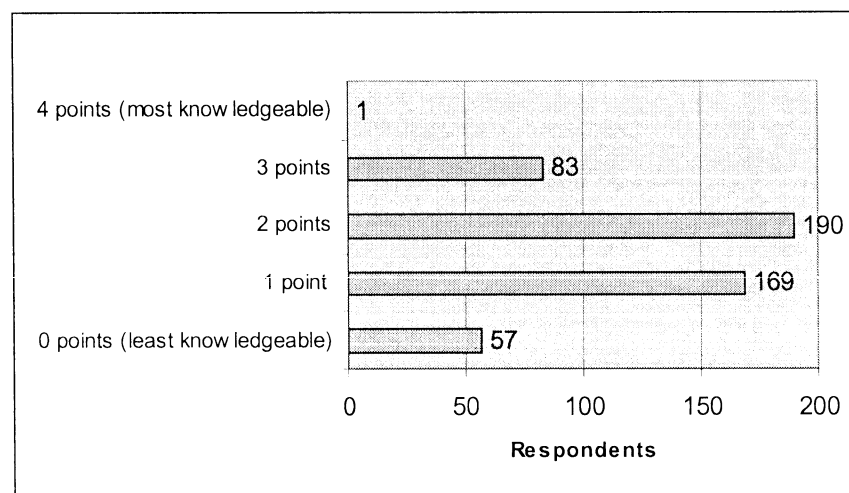


thought that in general the health benefits of eating seafood (e.g. protein, omega-3) outweighed the health risks (e.g. mercury, PCBs), while only 5% perceived the health risks as outweighing the health benefits. In addition, 33% of respondents felt the health benefits of eating seafood balanced out the health risks and 7% percent did not consider the health risks or benefits of eating seafood important.

*Consumer knowledge.* Three questions in the survey were designed to index consumers' seafood knowledge. Respondents were asked two questions about seafood and then were asked to categorize themselves as more knowledgeable, less knowledgeable or as knowledgeable as the average consumer. The knowledge score assigned to consumers was based on the sum of points that were awarded for each of the three questions. For the first two questions, respondents received one point for answering the question correctly. For the self stated knowledge question, respondents were awarded two points for indicating they are more knowledgeable than the average consumer and one point for indicating they are as knowledgeable as the average consumer. Possible scores ranged from zero to four. The first question, related to the shelf life of seafood after harvesting, was only answered correctly by a handful of consumers and thus no respondent scored higher than three. The second question asked how many 'average' six-ounce servings of seafood could be consumed weekly without risk according to the FDA. In general, high knowledge scores went to respondents who correctly answered a seafood safety question and considered themselves more knowledgeable than average consumers. Thus, respondents who scored high had some knowledge about seafood safety and were

confident they were knowledgeable seafood consumers. The mean knowledge score was 1.6 and the median score was 2. The distribution of scores is presented in Figure 6. Investigating a little further, it is discovered that only 25% of respondents who described themselves as more knowledgeable than the average seafood consumer answered the safety question correctly compared to 39% who considered themselves as knowledgeable as or less knowledgeable than the average seafood consumer. This surprising result may indicate that respondents describing themselves as more knowledgeable than the average consumer were not necessarily so. Still, it is a consumer's perceived level of knowledge that has the greatest bearing on seafood choice.

Figure 6  
Knowledge Index Scores



*Choice experiment methodology*

In addition to evaluating consumer demographic data, this study identifies the influence of seafood labeling on consumer choice, with the goal of determining the extent to which information about specific attributes increase the perceived value of seafood. The latter part of the survey consisted of a choice experiment, and the parameters were explained in that section of the survey. The goal of this choice experiment was to determine the value consumers place on various attributes as they consider their seafood purchasing decisions.

Respondents were asked to imagine they were shopping for the seafood they selected as their favorite earlier in the survey. The list consisted of five species, Chinook Salmon, Dungeness Crab, Pink Shrimp, Dover Sole and Albacore Tuna. The respondent was shown a common product form and was informed of the base market price for the species they selected as their favorite. Prices for the choice experiment represented the average annual retail price of the seafood products at our survey location. The products and market prices were: Chinook Salmon fillet (\$15.00/lb), whole Dungeness Crab (\$8.00/lb), whole Pink Shrimp (\$6.00/lb), Dover Sole fillet (\$8.00/lb) and Albacore Tuna loin (\$9.00/lb), representing fresh product forms for five of Oregon's most valuable commercial species.

Respondents were then presented with eight unique purchasing decisions between paired product profiles, such as "Salmon fillet 1" and "Salmon fillet 2". Respondents were asked to choose between two alternative product labels, which differed by the presence or absence of information regarding the attributes of safety,

environmental impact, local origin, and quality. These were attributes determined by local retailers and focus groups to be the most influential in consumers' purchase decisions. A laminated sheet defining each of the attributes was placed in front of the respondent, as seen in Table 2.

An example of one choice a respondent might be provided is shown in Figure 7. Respondents were told that both seafood choices were identical in appearance, and were both wild, caught in the U.S., and had never been frozen. Thus, decisions should be made according to differentiated information and price for each alternative. The price of each alternative differed according to the price premium associated with each attribute. The price increase levels were selected based on the recommendations of a seafood-marketing expert and equaled 2%, 7%, 12%, and 17% above market price. If neither product was satisfactory to respondents, they could choose to not make a purchase.

Additionally, it is important to point out that while production method (farmed vs. wild), country of origin, and fresh or frozen are important determinates of seafood choice, they are required by current labeling regulations and cannot be counted as providing "additional" information values (Thompson and Sylvia 2006).

Table 2  
Choice experiment attributes

Attribute		Information Label	Definition
<b>Safety</b>	Level 1	"Meets USDA safety guidelines"	Seafood is low in mercury and other contaminants compared to higher risk seafood choices. It is safe to eat twice weekly without significant health risk according to the U.S. Food and Drug Administration.
	Level 2	<i>No information</i>	
<b>Sustainable</b>	Level 1	"Sustainable Ecosystem Certification"	Ensures the fish population from which the seafood was harvested is healthy and sustainable. Also, it ensures the fishery causes minimal environmental damage.
	Level 2	<i>No information</i>	
<b>Local</b>	Level 1	"Harvested locally by Oregonians"	Oregon residents harvested this seafood from an Oregon fishing port. The label also provides information about the fishermen, vessel and port the seafood was harvested from.
	Level 2	<i>No information</i>	
<b>Quality</b>	Level 1	"Premium Quality Certification"	The seafood is certified to have received premium handling and is extremely fresh
	Level 2	<i>No information</i>	
<b>Price increase</b>	Level 1	2% price increase	The amount per pound you pay for the additional information provided about your seafood
	Level 2	7% price increase	
	Level 3	12% price increase	
	Level 4	17% price increase	

Figure 7  
Choice experiment format

### CHOICE 2

Please assume both of the salmon fillets are wild caught and are identical in appearance. Also, assume that wild, US caught salmon fillets with no additional information provided can be purchased at a different store for \$15.00

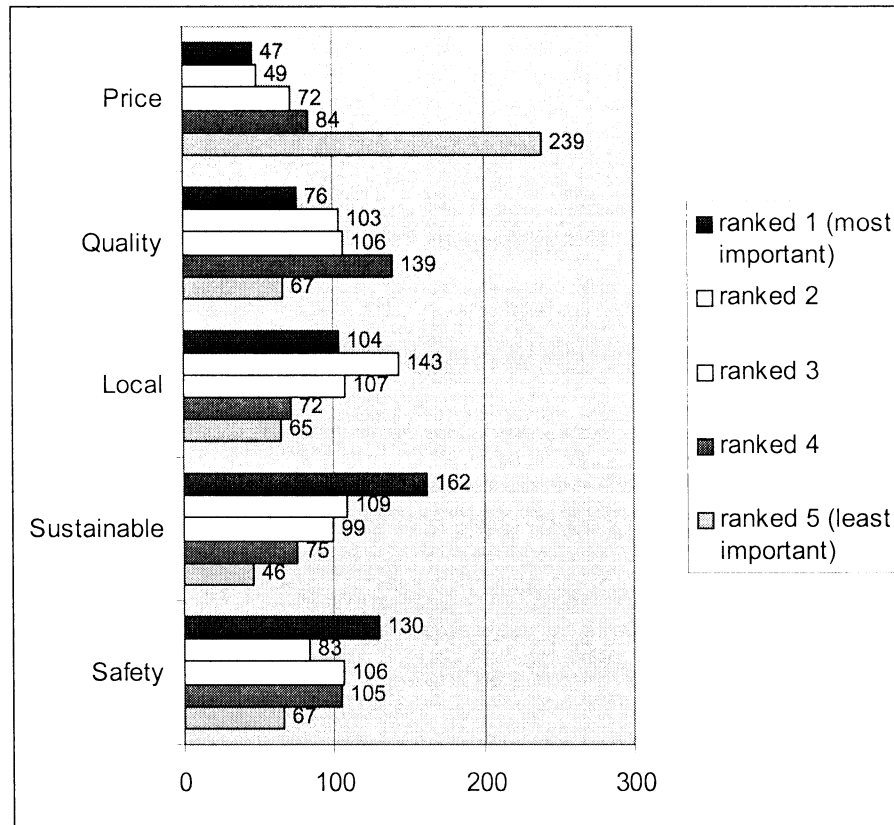
Attribute	CHINOOK SALMON FILLET 1	CHINOOK SALMON FILLET 2	PURCHASE NEITHER
<i>Safety</i>	----No information ----	Meets USDA safety guidelines	
<i>Environmental Impact</i>	Sustainable Ecosystem Certification	----No information ----	
<i>Local</i>	----No information ----	Harvested locally by Oregonians	
<i>Quality</i>	Premium Quality	----No information ----	
<i>Price Increase</i>	+ \$0.30/lb	+1.62/lb	
<b>Total price/ lb</b>	\$15.30	\$16.62	
<b>Choose one</b>	[ ]	[ ]	[ ]

The seafood product profiles in the choice experiment differed according to four information attributes with two levels each (information and no information) and four price increase levels. Different combinations of the attributes and prices yield 64 possible product profiles to show respondents. However, to keep the survey brief, a fractional factorial design where a specific combination of product profiles is shown to respondents. The current choice experiment consisted of 16 unique choice sets, but was blocked so that each respondent made 8 choices, which were shown in a random order to avoid possible ordering bias. To maintain the assumption of IID, attribute columns in a choice experiment must be independent. As such, arranging choice treatments so that the design columns are orthogonal, and thus independent, is one of the main challenges facing researchers designing choice experiments. Another consideration in experimental design is balance, or the concern that each of the attribute levels should appear an equal number of times. An unbalanced design is undesirable as it pays disproportionate attention to some attribute levels while neglecting others. These considerations were accommodated using the SAS mktex macro, which uses a modified Federov algorithm to iteratively search through possible designs and minimize a design's D-error and thus jointly optimizing the design's orthogonality and balance (Kuhnfield, 1997). A restriction was put on the search so that all choices would contain at least one information attribute. This restriction led to only a small increase in D-error compared to the unrestricted design created by Mktex. A perfectly orthogonal and balanced design is 100% D-efficient,

although this is not possible for most choice designs. Instead the SAS mktex macro searches for a design that best incorporates both orthogonality and balance.

*Ranking of attributes.* Finally, following the choice experiment, respondents were asked to rank the attributes used in the experiment from most to least important, based on their influence on purchasing decisions. This question allows the relative magnitudes of marginal utilities (Bs) derived from discrete choice modeling to be verified with an ordinal ranking exercise. For example, in Figure 8, “Sustainable Ecosystem Certification” received the highest ranking, indicating that the coefficient associated with this attribute will likely be largest in the model. The safety variable was the second highest ranked attribute, while the local variable received the most ‘second most important’ ranks by a margin of thirty-four responses. Also, price appeared to have the least influence on purchasing decisions as it received the most ‘least important’ rankings by a margin of 172 responses.

Figure 8  
Ranking of the choice experiment attributes



## Results

To test the results, the four attributes were coded and entered into the model. Following the discussion of attribute coding, results are discussed regarding a main effects model, pooled main effects model, and an interaction model. Finally, specific expectations are tested.

### *Attribute coding*

In order to determine the unique influence of each attribute, attributes were coded and entered into the model. Effects coding was used for the information



attributes, with variables labeled as 1 if the information was present and  $-1$  if no information was provided. Effects coding was chosen over standard 0, 1 dummy coding in the current study for two specific reasons. First, dummy variables equal 1 when an attribute is present and equal 0 otherwise. This framework does not fit the choice context. For example, if the attributes were coded 1 for “locally harvested” and coded 0 for “no information,” the coding would imply that the attributes equal zero, and thus have no effect when no information is provided. However, this is not the case as a seafood product with no origin labeling may very well be local. The marginal utility of the no information attribute is a function of consumer certainty whether or not the unlabeled product is indeed local. Thus, “no information” should not be coded as the absence of an attribute. If effects coding is used instead, the coding scheme no longer implies that the effect of attribute on choice drops out when no information is provided.

The second reason for using effects coding is it allows analysts to recover the omitted level of a variable. Continuing with the local attribute example, we code 1 for locally harvested and  $-1$  for no information provided to capture the utility gained from moving from ‘no information’ to ‘locally harvested’. Also, we can measure the change from ‘not-local’ to ‘local’ coding 0, 1. Finally, effects coding allows us to capture marginal utility of moving from not local to no information by coding 0,  $-1$ . This level is not estimable using standard dummy coding.

It is important to note that although the coding scheme was chosen after careful consideration, the appropriateness of various coding schemes and the interpretation of their coefficients are poorly understood and sparsely documented in the literature.

#### *Species Main effects*

First, a main effects model was run using Nlogit 3.0 software to determine the extent to which attribute preferences are uniquely linked to different species. Table 3 shows the main effects model output for each species. Each species model was determined to be significant overall using a log-likelihood ratio test to compare the log-likelihood function in the estimated model to the log-likelihood function of a model estimated with only constants. The model coefficients can be interpreted as the marginal utility of an attribute. All coefficients are significant at the 95% confidence level except the crab model price variable, which is significant at 90%.

Results show that attribute preferences for information attributes do differ across species. Specifically, consumers of crab care most about local origin, followed by sustainability, and then safety and quality. Salmon consumers are most influenced by sustainability, followed by local origins, safety, and quality, respectively. Finally, tuna consumers are most influenced by safety certification, followed by local origin, sustainability, and quality. The ordinal differences in coefficients reflect that information attributes affect seafood choices differently across species.

Table 3  
Main effects model by species

<b>Crab</b> (768 observations)			
	Coefficient	Std. Error	P-value
Safety	0.383	0.063	0.000
Sustainable	0.525	0.065	0.000
Local	0.552	0.065	0.000
Quality	0.315	0.063	0.000
Price increase	-0.023	0.013	0.064
Log-likelihood	-396.347		
<b>Salmon</b> (2320 observations)			
	Coefficient	Std. Error	P-value
Safety	0.482	0.041	0.000
Sustainable	0.646	0.042	0.000
Local	0.624	0.043	0.000
Quality	0.311	0.041	0.000
Price increase	-0.035	0.008	0.000
Log-likelihood	-1072.295		
<b>Tuna</b> (256 observations)			
	Coefficient	Std. Error	P-value
Safety	0.435	0.112	0.000
Sustainable	0.355	0.114	0.002
Local	0.377	0.112	0.001
Quality	0.226	0.111	0.041
Price increase	-0.065	0.023	0.005
Log-likelihood	-121.889		

Clearly attribute preferences differ across species, but the question remains whether the model coefficients are significantly different across models. Log likelihood ratio tests were conducted to test the null hypothesis that the parameters of the models estimated for each species were equal. Degrees of freedom for the test was equal to the number of restrictions estimated, which equaled 5 in the paired tests and ten in the three-way test. The results of the three paired tests between species, and the three-way test (i.e. Testing whether  $Bs\_tuna=Bs\_salmon=Bs\_crab$ ) are included in table 4.

Table 4  
Log likelihood ratio test for pooling data by species

<b>Paired Tests</b>					
Test to pool crab and salmon	Unrestricted LL function:	-1468.6418			
	Restricted LL function:	-1472.261			
	Chi squared test stat:	7.2384			
	<i>Significance level</i>		0.01	0.05	0.1
	<i>Critical value with 5 deg of freedom</i>		15.09	11.07	9.24
	Can be pooled? (test stat < critical value)		Y	Y	Y
Test to pool tuna and crab	Unrestricted LL function:	-518.2354			
	Restricted LL function:	-522.1933			
	Chi squared test stat:	7.9158			
	<i>Significance level</i>		0.01	0.05	0.1
	<i>Critical value with 5 deg of freedom</i>		15.09	11.07	9.24
	Can be pooled? (test stat < critical value)		Y	Y	Y
Test to pool salmon and tuna	Unrestricted LL function:	-1194.1836			
	Restricted LL function:	-1199.612			
	Chi squared test stat:	10.8568			
	<i>Significance level</i>		0.01	0.05	0.1
	<i>Critical value with 5 deg of freedom</i>		15.09	11.07	9.24
	Can be pooled? (test stat < critical value)		Y	Y	N
<b>Three way test</b>					
Test pool salmon, crab and tuna	Unrestricted LL function:	-1590.5304			
	Restricted LL function:	-1599.241			
	Chi squared test stat:	17.4212			
	<i>Significance level</i>		0.01	0.05	0.1
	<i>Critical value with 10 deg of freedom</i>		23.21	18.31	15.99
	Can be pooled? (test stat < critical value)		Y	Y	N

The tests showed that despite the divergence in coefficients by species discussed above, the null hypothesis that coefficients are the same across species couldn't be rejected at the 0.05 percent significance level. However, for the paired test of salmon and tuna, we reject the hypothesis that the coefficients are the same at the 0.1 level, but this is likely due to the weight of salmon observations in the data. Likewise, for the three-way test we can reject the hypothesis that the coefficients from all three

species are equal at the 0.1 level. Given that a 0.05 level of significance is generally used as the cutoff for whether data can be pooled, we proceed in pooling the data bearing in mind that species is a contributor to respondent preference heterogeneity. To capture the species affect, species dummy variables were constructed and estimated with the main effects model but were found to be insignificant as the log likelihood ratio tests implied.

#### *Pooled main effects*

Next, a pooled main effects model was examined to determine how information attributes influenced purchasing decisions. The pooled main effects model, combining tuna, crab and salmon responses, consisted of 418 respondents and 3,344 observations of choice. The overall model was determined to be significant with a log likelihood ratio test and model coefficients and p-values are presented in Table 5.

Table 5  
Pooled main effects model

	<b>Main Effects</b> (3344 observations)		
	Coefficient	Std. Error	P-value
Safety	0.451	0.033	0.000
Sustainable	0.591	0.033	0.000
Local	0.584	0.034	0.000
Quality	0.303	0.033	0.000
Price increase	-0.034	0.006	0.000
Log-likelihood	-1554.232		

All of the estimated coefficients are significant in the pooled main effects model. The sustainable and local coefficients are largest with the marginal utility of

sustainability certification only slightly greater than that of the local label. Third most important attribute is safety, followed by quality. Model results are consistent with results from the attribute-ranking question asked to respondents. Thus, the most important overall attribute is sustainability followed closely by the local attribute.

#### *Interaction effects*

Interaction effects gauge whether an attribute has a differential impact on choice when considered in concert with another variable. For example, consumers may already associate local seafood with being of higher quality. Estimating an interaction between quality and local origin would measure whether quality labeling has a different affect on choice when the local origin attribute is present compared to when it is not. The two-way interactions between all attribute variables were estimated in the model but none were found to be significant.

Given the generic nature of the study, no alternative specific constant (ASC) was specified in the model. This prohibited the common practice of estimating demographic effects through interaction with the ASC. Instead, the effects of demographic and attitudinal variables were investigated through interaction terms with the attributes. Unlike attribute variables, which are designed to be orthogonal, demographic and attitudinal interactions may lead to collinearity problems in the model (Holmes & Adamowicz, 2003). Also, past research has shown that in linear models such as MNL, only 5 to 15% of variance can be explained through two-way interactions (Dawes & Corrigan, 1974; Hensher et al., 2005). Thus the information

gained from interaction terms must be weighed against the problems they introduce into the model.

### *Expectation testing*

This study investigated the significance of four interactions whose effects were anticipated before model estimation. This differs from other models, which create a vast list of demographic variables to evaluate. The expectations are outlined below. Likely as a result of collinearity, the simple choice design in this study was only able to estimate three interactions at a time in the model. To deal with this restriction, the four anticipated interactions were estimated in the model, three at a time. The moderating variables are defined in Table 6.

*Expectation 1.* The first anticipated effect was an interaction between the gender and safety variables.

*Expectation 2.* Second, we expect that choices between tuna products would be influenced more by the safety attribute compared to choices between products of other species. This expectation follows the species-specific modeling results in Table 3 and the relatively greater health risks associated with tuna consumption compared to the risks of consuming other species.

*Expectation 3.* A third expectation is that sustainability certification would provide greater marginal utility to respondents who are concerned about the world's fisheries.

*Expectation 4.* A final, and less intuitive expectation is that respondents who scored three on the Knowledge index (answered seafood safety question and perceive

themselves as more knowledgeable than the average consumer) think they already know how to avoid high-risk seafood species, and thus receive less marginal utility from the safety attribute than other respondents.

Table 6  
Moderating variables

Variable	Definition
<i>Female</i>	Equals one if female, zero otherwise
<i>High KI score</i>	Equals one if scored three on knowledge index, zero otherwise
<i>Negative impression</i>	Equals one if believes most or nearly all of fish populations are declining, zero otherwise
<i>Tuna</i>	Equals one if choice species is tuna, zero otherwise

Expectation 2 was dropped from the model as analysis revealed that the tuna-safety interaction was insignificant while the other interactions were significant at a 95% confidence level and had the expected sign. The results of the interaction effects model are summarized in Table 7.

Table 7  
The interaction effects model

	Interaction Effects ( 3264 observations)		
	Coefficient	Std. Error	P-value
Safety	0.412	0.033	0.000
Sustainable	0.492	0.033	0.000
Local	0.609	0.034	0.000
Quality	0.321	0.033	0.000
Price increase	-0.032	0.006	0.000
Female * Safety	0.127	0.045	0.004
High KI score * Safety	-0.147	0.058	0.011
Negative impression* Sustainable	0.232	0.045	0.000
Log-likelihood	-1533.360		



In the interaction effects model, the local attribute becomes the most important determinant of choice followed by sustainable, safety, quality and then price. Results from the interaction model confirmed expectations 1, 3, and 4, but not expectation 2, that tuna choices were more influenced by the safety attribute than choices about other species.

#### *Willingness to pay for attributes*

Based on the main effects model, willingness to pay was calculated for each attribute and species using equation (13). Table 7 shows per pound willingness to pay for each of the information attributes among the three pooled species. Clearly high-end consumers are willing to pay for information about their seafood, with local and sustainability being the most valuable information attributes.

Table 8  
Per pound willingness to pay for information attributes

Attribute	Coefficient	Implicit price	Salmon	Crab	Tuna
<i>Safety</i>	0.451	-13.93%	\$ 2.09	\$ 1.11	\$ 1.25
<i>Sustainable</i>	0.591	-18.24%	\$ 2.74	\$ 1.46	\$ 1.64
<i>Local</i>	0.584	-18.02%	\$ 2.70	\$ 1.44	\$ 1.62
<i>Quality</i>	0.303	-9.37%	\$ 1.40	\$ 0.75	\$ 0.84
<i>% Price increase</i>	-0.034				
Market price/ lb			\$ 15.00	\$ 8.00	\$ 9.00

### **Discussion**

The models developed in this survey measured consumer preferences for information attributes separated by species, pooled in a main effects model, and pooled including main and interaction effects. The implications of model findings are discussed below.

*Main effects by species*

Although species dependent differences in attribute preferences could not be confirmed, the species-specific models still reveal some interesting patterns. The greater importance of the local attribute in Dungeness Crab and Albacore Tuna purchasing decisions may reflect that local producers of these species face less competition from aquaculture, Canada and Alaska than the highly developed salmon market. Also, it may indicate a marketing opportunity for Oregon crab and tuna producers. The importance of the safety attribute in tuna purchasing decisions can likely be attributed to the tuna's relatively higher mercury content and the recent media attention it has received. Respondents were more worried about health risks when making tuna choices, and thus were more influenced by the safety assurance label. This result is supported by the relative ranking of attribute coefficients in the tuna-specific model (Table 3), while the interactions effect in the pooled model failed to support this hypothesis, probably due to collinearity problems in the model.

*Main effects pooled*

The main effects pooled model confirmed the relative importance of eco-labeling compared to other information attributes, but also revealed strong consumer preferences for local labeling. The local label, whose provision does not require sophisticated certification, was nearly as important as sustainability certification in determining seafood choice. Given the substantial costs associated with sustainability and safety certification, the results may indicate that local labeling is a more efficient way to differentiate seafood, particularly on a regional basis.

### *Expectations*

The coefficients estimated in the interaction effects model are not consistent with the attribute-ranking question presented to respondents in the survey questionnaire. Interaction models complicate the explanation of welfare measures in the model. The implicit price or marginal willingness to pay for an attribute is estimated as the ratio of the attribute coefficient over the price coefficient. Implicit price represents consumers marginal rate of substitution between price and information attributes. When interactions are brought into the model, the correct specification of implicit price becomes less clear. For these reasons, the main effects model is used in deriving welfare estimates.

The interaction model did, however, reveal some factors determining how attributes affected respondent choice. The significant ‘Safety \* Female’ interaction effect confirmed expectation 1, that women derive higher marginal utility from safety assurances than men. This may indicate that seafood safety programs targeting women have been effective in raising female consumer safety concerns.

The interaction term between tuna and safety was not significant in the model, and the expectation that safety assurances are more important in tuna purchasing decisions was not confirmed. Though it is likely that species has some influence on how seafood safety assurances are perceived, the relationship is not clear enough in the model to determine a significant effect. Also, significance of the ‘Negative impression \* Eco’ interaction, confirmed expectation 3 and demonstrates that individuals with a negative impression of the world fisheries derive relatively more

utility from seafood sustainability certification. Thus education programs about the plight of the world's fisheries likely influence preferences for sustainability certification. Finally, the significant 'High KI Score \* Safety' interaction term indicated that consumers who perceive themselves to be knowledgeable about seafood choices are less influenced by safety assurances. If perceived knowledge about safe seafood choices is a substitute for safety assurance labels, then educating consumers about safe seafood choices might more effectively differentiate seafood compared to an involved safety assurance program.

#### *Future directions*

The information gathered by this study should help guide future seafood research. The importance of vendor trust for high-end shoppers indicates that high-end vendors should be more involved in seafood marketing efforts. Presenting the results of this study to vendors will educate them on consumer preferences and improve their ability to garner consumer trust. Also, the importance of locally caught information about seafood should be further investigated. The current study found strong preferences for local seafood compared to seafood from elsewhere in the US. However, future studies might investigate how preferences for local labels compare with preferences for other geographically differentiated products (e.g. Alaska Salmon or Washington Dungeness Crab). Also, local seafood demand might be investigated to determine if a higher proportion of locally harvested seafood could be consumed locally. Seafood has the potential to be more valuable when consumed locally as transportation costs are decreased and the seafood can demand a locally harvested premium.

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## Appendices

### *Appendix I. Respondent Demographics*

Figure (9)  
Respondent Gender.

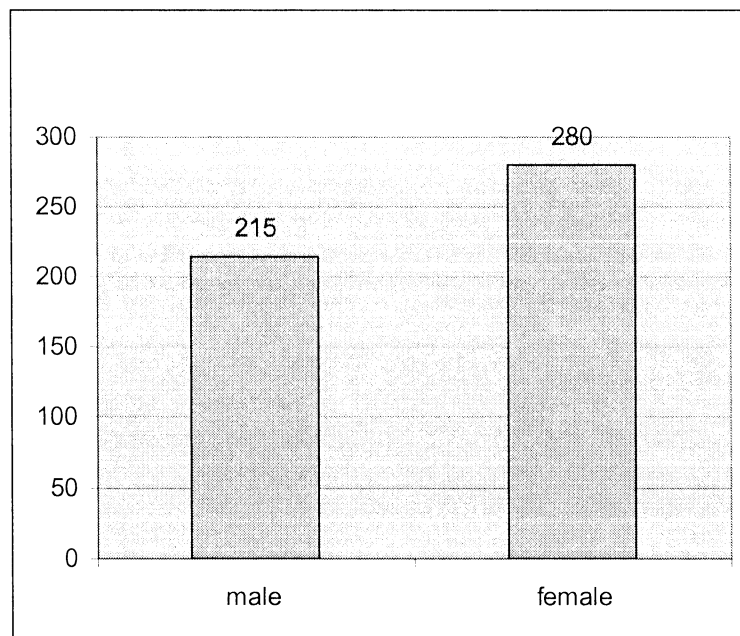


Figure (10)  
Respondent Age

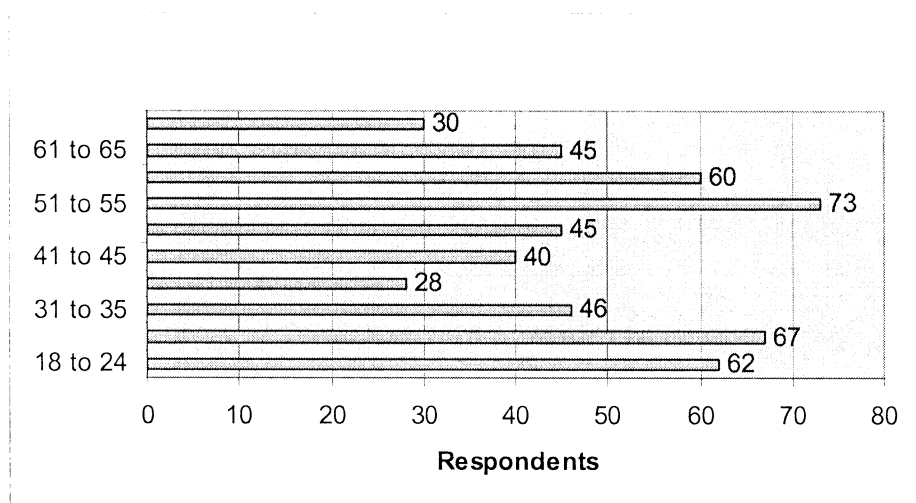


Figure (11)  
Respondent Income

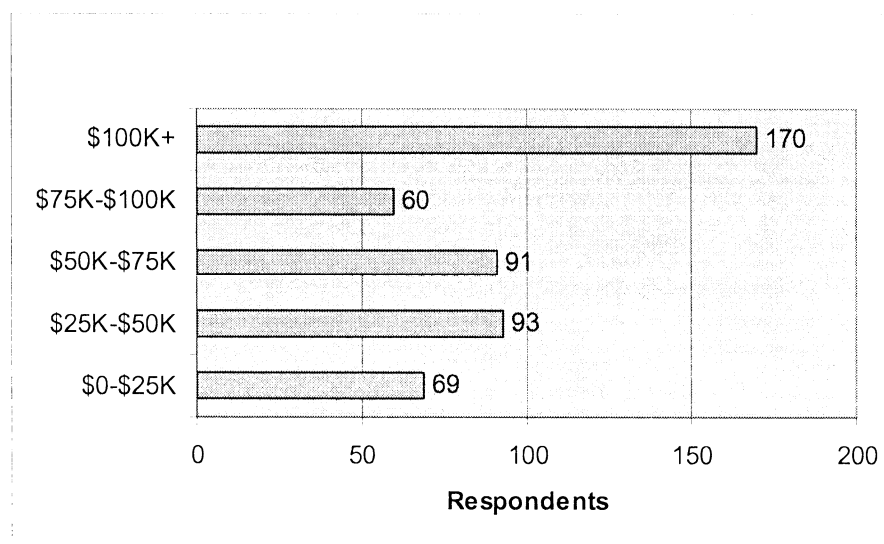




Figure (12)  
Number of People in Household

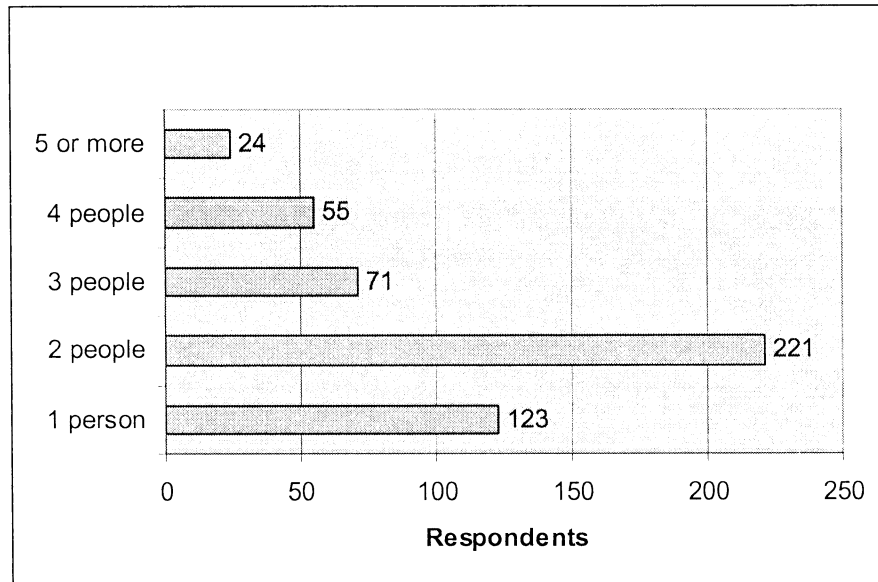


Figure (13)  
Highest Level of Education

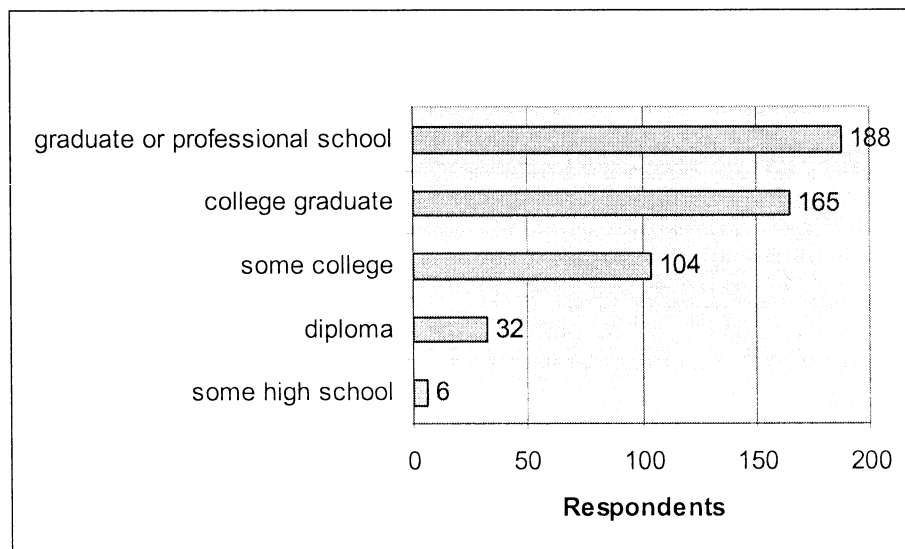


Figure (14)  
Ethnicity

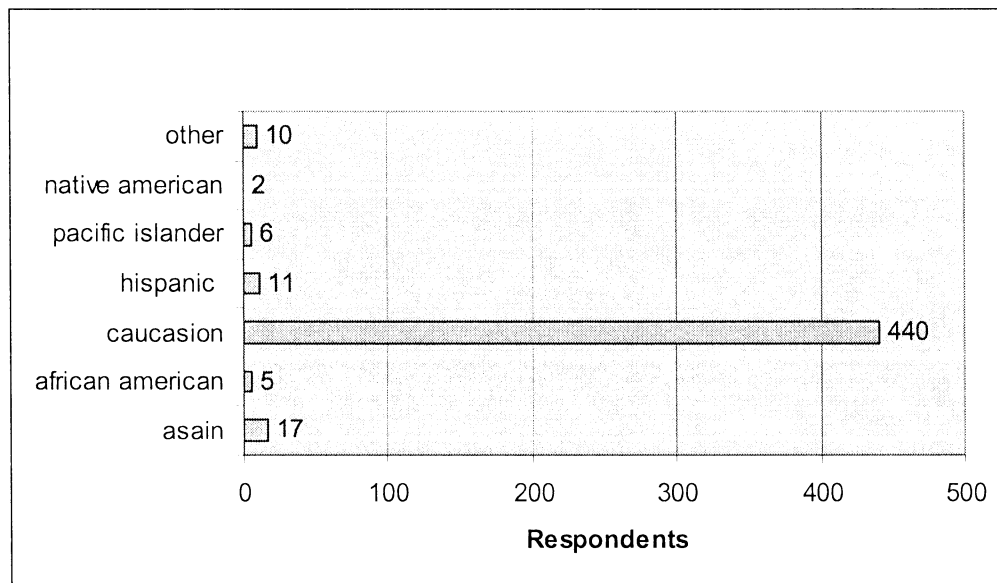
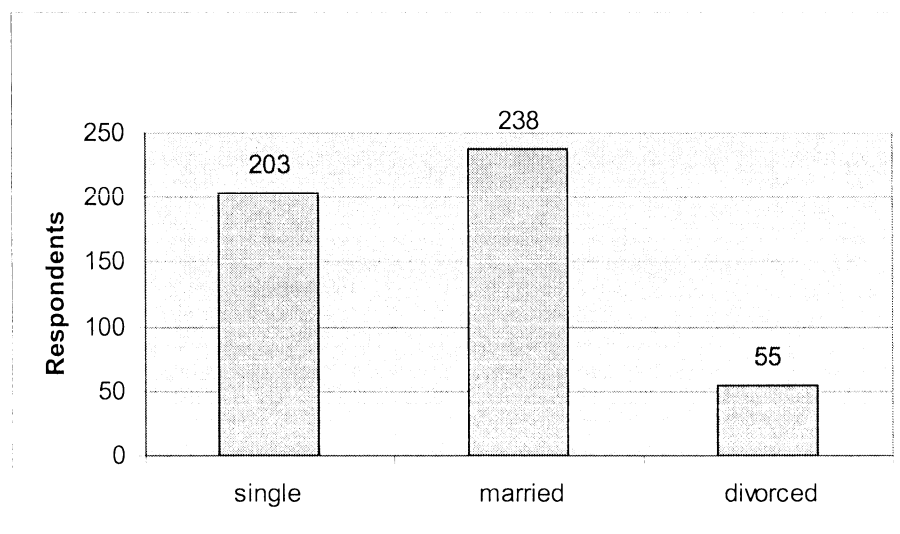


Figure (15)  
Marital Status



*Appendix II: Survey Questions*

1. In an average month how many times do you eat seafood

Type number (round to the nearest whole number)

\_\_\_\_\_

2. Where do you eat seafood more often, at a restaurant or prepared at home?
- At a restaurant
  - Prepared at home
  - About the same
3. Of the home-prepared seafood consumed by your household, how much do you personally purchase?
- Purchase almost all
  - Purchase over half
  - Purchase less than half
  - Purchase none
4. Where do you most often buy seafood to prepare at home?
- At a natural food store (for example New Seasons, Wild Oats, Zupan's)
  - At a standard grocery (for example Safeway, Fred Meyer, QFC)
  - At a fish market
  - Other (type in the box)
5. Select the statement that best describes your shopping habits for seafood to prepare at home.
- I almost always buy my seafood from the same chain or market
  - I usually buy my seafood at the same chain or market but sometimes at other outlets
  - I buy my seafood at a variety of places
6. What single factor is most important in your decision where to shop for seafood?
- Low price
  - The store has the products I like
  - Convenient location
  - Store Layout
  - I trust the vendor
  - Other (type in box)

7. From the list below, select your favorite type of northwest seafood you eat at least once a year. Specific species names are in parenthesis.
- Crab (Dungeness)
  - Salmon (Chinook)
  - Shrimp (Pink)
  - Sole (Dover)
  - Tuna (Albacore)

7a. In an average month, how many times do you purchase the type of seafood you selected in question 7 to prepare at home?

Type number (round to the nearest whole number)

\_\_\_\_\_

Questions 8-14 ask your opinions and perceptions about seafood and the seafood industry. There are no correct answers so respond to all of the questions the best you can.

8. Select the statement that best describes your general impression of the ocean's wild fish populations.
- Nearly all fish populations are healthy and sustainable
  - Most fish populations are healthy and sustainable, although some are declining
  - Some fish populations are healthy and sustainable, and some are declining
  - Most fish populations are declining, some are healthy and sustainable
  - Nearly all fish populations are declining
9. Select the statement that best describes your general impression of the nutritional benefits (omega-3 and protein) and health risks (mercury and PCBs) of eating seafood.
- The nutritional benefits of eating seafood outweigh the health risks
  - The nutritional benefits of eating seafood balance out the health risks
  - The health risks of eating seafood outweigh the nutritional benefits
10. Which of the following organizations would you trust most to provide information about the origin, handling, and contents of your seafood?
- The US govt
  - Independent third party (for example: Marine Stewardship Council)
  - State govt
  - The seafood industry

- My seafood vendor
- I would not trust any of these organizations to provide information about my seafood

11. If you were shopping at a seafood counter, how would you prefer to receive information about the seafood products?
  - On a seafood label
  - From an available store employee
  - On a web based kiosk
  - Other (write in box)
12. How long after a salmon is caught will it spoil if refrigerated but not frozen?
  - About 7 days
  - About 14 days
  - About 21 days
  - No idea
13. According to the US Food and Drug Administration, how many 6 oz. portions (1 average meal) of seafood can be eaten per week without significant risk from mercury?
  - 2 times
  - 4 times
  - 6 times
  - No idea
14. How knowledgeable are you about the harvest, handling and contents of the seafood you consume?
  - More knowledgeable than the average consumer
  - As knowledgeable as the average consume
  - Less knowledgeable as the average consumer
15. Which of the following five attributes were most influential in determining your purchasing decision? By typing numbers in the boxes, rank the following from 1- the most important attribute, to 5 – the least important attribute.
  - Meets USDA safety guidelines
  - Sustainable ecosystem certification
  - Harvested locally by Oregonians
  - Premium Quality
  - Price
16. How important is it that the information provided on seafood labels is verifiable by accessing a website?
  - Very important
  - Somewhat important

-Not important at all

17. Would you go to a website to access information about your seafood?

Yes → go to question 18

No → go to demographics

18. Why would you access a seafood information website?

-To verify the information provided on seafood labels

-To get additional about seafood products beyond seafood labels

-Both

-Other (type in box)

19. How many environmental organizations do you belong to?

20. Are you a recreational fisherman?

21. How long have you lived in Oregon or Southwest Washington

22. Annual household income

23. Age

24. Highest level of education

25. Ethnicity

26. Marital status

27. Number of children

28. Number of people in household

29. Gender