Analyzing Consumers' Willingness to Pay for Eco-labeled Seafood Products in Coastal and Inland Maine Counties

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Cover Page Footnote

Introduction

Histories of mis-managed species in the Gulf of Maine (GOM) lead to over-fishing and stock depletion. This was most pronounced with the cod fishery, which collapsed due to overfishing. Collapses of stock, such as cod in the GOM, can have several consequences for the ecosystem and economy. A crash in the stock population significantly decreased the amount fishermen were able to catch, and thus how much they could profit from the resource. Previous declines in economically valuable species motivated current policies and management for fisheries in the GOM.

A form of management driven by consumers to motivate more responsible fishery practices is eco-labels. Eco-labels specify characteristics of a product that are appealing to consumers, and thus result in a higher price. In the context of fisheries, an eco-label may indicate that the species a consumer is deciding to purchase is from a fishery that uses ecosystem friendly gear, is wild-caught, or is a species that is under-harvested and therefore sustainable to eat. These characteristics make the purchase more attractive to a demographic of consumers. Understanding consumers that are attracted to these purchases can help motivate fisheries to become certified for a specific label to meet market demand.

To characterize consumers in different areas, economists developed the benefits transfer method. This aims to predict the behavior of one population based on the behavior of another representative population. For example, one may assume that income is a determinant of spending. However, we cannot apply one populations spending to another population because they most likely have different incomes. Therefore, we can use the benefits transfer method to adjust the spending from the first population to the next, accounting for income. This method allows economists' to analyze important consumer decisions and determine equilibrium supply and demand conditions with the goal of maximizing utility and profits for everyone. I apply this tool to understand consumers' willingness to pay (WTP) for eco-labeled seafood products in the state of Maine.

Here, I will use a survey conducted in coastal Maine towns to understand demographic factors that influence a consumer's WTP. Developing a benefits transfer model requires one representative population and one or more populations that receive the transfer from the original population, thus I use this survey as my study site to base the rest of my analysis. From the values generated in the survey, I will incorporate the unique demographic make up of all the counties in Maine. Through this, I will calculate the overall WTP and the WTP for three label characteristics: ecologically sustainable, local, and promotes community development. Once each counties WTP is understood, I will compare the 9 coastal counties to the 7 inland counties to address overarching trends in consumer demand and acceptance of eco-labeled seafood (Figure 1).

Figure 1 The 16 counties in Maine that were used to compare the coastal and inland WTP for the benefits transfer analysis.

I have a two-part hypothesis addressing the survey conducted on consumers and the benefits transfer analysis:

(1) Consumers that are younger, more educated, have a higher income, and live in Maine will pay a higher price for eco-labeled seafood at a restaurant.

(2) Consumers that live in coastal Maine counties will pay more for eco-labeled seafood at a restaurant than consumers that live in inland Maine counties.

My hypothesis is based off characteristics of consumers that have been studied in the literature and I believe to be true. The first is that younger and more educated consumers are generally more aware of environmental issues and thus will be more willing to support labels that promote sustainability. Second, consumers that have a higher income are WTP more for products because it does not constrain their budget as much as a consumer that has a lower income. Finally, I believe that living in Maine, and particularly on the coast, makes a consumer more aware of the importance of fisheries on the livelihood and economy of Maine. For this reason,

I believe that consumers that live in Maine and on the coast are WTP more for eco-labeled seafood at a restaurant.

I will examine these beliefs by first looking at the current literature on the use of seafood eco-labels and the demographic characteristics that may make up a "typical" consumer. Next, I will analyze the data on trends of consumers from a survey on preferences for eco-labeled seafood at a restaurant. Finally, I will extend the results of this survey to the counties in Maine to identify geographic trends among consumers and motivate policy decisions.

Literature Review

The state of Maine has the third highest value of seafood landings worth a total of $473.9 billion behind Alaska and Massachusetts (Van Voorhees, 2013). Eco-labels have introduced a new market-based incentive for sustainable fisheries. Given the importance of fisheries in the Maine economy, eco-labels have the potential to shift demand toward more sustainable stocks. While there is little government regulation on seafood products, there are several independent agencies making seafood eco-labels and consumer guides such as the Marine Stewardship Council (MSC), Greenpeace, and the Monterey Bay Aquarium.

Although seafood eco-labels are still in development they have the potential to make several positive impacts in the market (Jaffry et al., 2004). Producers could see a rise in income as they meet consumers' label demands and charge a mark-up for the labeled product (Micheli et al., 2014). Seafood labels also have the potential to improve the degradation of the marine environment by encouraging sustainable fishing practices (Erwann, 2009). While there is great potential in this market, there are several challenges associated with successfully implementing and regulating seafood eco-labels. The marine environment is vast and defining specific boundaries for fisheries is difficult. As the geographic scope of fisheries widens it is increasingly difficult to assess fisheries for certification (Micheli et al., 2014). Additionally, producers absorb high start-up costs to be certified by agencies, which often makes labels an unfeasible investment.

Consumers play a key role in demanding the product. Understanding consumer demand will allow for strategic marketing and information for producers. The type of certification on eco-labeled seafood influences consumer's decisions for the product (Jaffry et al., 2004). There are similar and conflicting conclusions on how to define the "typical" consumer of eco-labeled seafood. Consumer's willing to pay more for eco-labeled seafood come from a background with higher income and therefore have lower price sensitivities (Ouédraogo, 2004; Brecard, 2009). Gender may be another defining characteristic of a seafood eco-label consumer, however currently some studies reveal that both men and women prefer the label (Brecard, 2009; Xu et al., 2012). Regardless of other factors, education has a positive effect on the purchase of eco-labeled seafood, as it is associated with

consumers that are more informed and aware of the information contained in eco-labels (Jacquet & Pauly, 2007; Xu et al., 2012). Consumers' preferences for a label are subject to change based on factors such as species, location and certifying agency (Jacquet & Pauly, 2007). The "typical" seafood eco-label consumer is not yet well defined, but in general factors such as education level, geographic residence, age, gender, and knowledge of the label have an effect on WTP (Wessells et al., 1999; Xu et al.,2012). Furthermore, consumers are willing to pay more for seafood eco-labels (Wessells & Anderson, 1995; Brecard et al., 2009; Erwann, 2009; Oleson et al., 2010; Schmitt, 2011; Xu et al., 2012).

Consumer demographics influence WTP for eco-labeled seafood products and therefore the benefits transfer method is an appropriate tool to use in order to assess WTP in deferent regions. An effective benefits transfer across sites and populations needs to be controlled by population characteristics (Brouwer and Spaninks, 1998). This method is of interest to policy makers that have limited time and money to conduct several surveys across multiple sites (Bergland et al., 2002). Additionally, it is an extremely informative tool for the use of economic values that consumers place on ecosystem services (Brouwer and Spaninks, 1998).

There are several economic and social factors that contribute to the effectiveness of eco-labels. In order to implement effective policy, the demand for eco-labels must be understood. Benefits transfer can be used in order to extend the current knowledge for WTP of eco-labels to other areas in order to understand site-specific demand. This study incorporates the demographic information in the literature for a consumer specifically in Maine. My aim is to contribute to the understanding of Maine consumers in each county in order to motivate future policy decisions based demand for seafood eco-labels.

Data
Data Collection

The ideal data set for this study would come from a survey that was an accurate representation of a population. This would allow for the most precise estimates of WTP and transfer of the WTP to other counties. Additionally, the categorical breakdown from the survey would match the categories from census data that I use for demographic characteristics of Maine counties.

A survey was given to customers in coastal Maine towns during the summer and fall of 2014. Customers that walked into local cafes were offered a $5 gift card in exchange for their participation. The purpose of the survey was to analyze consumers' decisions for seafood dishes at a restaurant. Through a hypothetical choice experiment, the survey analyzed consumers' preferences for different information about sustainability characteristics and the price associated with the dish. The survey started by getting a sense for the consumer's current knowledge on sustainability of fisheries, then moved into a consumer-choice experiment, and

finally concluded by gathering demographic information on the respondent. In this study, I will analyze one question from the fist section of the survey that asked, yes or no, if a consumer was willing to pay extra for information on the origins and sustainability of a seafood dish at a restaurant. If the consumer responded yes, they were asked to write in a dollar amount they would pay in addition to the cost of the dish for three different characteristics of eco-labels: ecologically sustainable, local, and promotes community development (Appendix Figure 4). A total of 228 customers participated in the survey and 158 indicated that they were willing to pay extra for information about their seafood. From this point forward I will focus my analysis on the consumers that were willing to pay extra for their seafood at a restaurant.

In the final section of the survey customers answered a series of demographic questions that I use in the analysis. The goal is that the survey is representative of a normally distributed population. However, the survey conducted displayed concerns that may skew the results. The customers that completed the survey were more likely to have a bachelors degree or higher, a higher income, and be over 60 years old (Figure A1, A2, A3). While this may skew the results of the benefits transfer analysis, I will continue with the analysis.

To perform the benefits transfer analysis, demographic information was obtained from the U.S. census for all counties in Maine. These demographics were the same facts that were obtained from the survey and included: age structure, gender, income, and education. There were some discrepancies between the categories on the survey and from the census data. For age, the survey categorized 18-25 as one bracket whereas the census uses either 15-19 or 20-24. For this analysis, I use the 20-24 bracket to represent those ages 18-25 in the survey. I do not believe this will be a problem for the results because the hypothesis is that younger consumers are WTP more, thus by including a slightly older demographic I will be underestimating the true WTP.

Data Summary

Four different WTP are examined in this study. Three types of labels (ecologically sustainable, local, and promotes community development) are taken directly from the survey respondent's answers. I also calculate the mean between these three labels to crease an overall WTP for the survey respondents. The overall WTP for information about a plate of seafood at a restaurant is $4.22. The ecologically sustainable and local label have similar values for WTP, however, the promotes community development label has a substantially lower WTP (Table 1). The relative importance that consumers place on the different types of labels will be important when analyzing the results. Additionally, it is important to notice that the standard deviation of these means are rather large and may be cause for concern during the analysis.

Table 1 The mean WTP and standard deviation for the ecologically sustainable, local, and promotes community development labels among consumers that were willing to pay extra for a label.

	Mean ($)	Standard Deviation
WTP	4.22	2.58
Ecologically Sustainable	4.42	2.75
Local	4.64	2.89
Community Development	3.61	3.38

Empirics

First, I build an ordinary least squares (OLS) regression to model the characteristics of a consumer that is willing to pay for eco-labeled seafood dishes:

$$\text{WTP} = \beta_0 + \beta_1 \, \vec{age} + \beta_2 \, \vec{edu} + \beta_3 \, male + \beta_4 \, \vec{income} + \beta_5 \, Maine + \beta_6 \, coast + \varepsilon \tag{1}$$

$$\text{Eco Sustainable} = \beta_0 + \beta_1 \, \vec{age} + \beta_2 \, \vec{edu} + \beta_3 \, male + \beta_4 \, \vec{income} + \beta_5 \, Maine + \beta_6 \, coast + \varepsilon \tag{2}$$

$$\text{Local} = \beta_0 + \beta_1 \, \vec{age} + \beta_2 \, \vec{edu} + \beta_3 \, male + \beta_4 \, \vec{income} + \beta_5 \, Maine + \beta_6 \, coast + \varepsilon \tag{3}$$

$$\text{Community} = \beta_0 + \beta_1 \, \vec{age} + \beta_2 \, \vec{edu} + \beta_3 \, male + \beta_4 \, \vec{income} + \beta_5 \, Maine + \beta_6 \, coast + \varepsilon \tag{4}$$

All explanatory variables in the model are binary variables. Age, education, and income are all categorical variables, which consumers fall into a particular bracket. For this reason, they are presented as a vector as there were multiple coefficient estimates associated with each of the three explanatory variables. The results of the first four equation are presented below (Table 2).

Each characteristic of a consumer influences their overall willingness to pay for ecolabeled products. For age, people younger than 40-45 appear to be willing to pay more than those who are older. Education does not tell as clear of a story, but it is noticeable that those who have not graduated high school are willing to pay less for a label than those who have a bachelor's degree. While both of these are not statistically significant they are in line with my expectations that in general younger consumers are more aware and involved in environmental issues. Income is the most statistically significant demographic characteristic and tells a clear story that those that have a larger income are willing to pay more for eco-labeled seafood at a restaurant. All consumers that make less than $50,000 are willing to pay significantly less than those that are in the $50,000 - $74,999 income bracket. This supports the hypothesis that consumers with a higher income are willing to pay more. Consumer's living in Maine appeared to generally pay less, particularly for the ecologically sustainable label which was statistically significant. This was not

consistent with my hypothesis, as I believed that Mainers would act in a manner to protect their fisheries since it is a large part of their livelihood and economy. However, one explanation for this result is that the surveys were conducted primarily during the summer months when there are a high number of tourists visiting Maine. While on vacation, tourists may be willing to pay more for their seafood at a restaurant, which would have skewed our results. If tourists make up a large portion of survey respondents that are not from Maine, then in comparison to tourists Maine respondents would have a lower WTP, explaining the negative coefficients. Finally, the results suggest that living on the coast decreases your WTP; although this is not statistically significant it is not in line with my hypothesis.

Table 2 Regression output from survey on consumers for mean WTP and WTP for ecologically sustainable, local, and promotes community development label.

	WTP	Ecologically Sustainable	Local	Community Development
Age				
18-25	1.74	2.42	1.69	1.12
25-30	2.29	1.88	2.50	2.50
30-35	0.71	0.94	1.36	-0.16
35-40	1.54	1.77	3.00	-0.15
45-50	1.02	1.45	1.67	-0.10
50-55	-0.33	-0.21	-0.26	-0.52
55-60	0.73	1.31	0.51	0.35
60+	1.15	1.26	1.06	1.13
Education				
Some high school	-0.86	-0.83	-1.14	-0.60
High school degree	1.44	0.84	1.19	2.29*
Associates's degree	1.38	1.57	0.89	1.68
Graduate or professional	0.32	0.46	0.2	0.31
Male	-0.17	0.43	-0.19	-0.74
Income				
<$25,000	-2.38*	-2.82*	-2.20	-2.11
$25,000- $34,999	-1.99*	-1.81	-1.49	-2.67*
$35,000- $49,999	-2.13*	-2.20*	-2.28*	-1.90
$75,000-$99,999	-1.42	-1.66	-0.78	-1.82
$100,000 +	-1.27	-1.32	0.06	-2.54
Maine	-0.93	-1.21*	-0.57	-1.00
Coast	0.63	0.89	0.53	0.46
R^2	0.1639	0.1568	0.1497	0.1825

* indicates value significant at the 5% level

Regressions 1-4 provide me with the appropriate coefficients to conduct the benefits transfer analysis. The estimates of beta can be used to account for the importance of each demographic factor when applying this regression to other populations. I estimated the WTP of consumers in all counties in Maine by substituting the demographic information for that county for each variable, while applying the corresponding coefficient from the original regression. This was done using the following equations:

$$\text{WTP} = \beta_0 + \hat{\beta}_1 \overline{age} + \hat{\beta}_2 \overrightarrow{edu} + \hat{\beta}_3 \, male + \hat{\beta}_4 \overrightarrow{income} + \hat{\beta}_5 \, Maine + \hat{\beta}_6 \, coast + \varepsilon \tag{5}$$

$$\text{Eco Sustainable} = \beta_0 + \hat{\beta}_1 \overline{age} + \hat{\beta}_2 \overrightarrow{edu} + \hat{\beta}_3 \, male + \hat{\beta}_4 \overrightarrow{income} + \hat{\beta}_5 \, Maine + \hat{\beta}_6 \, coast + \varepsilon \tag{6}$$

$$\text{Local} = \beta_0 + \hat{\beta}_1 \overline{age} + \hat{\beta}_2 \overrightarrow{edu} + \hat{\beta}_3 \, male + \hat{\beta}_4 \overrightarrow{income} + \hat{\beta}_5 \, Maine + \hat{\beta}_6 \, coast + \varepsilon \tag{7}$$

$$\text{Community} = \beta_0 + \hat{\beta}_1 \overline{age} + \hat{\beta}_2 \overrightarrow{edu} + \hat{\beta}_3 \, male + \hat{\beta}_4 \overrightarrow{income} + \hat{\beta}_5 \, Maine + \hat{\beta}_6 \, coast + \varepsilon \tag{8}$$

The $\hat{\beta}$ represents the coefficients from regressions 1-4 (Table 2) and each explanatory variable is the demographic information of each county. These equations were used for all inland and coastal counties on the four different WTP for eco-labeled seafood at restaurants (Table 3).

A comparison of inland and coastal counties in Maine reveals that overall coastal communities are WTP more than inland counties for eco-labelled seafood products at a restaurant. For the mean WTP, overall coastal towns are WTP $4.19 while inland counties $3.52. This same trend is evident for the ecologically sustainable, local, and promotes community development label as well. For the ecologically sustainable label the average WTP was $4.10 in coastal counties and $3.79 for inland counties. For the local label, the average WTP was $4.89 while $4.38 for inland counties. Finally, for the promotes community development label, the average WTP for coastal counties was $4.68 and $4.21 for inland counties. Across all labels, coastal counties were WTP a higher premium. In comparison to the summary results from the survey, I was surprised to find that among the counties the promotes community development label received a high average of above $4 because it was only $3.61 in the survey. This may suggest that residents of Maine due in fact place value on the fishing community in their state and support the belief that tourism was confounding the results of Mainer's WTP in the survey.

Table 3 Estimates for mean WTP and WTP for ecologically sustainable, local, and promotes community development labels for each county in Maine based on benefits transfer analysis.

	WTP ($)	Ecologically Sustainable ($)	Local ($)	Community Development ($)
Coastal				
Androscoggin	3.61	3.74	4.59	4.39
Cumberland	4.21	5.11	5.38	4.07
Hancock	4.24	5.08	6.26	5.87
Knox	4.32	3.87	4.64	5.97
Lincoln	4.26	3.85	4.64	4.33
Sagadahoc	4.31	3.89	4.76	4.30
Waldo	4.18	3.70	4.51	4.32
Washington	4.29	3.81	4.47	4.59
York	4.32	3.89	4.77	4.29
Inland				
Aroostook	3.48	3.00	3.85	3.89
Franklin	3.20	3.66	5.18	4.26
Kennebec	3.63	2.92	5.75	5.46
Oxford	3.59	2.80	3.99	4.00
Penobscot	3.63	2.92	4.09	3.91
Piscataquis	3.55	2.78	3.88	4.01
Somerset	3.55	2.76	3.94	3.95

Conclusion and Summary

The survey exposed the current lack of information available on consumer's willingness to pay for eco-labeled seafood dishes at restaurants in Maine. Results from the survey and benefits transfer are limited due to the abnormal distribution of the survey population. Additionally, the potential for a high number of tourists that responded to the survey may hinder the use of the results for Maine consumers. In the future, a larger survey targeting Maine residents in one area will build a model for a known population. By directing the survey at one demographic, problems such as tourists altering the results will hopefully be controlled for. As well as a larger sample size, ensuring that all categories of the survey align with available census data will accurately transfer the survey responses to other population. From this analysis, it is evident that there is a need for future studies on this topic. I have come to understand that the benefits transfer method may be an extremely affordable method for policy makers. This may be an important tool that can be used in the future for Maine fisheries.

With future research, there is potential to characterize the demand for eco-labeled products in Maine. This could lead to increases in the number of certified fisheries, furthering Maine's effort to ensure sustainable fisheries in. As Maine is one of the most valuable fisheries in the United States, sustainable fisheries will be important to ensure a healthy economy in Maine as well as the rest of the country.

Potential policy may include government subsidies for certifying as well as more stringent laws enforcing sustainable fishing practices. For policy to be effective, I believe that one population should be characterized extremely well, thus the benefits transfer analysis will be much more precise and insightful. Using this method I believe that market demand can be described, allowing for effective, geographic specific, policy to be implemented.

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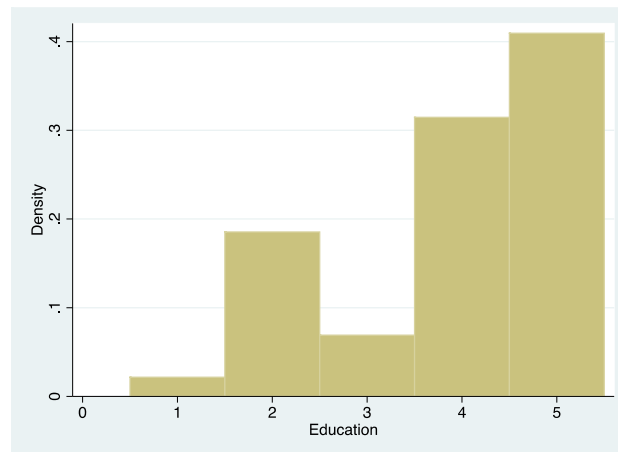
Appendix

Figure 1 Histogram representing the level of education of the survey population. 1= some high school 2= high school degree (or equivalent) 3= associate's degree 4= bachelor's degree 5= graduate or professional degree
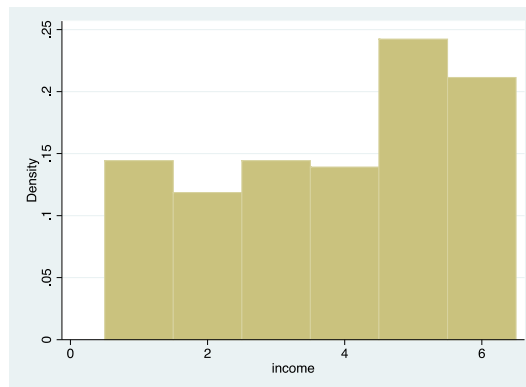

Figure 2 Histogram representing the income level of survey population.
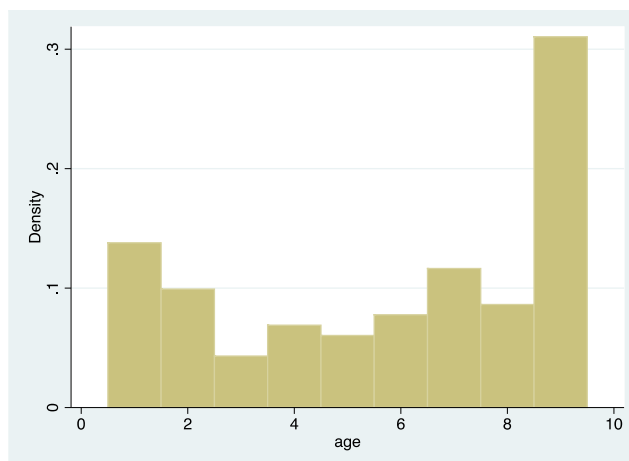

Figure 3 Histogram representing the age of the survey population.

<u>Part 1 - Short Questions</u>

For the following questions, there is <u>no right or wrong answer</u>. We would like an understanding of <u>how you perceive</u> each of these terms.

1. If you saw the term *"ecologically sustainable"* describing a seafood restaurant menu item what would you assume it meant?

    _____

    _____

    _____

2. If you saw the term *"local" "* describing a seafood restaurant menu item what would you assume it meant?

    _____

    _____

    _____

3. If you saw the term *"promotes community development"* describing a seafood restaurant menu item what would you assume it meant?

    _____

    _____

    _____

4. If you were to eat at seafood at a restaurant tonight for <u>dinner</u>, how much would you be willing to pay for a seafood dish? (If you are visiting Maine assume this is during your visit/vacation).

    $_____

5. Would you pay more for a dish at a typical seafood restaurant if they provided information about the origins and sustainability of the seafood?

    ❏ Yes   ❏No

    If yes, how much more (in addition) would you be willing to pay for the above dish if the restaurant provided information about the origins and the sustainability of the seafood?

    | Ecologically Sustainable | : | $_____ |
    | Local | : | $_____ |
    | Promotes Community Development | : | $_____ |

6. How familiar are you with <u>Marine Stewardship Council (MSC) certification</u>?

    ❏ Extremely familiar   ❏ Very familiar   ❏ Familiar   ❏ Not very familiar   ❏ Not at all familiar

7. How familiar are you with <u>Fair Trade certification</u> with regard to food?

    ❏ Extremely familiar   ❏ Very familiar   ❏ Familiar   ❏ Not very familiar   ❏ Not at all familiar

Figure 4 Survey page that asked consumers if they were willing to pay more for a dish and if yes write in a dollar amount.

Demographic Questions

The following information is important so that the researchers are able to conduct a complete analysis. Remember that all responses are anonymous and strictly confidential and you may chose not to answer any of the questions.

1. Do you live in New England? ❏ Yes ❏No

2. What is your relationship to Maine? (Check all that apply)
   ❏ I live in Maine
   ❏ I am on vacation
   ❏ I am visiting Maine but not on vacation
   ❏ I've been visiting Maine with my family since I was young
   ❏ At least two generations of my family have lived in Maine

3. If you live in Maine, how long have you lived here? _____ (years)

4. If are visiting Maine, how long is your trip? _____

5. In the last five years have you gone:
   Fishing ❏ Yes ❏No
   Boating ❏ Yes ❏No

6. What is the highest educational level you have completed? Check one
   ❏Some high school ❏High school degree (or equivalent) ❏Associate's degree
   ❏Bachelor's degree ❏Graduate or professional degree

7. Check all of the following categories that describe you.
   ❏Employed full time ❏Employed part time ❏Self-employed
   ❏Student full time ❏Student part time ❏Recent graduate
   ❏Retired ❏Unemployed ❏Other _____

8. If you live in the US, what is your zip code? _____

9. If you do not live in the US, what country do you live in?_____
10. How many children under 18 live in your household? ____
11. What is your gender? ❏Male ❏Female
12. What is your age?
   ❏18-25 years old ❏25-30 years old ❏30-35 years old
   ❏35-40 years old ❏40-45 years old ❏45-50 years old
   ❏50-55 years old ❏55-60 years old ❏60+ years old
   ❏ Prefer not to answer
13. What category comes closest to your total household pre-tax income? Check one.
   ❏less than $25,000 ❏$25,000 to $34,999 ❏$35,000 to $49,999
   ❏$50,000 to $74,999 ❏$75,000 to $99,999 ❏$100,000 or more
   ❏ Prefer not to answer

| Enumerator's name: _____ | Date & Time: _____ | Location_____ |

Figure 5 Survey page that collected demographic information on consumers.