Sustainable Seafood:
Improving Environmental Attitudes, Not Increasing Product Information, Can Lead to Greater Willingness to Pay

by Panos Smyrnios
University of Colorado, Boulder

A thesis submitted to the
University of Colorado at Boulder
in partial fulfillment
of the requirements to receive
Honors designation in Environmental Studies
Spring 2018

Thesis Advisors:
Peter Newton, Environmental Studies, Committee Chair
Dale Miller, Environmental Studies
John Lynch, Leeds School of Business

Abstract

Marine fish stocks and associated ecosystems are currently in a grave state, with 90 percent of worldwide fisheries considered fully fished or overfished. Due to policy and legislation proving timely and expensive, a market-based solution is needed to expedite sustainable change. Unfortunately, eco-labels, such as Marine Stewardship Council (MSC) and Dolphin Safe have not been effective in eliciting a greater consumer willingness to pay (WTP) for sustainable products. I distributed an online experimental survey to over 529 U.S. consumers to test whether providing concise, explanatory information on product packaging would elicit a higher WTP than products that just contained the traditional MSC label. In addition, I tested how environmental attitude, industry knowledge, and socio-demographic characteristics influence WTP. I found that there was no difference in WTP among products whose packaging included only a traditional MSC label, explanatory information, or a combination of the two. In contrast, environmental attitude played a significant role in predicting WTP: the more pro-environmental a consumer's attitude was, the more they were WTP for sustainable shrimp and salmon products. Like many other studies have found, product price was a main barrier in WTP. Improving consumers' environmental attitudes while focusing marketing campaigns on consumers that already hold pro-environmental attitudes may help boost sales and demand for sustainable seafood products, helping expedite vital sustainable change to the commercial fishing industry.

Preface

This undergraduate honors thesis was inspired firstly by my love for our oceans and their inherent power and beauty, but also largely due to my experience working for The Billfish Foundation as a summer intern in 2017. I have always been an avid fisherman and diver with a passion for ocean conservation and sustainability. However, it wasn't until my internship with TBF in 2017 where I learned a great deal about the commercial seafood industry, and the severe impacts it is having on global marine ecosystems. Once I made this connection, I became passionate in learning about seafood sustainability and investigating solutions to, what I consider, a highly underrated environmental crisis.

Acknowledgements

First, I would like to thank my committee for their year's worth of support and guidance. The many hours they spent providing me with valuable feedback and advice helped make this project possible and an incredible learning experience. I would also like to thank my good friend Gabirel Ezcurra, who was vital in helping me digitally create all of the original seafood products that were essential to my online experimental survey. Finally, I would like to thank Ashton Weins and Alan Medinger of CU's Lab of Interdisciplinary Statistical Analysis (LISA). The help they gave me with coding and analyzing my data was pivotal in the later stages of this project.

Table of Contents

Abstract iv

Preface v

Acknowledgements v

Introduction 1

Background and Literature Review 2

Background 2

The seafood supply chain and its environmental impacts 2

Sustainable seafood and eco-labels in the market place 6

Literature Review 7

Issues with eco-labels in eliciting higher WTP 7

Is information the missing link? 9

Effect on WTP: Environmental attitude, knowledge, and demographics 10

Methods 11

Experimental Survey 11

Participation 12

Experiment Design and Procedure 12

Empirical methods 18

Results 19

Response Breakdown 19

Socio-demographic breakdown of participants 19

Further filtering of data 22

Effect of Predictors on WTP 24

Finding 1: No difference in WTP between treatments 28

Finding 2: Environmental attitude was significant in predicting WTP 29

Finding 3: Age was significant in predicting WTP for the shrimp product 30

Discussion 31

What Was Learned About the Research Questions 32

Research question 1: Does providing explanatory information to packaging increase WTP over a traditional eco-label? 32

Research question 2: How do environmental attitude, industry knowledge, and demographics influence WTP for sustainable products? 36

Limitations 38

Conclusion 39

Appendices 41

Bibliography 48

Introduction

Since the global commercial fishing industry adopted large-scale, industrial level fishing techniques and technology in the 1970s, over 90 percent of global fish stocks have been overfished or are subject to overfishing. Although there have been many positive steps taken by national governments and multinational regulatory bodies to combat overfishing and related issues, command and control policy has consistently proven to be a timely and expensive process. As with many other environmental issues, a market-based approach is necessary in expediting change, since consumers hold significant clout in driving demand toward better industry practices. A number of third party eco-labels have entered the scene within the 21st century to take advantage of consumers' growing pro-environmental preferences and to promote sustainable practices, the most notable being the Marine Stewardship Council (MSC) label. However, literature is mixed on the effectiveness of eco-labels, such as MSC, in influencing consumers to pay the premiums associated with more sustainable production methods.

Reasons for this could be that the vague statements, like "sustainably caught" or "sustainably certified" provided by eco-labels fail to effectively communicate environmental benefits and impart trust among consumers. Literature associated with consumer purchasing behavior has indicated that providing consumers with the right amount of explanatory information may help increase consumer willingness to pay (WTP) for sustainable food products by imparting trust and perceived consumer effectiveness (PCE). Utilizing an online experimental survey distributed to over 600 individuals residing in the U.S., in addition to examining current

literature regarding eco-labels, behaviorally informed marketing, and environmental economics, I address the following two research questions:

1) Does providing consumers with more explanatory information on sustainable seafood product packaging lead to an increase in WTP over packaging only containing a traditional eco-label, specifically the MSC label?

2) In addition to changes in displayed information, to what extent do factors such as, age, education, environmental attitude, and self-rated knowledge of the seafood industry have on consumer WTP?

Background and Literature Review

Background

The following sections provide background information necessary to understanding the role that the seafood industry, specifically the commercial fishing industry, has in global consumer markets and the severe environmental impacts associated with it. I will also discuss the aims and roles of seafood related eco-labels in addressing these environmental concerns.

The seafood supply chain and its environmental impacts

In 2014, over 160 million tons[1] of seafood was produced worldwide, with 90 million coming from wild capture fisheries and 70 million from aquaculture (fish farming) (FAO, 2016). In the same year, these two industries employed over 50 million people and provided more than 3 billion with 15 percent of their animal protein intake (FAO, 2016). Unfortunately, much of this production has come at a large cost to our marine environments due to the highly unsustainable

[1] To put this into perspective, this is over five times the weight of all of the material used to construct the Empire State Building and the same amount of weight as the amount of paper products recycled each year worldwide.

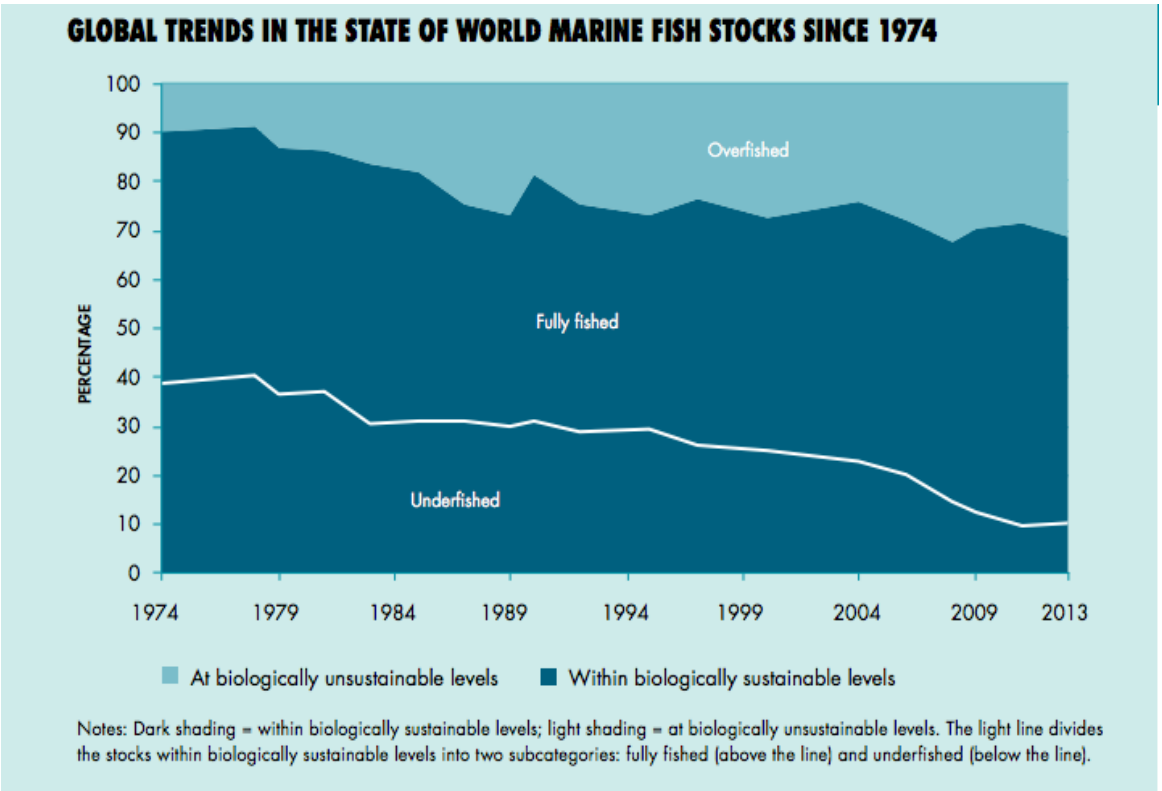
production techniques utilized by these two industries. Wild capture fisheries, through poor resource management worldwide and highly unselective fishing methods have led to significant degradation in both target (species that fisherman are pursuing) and non-target species' marine populations. Aquaculture, although it's meant to be a more efficient than wild-capture and take strain off of wild populations, creates significant environmental externalities, such as severe pollution and coastal habitat degradation. Although aquaculture is growing rapidly both in production and environmental impact (Swain, 2017; Martinez-Porchas and Martinez-Cordova, 2012), I am only going to address in detail wild-capture fisheries. This is because I will be focusing Marine Stewardship Council (MSC) label, which only certifies wild-capture fisheries.

Prior to the 1950's, small-scale, artisanal fishermen were responsible for producing the majority of wild seafood. At this time, fishing pressure and its associated environmental impacts were relatively low (Iles, 2007). The period between 1950 and 1970 saw a large increase in seafood demand due to refrigeration technology and increased awareness of seafood's high nutritional quality (FAO, 2013). In addition, technological advancements in fishing gear saw the commercial fishing industry explode, both in its production and associated environmental impacts. Vessels grew in size and number while advancements in commercial fishing gear, such as gillnets[2], loglines[3], and trawls[4] were readily adopted worldwide (Keledjian et al., 2014). These advancements saw annual catch increase from 17 million tons in 1950 (FAO, 2011) to over 90 million tons in 1980 (FAO, 2013). Production has stayed level between 80-90 million tons harvested per year since 1980 (FAO, 2016). Although this might sound positive, the reason

[2] Gillnets are massive "walls of net" that usually stretch from one to two miles, entangling most any fish or marine animal that swims into it them (Brown, 2016).
[3] Longlines consist of a long mainline with many smaller, baited lines attached. These lines can span up to 30 miles and contain around 10,000 baited hooks (Brown, 2016).
[4] Trawls are large, cone-shaped nets dragged by one, often two boats. (Brown, 2016).

production has leveled off is not due to decreased fishing pressure, as this has actually continued to increase every year, it is due to overexploited stocks (Keledjian et al., 2014; Iles, 2007). Due to poor fishery resource management worldwide, in combination with the highly unsustainable nature of modern industrial fishing methods, serious environmental issues have arisen. Global fish stock biomass is predicted to be at 10 percent of pre-industrial levels, with over 90 percent of global fisheries considered to be overfished or fully fished (Meyers and Worm, 2003; FAO, 2013; FAO, 2016; Keledjian et al., 2014) (See **Figure 1**).

Figure 1: The current status of (wild) marine fish stocks according to the FAO (2016).



In addition to the overfishing of commercially sought after wild fish stocks, bycatch[5] of non-target species like turtles, sharks, and cetaceans (dolphins and whales) is of substantial environmental concern (Meyers and Worm, 2003). The fishing methods described earlier are considered highly unselective (Iles, 2007), meaning that they catch more than just species they are targeting. For example, shrimp trawls, the primary method used to catch shrimp around the world, have a 62 percent bycatch rate (FAO, 2013; NOAA, 2015), meaning that 62 percent of their catches are not shrimp. Longlines, the primary method utilized to catch tuna, swordfish, mahi-mahi, and wahoo average a 30 percent bycatch rate (NOAA, 2015). These high bycatch rates have proven detrimental to many marine ecosystems, as keystone species, such as sharks, cetaceans, and large predatory fish are often caught. In addition, commercial fishing bycatch has directly led to the endangerment of sea turtles, such as the leatherback and seabirds, such as the albatross (Iles, 2007).

Within just the past two decades, there have been some improvements in technology, such as Turtle Excluder Devices (TEDs) that reduce turtle bycatch, "weak hooks" that allow larger fish and sharks to break free from longline hooks, and deep-set gillnets that reduce interactions with non-target species (NOAA, 2017). However, these improvements have been applied at a relatively small scale and mostly only prevalent within U.S. waters. Countries such as China, Taiwan, and Indonesia, where the U.S. imports nearly 80 percent of its seafood from (FAO, 2016), have done little if nothing to combat overfishing (Iles, 2007). Command and control policies implemented through national and multi-national regulatory bodies have proven to be timely and expensive, often taking decades to implement more sustainable production

[5] The catch of non-target species like turtles, whales and dolphin or undersized/non-legal target species. Bycatch is usually discarded by fisherman.

methods (Myers and Worm, 2003). Just like in other food related sectors facing environmental issues, market-based solutions have been sought as a way to expedite the transition toward more sustainable production and consumption (Teisl, Roe, and Hicks, 2002; Iles, 2007; Verbeke and Vermeir, 2007). Increasing awareness of these issues and demand for more sustainable products in the public sphere within the last three decades has seen the market for sustainably produced and labeled seafood to grow considerably (FAO, 2016; Brécard, 2009).

Sustainable seafood and eco-labels in the market place

The past two decades has seen both an increase in consumer attitudes towards marine sustainability (Vermeir and Verbeke, 2007). Sustainable seafood is estimated to make up around 14 percent of the market share in the seafood sector and be worth around 11.4 billion dollars (Potts, Wilkins, Lynch, and McFatridge, 2016). In reaction to an increase in pro-environmental attitudes, a wave of third party eco-labels such as Marine Stewardship Council (MSC), Friend of the Sea, and Dolphin Safe have made their way into the market place (Brownstein and Safina, 2008; Gertz, 2005). MSC is the most prevalent of the eco-labels, as it now certifies over 14,700 products from 300 fisheries, making up 10 percent of the world's fisheries (MSC, 2017). In addition, MSC has been partnered with Wal-Mart, the world's largest retailer, since 2006 (Fonner and Sylvia, 2015). Private companies utilize third party eco-labels to communicate the sustainability of their products to interested consumers. In addition, non-profit sustainability rating systems like Monterrey Bay Aquarium's "Seafood Watch" and EDF's sustainability rating system, among a slew of others, have grown in popularity (Iles, 2007).

Although the quantity of sustainable seafood options and associated labels have grown considerably since the 1990's (Verbeke and Vermeir, 2007; MSC, 2016), many studies have found that they, like other food related eco-labels, have had a marginal effect in shaping consumer-purchasing behavior (Horne, 2009). As with many environmental issues, there exists a

gap in consumers' intent to pay a premium for sustainably produced seafood and actually paying a premium (Grunert et al., 2014). The following literature review will address the theories regarding the lack of consistency of eco-labeling schemes in influencing consumer WTP.

Literature Review

The following sections will explore, through established literature, how eco-labels, information, and other factors such as environmental attitude, industry knowledge and demographics have shown to influence consumer purchasing decisions.

Issues with eco-labels in eliciting higher WTP

Due to the general public's environmental awareness increasing significantly between the end of the 20th and beginning of the 21st century (Gertz et al., 2005), a multitude of third party eco-labels in a variety of industries have entered global markets with hopes of rewarding sustainable producers by stimulating consumers to place greater utility on sustainable certified products (Horne, 2009). Seafood eco-labels, like those by the Marine Stewardship Council (MSC), Friend of the Sea, and Dolphin Safe, as well as other food related eco-labels, such as Rainforest Alliance, Non-GMO Project, and USDA Organic have become significantly more prevalent and recognizable by consumers (Teisl et al., 2002). Studies done specifically on seafood eco-labels (MSC, 2016; Cargill 2017; Guo, 2006) found that up to 75 percent of consumers claim that the sustainability of marine resources is of high importance to them, and that they would seek out sustainable products while shopping or eating out. However, studies that look deeper into whether or not consumers with these attitudes are in fact willing to pay the necessary premiums have shown that only a minority of these consumers actually translates this intent into purchasing behavior (Verbeke and Vermeir, 2007; Guo, 2006; Grunert et al., 2014). The answer to why this is the case the topic of much debate among behavioral, economic, and

environmental scientists. One of the main focuses of this debate is whether sustainable information on product packaging, specifically eco-labels, is currently adequate in justifying the premiums associated with the production of sustainable foods (Horne, 2009).

Despite their increasing prevalence, scientific consensus is still mixed as to whether eco-labeling schemes work in eliciting greater WTP (Grunert et al., 2014). Many studies have shown that eco-labels in themselves do little to alter consumer behavior toward sustainable alternatives (Janssen and Hamm, 2012; Horne, 2009; Grunert et al., 2014; Gertz. et al., 2005). While some studies like Teisl et al. (2002) that looked into the effect of the Dolphin Safe label implemented in the early 2000's, found that tuna products containing the Dolphin Safe label did increase the market share for canned tuna. With this being said, Teisl et al. (2002) acknowledged that a significant reason for the success of the Dolphin Safe label might have been its strong presence in popular media at the time. Many eco-labeled fisheries, say those certifying the U.S. Atlantic squid fishery, may not attract as much attention…

In contrary to Teisl et al. (2002) a lot of literature agrees that eco-labels do not do a sufficient job in convincing consumers to purchase a respective product; rather studies have shown that the main marketing power of eco-labels is to signal to consumers that a product is sustainable (Grunert et al., 2014) and rely on other factors, such as environmental attitude (Mainieri et al., 1997) and industry knowledge (Wessells et al., 1999). The acceptance of eco-labels like MSC are often determined by 1) the perceived credibility of the certification agency and 2) consumers' understanding and awareness of the meaning of a label and the link between a label and its environmental implications (Wessells, Johnston, and Donath, 2009). Deficiencies in these two facets concerning eco-label acceptance has been well reviewed in literature, along with perceived consumer effectiveness PCE (Verbeke and Vermeir, 2007). The following section will

address literature related to the abovementioned factors in relation to WTP for eco-labels and how providing better information on product packaging may elicit a greater WTP for sustainable products.

Is information the missing link?

Since eco-labels often are small and provide little information apart from "sustainably certified," it is difficult for consumers to understand what sustainability benefits are associated with eco-labels (Horne, 2009; Grunert et al. 2014). This confusion has been found to have an effect on eco-label acceptance. Risius, Hamm, and Janssen (2017) found that when interviewing European consumers, they frequently criticized eco-labels on sustainable seafood products as being imprecise and vague. A similar study conducted by the European Commission (2008) found that although over 75 percent of consumers claimed that they were ready to spend premiums on environmentally friendly food products, less than 17 percent actually reported purchasing environmentally friendly or eco-labeled products. In addition, over 40 percent of the sample population claimed to not being confident in discriminating between conventional and eco-friendly products, even when an eco-label was included (Brécard et al, 2009). These two studies, among others (Grunert et al., 2014; Getz et al., 2005), found there to be a demand for more informative labeling schemes.

Since eco-labels provide very little information other than "sustainably certified" or "environmentally safe," it is difficult for consumers to comprehensively compare between the benefits of sustainable vs. non-sustainable products or between two competing sustainably certified/labeled products (Grunert et al., 2014). This is especially true in an age where nearly every "sustainable" food product, seafood or not, seems to have an independent label attached to it. For many consumers, fear of "green washing" has shown to decrease consumer trust in eco-labels and an apprehension towards purchasing eco-labeled products (Cliath, 2007; Engels,

Hansmann, and Scholz, 2010). Lack of enough meaningful information in products that claim to be sustainable may lead to uncertainty over their legitimacy often due to a perceived lack of transparency (Grunert et al., 2014; Horne, 2009). In addition, uncertainty due to an unsatisfactory amount of information leads to a decrease in trust and perceived consumer effectiveness (PCE), which are vital for increasing WTP (Vermeir and Verbeke, 2007). Further, when confronted with incomplete information, such as broad sustainability claims like "sustainably caught" or stand-alone eco-labels, consumers are forced to search for further information (Brécard et al., 2009)

I decided to study research question number one (see Introduction), as I uncovered little research that investigated how WTP changed with added information in direct comparison with WTP for an identical product containing only an eco-label, or combination of the two. As the research compiled above dictates, eco-labels leave many consumers uncertain, low in PCE, and lacking of trust. Research such as Simoes et al. (2015) found that providing test subjects with short, two to three sentence claims that explained the sustainable production methods for freshwater tiger prawns increased consumer perceptions, preferences, and acceptance of sensory attributes when conducting taste tests. In addition, Rucker and Petty (2006) and Fernback, Louis, Sloman, and Shube (2013) both explored how information, as long as it is tailored to the right audience in the right setting, i.e. short bits of concise information in shopping scenarios rather than an entire paragraph, allowed consumers to better compare between products, increasing their sense of certainty and PCE, leading to more confident buying decisions. These findings further make the case for studies like mine.

Effect on WTP: Environmental attitude, knowledge, and demographics

This section will address research question number two. In addition to addressing WTP in relation to different types of eco-labels, information, or product types, many of the studies cited above also included secondary findings of how environmental attitude, industry related

knowledge, and demographic characteristics affect WTP for sustainable products. Environmental attitude is often referred to in studies due to the increasing importance of behavioral psychology in product marketing and environmental behavior change (Grunert et al., 2014; Bolderdijk et al., 2013). Numerous studies found that environmental attitude played a very strong role in determining propensity to pay a premium for environmentally friendly products. Specific to seafood, Brécard et al. (2009) found that individuals who held environmental concerns for marine resource health placed much higher demand on sustainably certified products than those with little concern. Other studies not related to seafood, but to buying less plastic water bottles (Bolderdijk et al., 2013) and WTP for Fair Trade, Organic, and Rainforest Alliance eco-labels (Loureiro and Lotade, 2005; Grunert et al., 2014) showed that consumers with greater pro-environmental attitudes were far more receptive to informational interventions and purchasing of eco-labeled products than those holding less environmental views. To a lesser extent than environmental attitude, knowledge and demographic characteristics, such as age, income, and education also seem to play a role in increasing a consumer's likelihood of paying more for an environmentally sustainable product (Horne, 2009).

Methods

Experimental Survey

Please recall the two research questions that I was investigating: 1) Does providing consumers with more explanatory information on sustainable seafood product packaging lead to an increase in WTP over products only containing a traditional eco-label, specifically the MSC label? 2) In addition to changes in displayed information, to what extent do factors such as, age,

education, environmental attitude, and self-rated knowledge of the seafood industry have on consumer WTP?

I answered these questions by collecting data using an experimental survey that tested the relationship between product package information and consumers' willingness to pay. The following sections will elaborate on the methods involved in distributing, operating, and analyzing the survey.

Participation

The survey was distributed to 604 participants within the United States. 362 participants were drawn from Amazon's *Mechanical Turk*[6]. The other 242 responses were collected by distributing a survey link to all undergraduate and post-graduate students within the University of Colorado's Environmental Studies Program and, to a lesser extent, through my personal social media account.

Experiment Design and Procedure

The experiment was inspired by other studies (Bi, House, and Gao, 2016; Simoes et al., 2015; Loureiro and Lotade, 2005; Wessels et al., 2009; Janssen and Hamm, 2012; Horne, 2009; Teisl et al., 2002) investigating the effects of different eco-labels and information types on consumer WTP for seafood and other food products. In addressing research question one, participants were asked to provide the amount they were WTP for a seafood product containing either just an MSC logo, information regarding sustainability attributes, or a combination of the two in reference to a similar (competing) product without any information or label denoting sustainable attributes. In addressing question two, participants noted their responses to a set of

[6] Mechanical Turk (MTurk) is Amazon's crowdsourcing human marketplace, where "requesters," like myself, can post tasks like this survey for MTurk workers across the United States to complete for a small fee.

questions measuring their environmental attitude, self-rated knowledge of seafood industry, as well socio-demographic information. Below is an in-depth breakdown of the methodology behind my experimental survey.

The survey can be divided into four main question blocks:

Block A-Consumption Information: Block A contained three questions related to consumption. The first question inquired on how many days in a typical month do consumers eat seafood, ranging from "Never, I don't eat seafood" to "more than 20 days per month." Apart from gathering an insight into participant consumption patterns, this question was utilized as a filter question. All participants who answered, "Never, I don't eat seafood" were directed to the end of the survey, as they wouldn't have provided accurate or useful WTP estimates for the treatments. The next two questions asked consumers whether they eat salmon "yes" or "no" and shrimp "yes" or "no" in order to separate participants into treatment groups (i.e. salmon, shrimp, or both) that match their consumption preferences (Bi et al., 2016). Shrimp and salmon were chosen as the two product types, as they are the number one and number and number two most consumed seafood products in the U.S., respectively, excluding canned tuna (Wessells et al., 1999). If participants answered "no" to both, they were also directed to the end of the survey.

Block B - Treatment Groups: This section was comprised of either one or two sets of two questions, depending on if participants answered, "yes" to consuming shrimp, salmon, or both. The first question in each group asked consumers to rate their intent to buy a U.S. wild-caught salmon fillet at the average market price of $14/lb. or a bag of U.S. wild-caught Gulf shrimp at a average market price of $16.50/lb. Intent to buy was measured on a scale from 1-"Definitely would buy", 2-"Pobably would buy, 3-"Might buy", 4-"Probably wouldn't buy, and 5-"Definitely wouldn't buy". These two products represented conventionally (unsustainably)

fished products. They were utilized as "anchors" in order to add context for which to compare the treatment groups provided in question two. In real life shopping scenarios, consumers are often presented with at least one or more products from which to compare between. Research has shown that consumers draw judgments and place expected utility not only based on a product's characteristics alone, but also by comparing it to the characteristics of other products in a judgment context (Lynch, Chakravarti, and Mitra, 1991). I wanted to replicate this real-life scenario in my experiment.

In question two, participants were provided at random with one of the three treatments. All treatments appeared identical to each other apart from that one included only an MSC label, one included only information associated with its environmental benefits, and one included both (see **Appendix A** for salmon treatments and **Figure 3** for shrimp). Reflecting ideas addressed in the literature review, the information provided on treatment packaging focused on concisely summarizing the main environmental benefits associated with the methods certified by MSC (Simoes et al., 2015; Rucker and Petty, 2006).

The information provided on the shrimp treatments was: "Purchasing these shrimp helps avoid catching threatened and endangered sea turtles and other species" (see **Figure 3).** Information on the salmon treatment packages read: "Purchasing this salmon helps avoid: Overfishing of endangered salmon, negative impacts on non-salmon species, and ecosystem habitat damage" (see **Appendix A**). In both, a simple graphic representative of the information was included to appeal to consumers with more visual processing (Fernback et al., 2013). In addition, the manner that the information was worded (i.e. "Purchasing this product helps…) aimed specifically at increasing PCE by associating the act of purchasing an individual product with the environmental benefits listed (Verbeke et al., 2006).

The treatments were designed to appear similar enough to the (competing) anchor product; as to avoid WTP decisions based heavily appearance. The only differences between treatment and anchor products were in brand name and brand logo design and color. Participants were asked to rate their WTP utilizing a payment card method that included 11 prices. The middle price reflected the industry average for wild, conventionally caught (i.e. the same price associated with the anchor product), the lowest five choices reflected 10,20,30,40 and 50 percent decreases from anchor product's price, and highest five choices reflected 10,20,30,40 and 50 percent increases. For example, the payment card choices for salmon, where the industry average is $14/lb. were as follows: $7.00 or less, $8.40, $9.80, $11.20, $12.60, $14.00, $15.40, $16.80, $18.20, $19.60, $21.00 or more. Respondents were asked to additionally provide a qualitative response to why they chose the price that they did. A payment card format was chosen, as interval data obtained through the payment card is often more accurate in representing consumer utility than contingent valuation methods (Albirini, 1995).

Figure 2: Moving clockwise, the shrimp anchor product and treatments (label, info, label+info)

Block C-Measuring Environmental Attitudes: In order to measure participants' environmental attitude, I employed the New Ecological Paradigm (NEP) scale (see **Appendix B**), the most commonly used scale in assessing environmental attitudes and beliefs (Coi, Kelly, and Fielding, 2013). Hawcroft and Milfont (2010) conducted a meta-analysis that found that over 68 studies conducted in 36 different countries utilized the NEP scale. Other studies utilized more industry specific measurements of environmental attitude, such as Brécard et al. (2009) that measured participants' level of concern over marine fish stocks. Since a majority of consumers aren't aware of the environmental issues associated with the fishing industry (Iles, 2007), I chose the NEP in order to understand how a more broad-spectrum environmental attitude influences WTP.

The NEP is composed of a wide array 15 ecologically related questions (Dunlap, Liere, Mertig, and Jones, 2000). Odd numbered questions represent pro-environmental worldviews and even numbered questions represent anti-environmental worldviews. I asked participants to rate the level to which they agree with these statements, choosing from "strongly agree, mildly agree, neutral, mildly disagree, and strongly disagree". Responses to pro-environmental questions were given values from 5(strongly agree) to 1(strongly disagree). Anti-environmental questions had the values arranged in opposite order, so that when averaged, a higher score represents a more pro-environmental attitude with 5 being the highest, 3 neutral, and 1 the lowest.

Block D-Demographic Characteristics: For this section, I collected responses to all of the socio-demographic characteristics found in **Table 1**. Knowledge was included, as studies such as Brécard et al. (2009) and Wessells et al. (1999) demonstrated that consumers who were most knowledgeable of the state of marine resources and fishing industry typically conducted more "green" purchasing decisions. Formal environmental background was also something I was

interested in investigating, as no other studies I looked into addressed how formal environmental education or work plays a role in consumer choices. One would assume it may have an effect.

Empirical methods

Recall that I wanted to test how WTP differs for sustainable salmon and shrimp products among the three treatment groups (MSC label, sustainability info, and label+info), environmental attitude, and various demographic characteristics. To test this relationship, I conducted two primary statistical tests. 1) I carried out a one-way ANOVA that tested the differences in mean WTP between treatments to see if there was a statistically significant ($p<0.05$) difference between treatment means. 2) A multivariate linear regression model predicting WTP by the following predictor variables: treatment, environmental attitude (NEP), and various demographic variables (see **Table 1)** in the following form: $y =$

$b_0 + b_1 D1 + b_2 D2 + b_3 X_1 + b_4 X_2 + b_5 X_3 + \cdots b_i X_i + \mathcal{E}$,

where b_0 was the intercept, an arbitrary value representing the amount a participant was WTP when all other variables were equal to zero (Brown, Hendrix, Hedges, and Smith, 2011). D1 and D2 were dummy variables that represented the treatments.

The treatments were dummy coded in the following manner:

- Label: Dummy Variable 1=0, Dummy Variable 2=0
- Info: Dummy Variable 1=1, Dummy Variable 2=0
- Info+Label: Dummy Variable 1=0, Dummy Variable 2=1

All other b coefficients represent the change to y (WTP) with each one-unit change in the respective X (predictor) variable.

Results

Response Breakdown

At the end of the collection period, after trimming out blank and incomplete responses, I was left with 529 responses. Of these respondents, 57 replied that they did not eat seafood. Another 34 replied that they neither bought nor consumed salmon or shrimp products. Once I removed these participants, I was left with 438 responses that could be used in data analysis. Of these 438 respondents, 293 replied that they consume both salmon and shrimp, 78 just consume salmon, and 67 chose just shrimp. That is a total of 371 responses within the salmon group and 360 in the shrimp group. The following sections illustrates the socio demographic classification of participants. In addition, I will address the need to further filter data by responses to the anchor product in order to achieve meaningful, representative results.

Socio-demographic breakdown of participants

Table 1 displays the demographic breakdown of participants, as well as some information that describes their seafood consumption. About two-thirds of participants were between the ages of 18 and 34 and earning below 60,000 dollars a year in income, representing a fairly young demographic. The sample population can also be considered to be fairly educated with greater than 90 percent having completed some college or a higher degree of education.

As far as seafood consumption, nearly 90 percent of the sample population reported that they consume seafood, with 54 percent claiming they eat seafood 1-3 days per month or less. This is below the FDA approved recommendation of one to two times per week (Jahns, Raatz, Johnson, Kranz, Silverstein, and Picklo, 2014). These statistics mirrored the general U.S.

population where between 80 and 90 percent of individuals consume seafood, with the majority of these individuals consuming less than the minimum recommended by the FDA (Jahns et al., 2014).

Table 1: Demographic and consumer characteristics of respondents

Variable	Description	Frequency	Mean	SD
Age	1=<18 2=18-24 3=25-34 4=35-44 5=45-54 6=55-64 7=65<	1=0% 2=29.44% 3=36.63% 4=17.53% 5=8.99% 6=6.52% 7=0.90%	3.29	1.22
Income	1= <$10,000 2=$10,000 - $19,999 3=$20,000 - $29,999 4=$30,000 - $39,999 5=$40,000 - $49,999 6=$50,000 - $59,999 7=$60,000 - $69,999 8=$70,000 - $79,999 9=$80,000 - $89,999 10=$90,000 - $99,999 11=$100,000 - $149,999 12= $150,000<	1=3.42% 2=7.19% 3=16.10% 4=13.36% 5=10.96% 6=9.59% 7=9.25% 8=10.62% 9=4.79% 10=3.42% 11=8.22% 12=3.08%	5.86	2.96
Highest Educational Degree Obtained	1=Less than high school 2=High school 3=Some college 4=2 Year degree 5=4 Year degree 6=Masters degree 7=Professional graduate degree 8=Doctorate	1=0.22% 2=8.54% 3=32.13% 4=11.01% 5=36.40% 6=9.44% 7=1.80% 8=0.45%	4.13	1.28
Employment Status	1=Full time 2=Part time 3=Unemployed (searching) 4=Unemployed (not searching) 5=Retired 6=Student	1=51.01% 2=18.79% 3=4.03% 4=4.47% 5=0.89% 6=20.81%	2.48	1.98
Seafood Consumption	1=Never, don't eat seafood 2= <Once per month 3= 1-3 Days per month 4= 4-9 Days per month 5= 10-15 Days per month 6= 20 days per month<	1=10.51% 2=18.30% 3=35.51% 4=27.72% 5=6.70% 6=1.27%	3.06	1.12
Environmental Background	Yes No	31.41% 67.04%	1.69	0.46

Further filtering of data

There was a need to further filter the data based on the intent to buy responses to the anchor product. Upon beginning to analyze the data, I noticed that participants who answered 4 ("Probably wouldn't buy") and 5 ("Definitely wouldn't buy") had a distribution of WTP values significantly lower than the group means (see **Appendix C)**. I noticed this when running the multiple linear regressions models. Regression Model 1 for both salmon (See **Table 3**) and shrimp (see **Table 4**) showed that responses to the anchor were having a very strong and significant effect on WTP. The anchor variables had large negative coefficients of -0.79 (with an F-value of 26.87, p-value<0.001) for the salmon group and -1.00 (F-value of 29.93, p<0.001)for the shrimp group.

In order to verify this, I calculated a one-way ANOVA for WTP by response to the anchor. **Table 2** presents the findings that mean WTP for respondents who answered less than "might buy" (3) to the anchor products had means that were significantly lower than the overall average and that the differences between means were statistically significant at the p<0.001 level for both treatment groups.

Additionally, to understand the differences in means between individual responses, I ran a pairwise T-test for both treatment groups and found that WTP for groups answering "4" and "5" were significantly different at a p<0.001 level than those who answered "2" and "3." However, interestingly, WTP for anchor response "1" was not significantly different from "4" and "5" (see Appendix **D**). The reason for this is most likely due to the relatively small sample size of those who answered "1." Since that WTP responses for those who answered "1" were similar enough to those that answered "2" and "3", I decided to keep these responses in the data

in order avoiding removing any more data than necessary. I only removed respondents who answered “4” and “5” due to how drastically different their responses were.

In addition, when looking through the qualitative responses for those that answered “4’s” and “5’s”, the vast majority of respondents stated that the original market average price of $14/lb. for salmon and $16.50/lb. of shrimp was too high or above their price point. These respondents, as displayed by the means of the two groups (see **Table 2**), reported WTP amounts far less than the market average price, choosing the lowest option a good amount of the time. Below are three actual qualitative statements taken from respondents answering “4” or “5” that represent the majority of the others’ who responded in this way:

- “$14 dollars a pound is a lot of money for a piece of fish that will only feed two people in my family. (Teenage boys). Less than $10 is a better price.”
- “$13/lb. is fair market price for fresh shrimp. As much as I like seafood, I'm not willing to overpay for it.”
- “I can get shrimp for $5/lb. on sale.”

Recall that the anchors’ prices reflected the market average of wild-caught product. Many of these participants’ may mostly have been buying farm-raised products, as they are significantly cheaper. I purposefully chose to use wild-caught products, as I wanted to utilize the MSC label, since it is by in large the most popularly used and recognized seafood eco-label (Horne, 2009; Iles, 2007). MSC only certifies wild fisheries.

Once I filtered out respondents who answered “4’s” and “5’s”, the salmon group contained 262 usable responses while shrimp contained 240. I used this filtered data to run a multiple regression Model 2. Model 2 was identical to Model 1, apart from that Model 1 utilized unfiltered data. Model 2 showed that with responses from those who answered 4’s and 5’s

removed, the anchor variable no longer had a significant predictive effect (see **Table 3** and **Table 4**).

Table 2: One-way ANOVA of WTP responses by response to salmon and shrimp anchor products.

One-Way ANOVA of WTP Means by Responses to Anchor Product [Salmon]							
Anchor Response	1 Definitely would buy	2 Probably would buy	3 Might buy	4 Probably wouldn't buy	5 Definitely wouldn't buy	Total	F-value (p-value)
N	25	94	143	85	24	371	13.83 (0.00)***
Mean	13.44	14.13	14.11	11.78	11.67	13.38	
Std.Dev.	3.05	2.39	2.41	3.12	4.02	2.93	
*Significance codes: *p<.05,**p<.01,***p<.001*							
One-Way ANOVA of WTP Means by Responses to Anchor Product [Shrimp]							
Anchor Response	1 Definitely would buy	2 Probably would buy	3 Might buy	4 Probably wouldn't buy	5 Definitely wouldn't buy	Total	F-value (p-value)
N	16	77	147	85	35	360	19.41 (0.00)***
Mean	14.95	16.31	16.44	13.23	13.06	15.26	
Std.Dev.	4.61	2.87	2.43	3.69	4.79	3.56	
*Significance codes: *p<.05,**p<.01,***p<.001*							

Effect of Predictors on WTP

After analyzing the data, I found the following three findings. Finding 1 answered research question number one, and Findings 2 and 3 were associated with research question number two:

Finding 1) There was no statistically significant difference in WTP between the three groups. In other words, providing explanatory information did not significantly increase WTP over a stand-alone MSC label for either salmon or shrimp.

2) Generally, the more of a pro-environmental attitude held by a participant, the more they were WTP for sustainable shrimp or salmon products, no matter the treatment.

3) Age proved to be statistically significant in predicting WTP for shrimp (but not salmon), although the predictive strength was lower than that of environmental attitude.

I ran all statistical tests using filtered and unfiltered data to ensure that no meaningful information was being missed. The following three sections will address each of the three main findings. **Table 3** and **Table 4** will be addressed throughout.

Table 3: Multiple Regression Analysis [Salmon]

	Model 1 (unfiltered data)		Model 2 (filtered data)		Model 3 (simplified version of model 2)	
Predictor	**Beta**	**F-value (P-value)**	**Beta**	**F-value (P-value)**	**Beta**	**F-value (P-value)**
Dummy Variable 1 (When "1", treatment=info)	0.17	0.05 (0.83)	0.09	0.16 (0.90)		
Dummy Variable 2 (When "1", treatment=info+label)	0.38	0.47 (0.49)	0.40	0.89 (0.35)		
Anchor 1=Definitely would buy 2=Probably would buy 3=Might buy 4=Probably wouldn't buy 5= Definitely wouldn't buy	-0.79	26.87 (0.00)***	0.24	0.17 (0.68)		
Age 1=18-24 2=25-34 3=35-44 4=45-54 5=55-64 6=65<	-0.04	1.15 (0.29)	0.07	0.00 (0.93)		
Education 1=Less than high school 2=High school 3=Some college 4=2 Year degree 5=4 Year degree 6=Masters degree 7=Professional grad. degree 8=Doctorate	0.03	0.82 (0.36)	0.07	1.33 (0.25)		
NEP Score	0.65	8.22 (0.00)**	0.85	14.00 (0.00)**	0.77	14.05 (0.00)***
Industry Knowledge 1=Extremely 2=Very 3=Moderately 4=Slightly 5=Not at all	-0.20	4.44 (0.04)*	-0.22	3.80 (0.05).	-0.23	1.86 (0.17)
Income	0.07	1.89 (0.17)	0.01	0.02 (0.90)		
Env. Background 1=Yes 2=No	Reference -0.45	1.41 (0.24)	Reference -0.28	0.48 (0.49)		
(Intercept)	(13.70)		(10.50)		(11.98)	
*Significant codes: '.'p<.1,*p<.05,**p<.01,***p<.001*						

Table 4: Multiple Regression Analysis [Shrimp]

	Model 1 (unfiltered data)		Model 2 (filtered data)		Model 3 (simplified version of Model 2)	
Predictor	**Beta**	**F-value (P-value)**	**Beta**	**F-value (P-value)**	**Beta**	**F-value (P-value)**
Dummy Variable 1 (When "1", treatment=info)	0.35	0.64 (0.42)	0.37	0.89 (0.35)		
Dummy Variable 2 (When "1", treatment=info+label)	-0.25	0.22 (0.64)	-0.24	0.05 (0.82)		
Anchor 1=Definitely would buy 2=Probably would buy 3=Might buy 4=Probably wouldn't buy 5= Definitely wouldn't buy	-1.00	29.93 (0.00)***	0.39	2.72 (0.11)		
Age 1=18-24 2=25-34 3=35-44 4=45-54 5=55-64 6=65<	-0.01	0.01 (0.94)	0.30	4.73 (0.03)*	0.33	4.41 (0.04)*
Education 1=Less than high school 2=High school 3=Some college 4=2 Year degree 5=4 Year degree 6=Masters degree 7=Professional grad. degree 8=Doctorate	0.06	1.29 (0.26)	0.16	3.00 (0.08).		
NEP Score	0.67	7.12 (0.01)**	0.85	11.69 (0.00)***	0.83	12.07 (0.00)***
Industry Knowledge 1=Extremely 2=Very 3=Moderately 4=Slightly 5=Not at all	-0.19	2.21 (0.14)	0.27	0.41 (0.52)		
Income	0.08	1.90 (0.17)	0.03	0.38 (0.54)		
Env. Background 1=Yes 2=No	Reference 0.07	0.02 (0.89)	Reference -0.18	0.09 (0.77)		
(Intercept)	(15.86)		(9.45)		(11.77)	
*Significant codes: '.'p<.1,*p<.05,**p<.01,***p<.001*						

Finding 1: No difference in WTP between treatments

As mentioned in the methods section, I utilized a one-way ANOVA and multiple linear regression models to measure any differences in WTP between treatments and the extent of their impacts, represented by the associated beta coefficient, on WTP. As can be seen in **Table 5**, although means increased closer to the reference prices ($14/lb. for salmon, $16.50/lb. for shrimp) in neither the filtered versus the unfiltered data, there was not a significant difference in WTP between any of the shrimp or salmon treatments. This can be seen in the results of the one-way ANOVA test (see **Table 5**) that failed to return any p-values remotely near $p<0.05$. I found mirroring results in the multiple regression models run for both salmon (see **Table 3)** and shrimp (**Table 4).**

I ran two models, Model 1 and Model 2, with the dummy coded treatment variables alongside the other predictors. In both Model 1(unfiltered data) and Model 2 (filtered data) dummy variable 1 (info) and dummy variable 2 (info+label) resulted in F-values all below 1.00 and p-values far larger than $p<0.05$. The results implied that I had to to accept the null hypothesis that there is no difference in WTP between treatments for shrimp and salmon products.

Table 5: Means, standard deviations, and one-way ANOVA results run between WTP responses for the three treatments.

	Treatment	Mean WTP	SD	One-Way ANOVA
Unfiltered Salmon Data	Label	13.28	2.90	F-value: 0.10 P-value: 0.91
	Info	13.42	2.89	
	Info+Label	13.43	3.00	
Filtered Salmon Data	Label	13.98	2.33	F-value: 0.25 P-value: 0.78
	Info	13.97	2.72	
	Info+Label	14.20	2.36	
Unfiltered Shrimp Data	Label	15.32	3.37	F-value: 0.32 P-value: 0.73
	Info	15.38	3.58	
	Info+Label	15.04	3.72	
Filtered Shrimp Data	Label	16.19	2.69	F-value: 0.28 P-value: 0.75
	Info	16.48	2.82	
	Info+Label	16.20	2.85	

*Significant codes: *p<.05,**p<.01,***p<.001*

Finding 2: Environmental attitude was significant in predicting WTP

The multiple linear regression analyses depicted in **Table 3** and **Table 4** were the primary methods I used to understand how the other predictor variables influenced WTP. Model 1 for both product types showed that environmental attitude measured by NEP had a significant effect in predicting WTP. However, as discussed throughout, I did not bother drawing any results from Model 1, as respondents who answered "definitely wouldn't buy" (5) and "probably wouldn't buy" (4) to the anchor statement provided extremely low WTP values. Multiple linear regressions Model 2 (run on filtered data) saw beta coefficients outputs of 0.85 in both groups and F-values of 14.00 and 11.69 for salmon and shrimp, respectively (see **Table 3** and **Table 4**), both significant with p-values <0.01. Very similar results were found in Model 3, a simplified version of Model 2 where only variables with p-values at or below p<0.05 were included in the

regression. The average NEP score in each (filtered) product group was 3.73 for salmon and 3.63 for shrimp.

In order to further understand the effect that environmental attitude had on WTP, I ran a Spearman's Rank-Order correlation test on WTP vs. NEP score. Spearman's Rank-Order tests are non-parametric and are extremely similar to the Pearson's correlation coefficient that is commonly used for determining fit of two continuous variables along a trend line (Myers and Well, 2003). The difference being that Spearman's Rank order coefficient is more useful when working with ordinal data (Myers and Well, 2003) like in this case. WTP, although composed of 11 different numeric levels, is technically ordinal in that it is not perfectly continuous. I utilized data from the filtered groups in order to get the most accurate and representative estimate. The linear equation used to model the WTP distribution (see **Appendix F**) in response to NEP score for salmon was $y= 10.9806 +0.83x$, where y=WTP in dollars/lb. and x=a consumer's NEP composite score. The Spearman's Rank-Order coefficient (rho) measuring the overall data's fit to this equation was 0.26, with an R squared of 0.07, and an associated p-value of <0.001. The line of best fit for the shrimp data was similar at $y=13.30+0.82x$ with a rho of 0.28, R squared of 0.08, and $p <0.001$. Overall, these results imply that with the stronger environmental attitude (NEP score) held by a consumer, the more they will be WTP for a sustainable seafood product.

Finding 3: Age was significant in predicting WTP for the shrimp product

The results from regression Model 2 showed that Age (only in the shrimp group) was the only demographic predictor that significantly predicted WTP, assuming a $p<0.05$ (see **Table 3** and **Table 4**). Industry knowledge returned an F-value of 3.80 and a p-value just above the threshold of 0.05 at 0.052 in the salmon group. However, when I included age along with NEP

score in Model 3 (see **Table 3**), a p-value of 0.17 showed that it was not significant and was aided by some amount of co-variance in the more stratified Model 2 (see **Table 3**).

Age returned coefficients of 0.30 and 0.33 in Model 2 and Model 3, respectively, with F-values around 4.00 and p-values <0.05 in both models. Age can be used alongside environmental attitude to predict WTP using the equation derived from Model 3 where WTP=11.77+0.83(NEP)+0.33(Age). This equation is implying that with age every unit increase within the 1-7 interval scale of [18-24], [25-34], [35-44], [45-54], [55-64], [65<] WTP increases by $0.33. This is to say that, generally, the older a participant's age, the more likely they were to pay more for shrimp.

Discussion

There is an urgency to address the severe environmental degradation occurring across ecosystems worldwide at the hands of the global commercial fishing industry. It has become apparent that eco-labels like MSC are not very effective in eliciting a higher WTP, therefore, it's vital to understand what extrinsic and intrinsic factors could help encourage consumers to pay the premiums associated with sustainable seafood. To find some solutions, I investigated:

1) Does providing consumers with more explanatory information on sustainable seafood product packaging lead to an increase in WTP over products only containing a traditional eco-label, specifically the Marine MSC label?

2) In addition to changes in displayed information, to what extent do factors such as, age, education, environmental attitude, and self-rated knowledge of the seafood industry have on consumer WTP?

The following discussion sections are organized by research question, where *finding 1* addresses Research Question 1 and *findings 2 and 3* address Research Question two. I will also discuss the resulting implications for sustainable seafood companies, retailers, policymakers, and other stakeholders, along with limitations to the study and recommendations for moving forward.

What Was Learned About the Research Questions

Research question 1: Does providing explanatory information to packaging increase WTP over a traditional eco-label?

The results demonstrated that there wasn't a significant difference in respondents' WTP between the three treatment groups. This is interesting for a few different reasons. First, it proved contrary to findings from Simoes et al. (2015), Rucker and Petty (2006), and Fernback et al., (2013) that providing concise explanatory information to consumers, much in the way that I did, increased consumer preference and WTP. As seen in **Table 5,** treatment means for filtered data among both shrimp and salmon treatments were extremely similar, with no treatment mean WTP varying more than 28 cents from one treatment to another (within the same group).

In addition, not only were the means of the two groups not significantly different from each other, but they all mostly fell just (0-30 cents) below the reference prices of $14/lb. for salmon and $16.50/lb. for shrimp. This implies that for the average consumer, the sustainability indicators (MSC label and information) did little to motivate an increase in WTP. However, as literature has shown (MSC, 2016; Vermeir and Verbeke, 2007; Verbeke et al., 2006), this probably isn't due to consumers not placing any value on sustainable attributes. Rather, these results like other studies (Grunert et al., 2014); Vermeir and Verbeke, 2007; Choi et al., 2013) have shown, imply that price may be a significant barrier holding back consumer acceptance and WTP for sustainable products.

Participants' qualitative responses seem to validate this, as the vast majority of participants answering below the reference prices stated that they wouldn't pay anything above "x" amount of dollars due to budget constraints or the value they placed on the salmon or shrimp as products to begin with. More telling, though, were the responses from participants who were WTP the same or just above the reference price. Many of these participants replied that although they valued the sustainable information, they weren't able to or didn't want to pay more than the reference. The following three responses are good representations of what many participants replied:

- [WTP $15.40, one unit above the salmon reference price]: "I would be willing to pay more because of the benefit to ocean life but my budget is limited so I wouldn't be willing to pay much more"
- [WTP $14.00, equal to the salmon reference price]: "I already struggle to afford $14/lb...so even though it is "certified", I'd be hard pressed to spend more on it."
- [WTP $16.50, equal to the shrimp reference price]: "If both products were the same price I would chose the one with the certified label if one has a higher price i would chose the product that costs less."

These results are congruent with a number of other studies (Coi et al., 2013; Fonner and Sylvia, 2015; Brécard et al., 2009; Loureiro, Mccluskey, and Mittellhammer, 2002; Murray et al., 2017, Verbeke et al., 2007) done on WTP for various eco-labeled foods. They also found that consumers were willing to pay marginal premiums, if anything.

The implications of these findings are as follows. First, private companies or producers that are responsible for the information included on their products should not expect that providing more (in depth) information in addition to or in place of a MSC label will elicit a consumer response. Many companies will be happy with these findings, as it provides them with significantly more room on product packages for more "attractive" marketing. However, the reverse is also true, since there wasn't a difference in WTP between the additional information

and the MSC label, the inclusion of an MSC label is not necessary to compete with other products. This is good news for small scale producers selling directly, as they do not need to feel pressured to pay the high production costs associated with verification processes of independent labeling schemes (Grunert et al., 2014). Brand popularity and brand awareness play much bigger roles than eco-labels in eliciting a higher WTP (Janssen and Hamm, 2012). Recall that this is how Dolphin Safe found success, by putting emphasis on marketing and becoming a popular name, through mass media stories and federal policy (Teisl et al., 2002).

With all of this being said, the role of eco-labels, especially large-scale labels like MSC, should not be discounted. Although the findings in this study and others have shown that they do not necessarily increase WTP any more than other methods (e.g. information noting sustainability), they have had a big impact further down the supply chain (Grunert et al., 2017). Retailers like Walmart and companies like McDonalds are just some of the big names representing a large number of organizations who have committed to selling MSC within just the last decade. As a result of this, MSC has grown from certifying less than 50 fisheries in 2008 to just under 300 as of January 2017 (MSC, 2017). This mirrors the consumer-industry dynamic associated with introduction of the Nutrition Labeling and Education Act (NLEA) in the U.S. that required companies to release a base amount of nutritional information on product packaging. Moorman (1998) found that the introduction of nutritional information did little in changing indirect consumer behavior like purchasing decisions. Rather, most of the change was at the producer level, where direct consumer behavior (e.g. complaining to stores, campaigning for/or against companies, and governmental activism) saw companies improve the nutritional value of their base products and brand extensions, while also changing the way they branded their items (Moorman, 1998). MSC seems to be having a similar effect (Horne, 2009;

Brownstein and Safina, 2008) and may prove beneficial in holding companies' sustainability claims responsible as products continue to enter the market in the future.

The obvious implication of price playing such a large role is that producers should focus on lowering production costs as much as possible without reducing sustainability goals. Advancements in technology and/or more emphasis in efficient production is needed. The qualitative responses in the survey, as well as much literature (Coi, Kelly, and Fielding, 2013; Grunert e al., 2014; Janssen and Hamm, 2012) show that although consumers place value in sustainability claims, price is still one of the most important drivers in purchasing decisions. If producers can offer sustainably produced items at a price similar to conventional products, all else (marketing) equal, sustainable items should hold a competitive edge. Since lowering production costs without sacrificing sustainability is difficult, companies should focus on selling sustainable products through market channels targeting less price sensitive consumers.

An additional recommendation would be for companies to completely move away from wild-capture products altogether. Aquaculture, although it has its own environmental concerns, is viewed as the future of seafood production (Swain, 2017) and projected to overtake wild-capture by 2030 (FAO, 2016). Its superior efficiency compared to wild capture means that the same product produced through aquaculture can be half the price of its wild-caught counterpart. By focusing on selling sustainably produced aquaculture products, sustainable seafood companies may better appeal to price sensitive consumers. Not to mention that a focus on aquaculture would take the strain off of wild fisheries and ecosystems altogether. Studies similar to this should be conducted using aquaculture products in order to see if 1) there are still no differences in WTP across varying levels of information and 2) would the average consumer be WTP more for sustainable versus conventionally produced aquaculture products?

Research question 2: How do environmental attitude, industry knowledge, and demographics influence WTP for sustainable products?

Environmental attitude and age showed the ability to predict WTP. Age showed a relatively low level of predictive power, where the older the participants were (along a Likert scale made up of 7 age brackets) the more they were WTP for shrimp. Because of age's low predicative power and the fact that age was only relevant for shrimp, I will not dedicate very much discussion to age or the other demographic variables that proved to have no effect on WTP.

In agreement with many of the other studies (Horne, 2009; Bolderdijk et al., 2014; Brécard et al., 2009; Manieri et al., 1997; Choi et al., 2013) environmental attitude (measured by NEP) had a significant effect on willingness to pay, where the more positive environmental attitude held by a consumer, the more likely they were to pay more for a sustainable product.

This trend can be seen in more detail from the linear equation derived from the results where WTP predicted by NEP score is:

- [salmon] WTP= 10.9806 +0.83(NEP Score)
- [shrimp] WTP=13.30+0.82(NEP Score)

Utilizing the equations above to solve for NEP score when WTP is equal to the reference products ($14/lb. for salmon, $16.50/lb. for shrimp), we find that an NEP score of greater than 3.64 (for salmon) and 3.90 (for shrimp) is needed to pay a price higher than the reference prices. Note that anything above a 3.0 on the NEP scale is considered pro-environmental. Recall that the average NEP score for respondents in the salmon group was 3.73 and 3.63 in the shrimp group. This implies that respondents needed to have a larger than average NEP score in order to pay more for shrimp. Judging by the qualitative responses addressed in the previous section regarding price, the reason for this is most likely because of the higher price per pound for

shrimp, requiring participants to be highly motivated to pay more for sustainable shrimp products.

Overall, though, the trends show that the more positive environmental attitude a consumer has, the more likely they are to pay more. These results have very important implications. If we look at them in reference to the results from research question 1, information and eco-labels do not convince consumers to purchase a product. Rather, it is their intrinsic motivation and values (environmental attitude) prior to being presented with a purchasing decision that determines whether or not they will pay more for a sustainable product. People holding positive environmental attitudes get an increased sense of utility and satisfaction when they follow through on a sustainable purchasing decision (Brécard et al., 2009). This attitude-behavior correlation extends into other sectors such as recycling (Manieri et al., 1997), bottled water use (Bolderdijk et al., 2013), fruit (Loureiro et al., 2002), and even public goods (Choi et al., 2013).

This information is extremely valuable to seafood businesses and policymakers alike. I recommend that businesses producing or selling environmentally certified or labeled goods, such as MSC certified seafood products, should put much more emphasis in understanding their consumer base. Since it is fairly apparent that environmental attitude significantly increases the propensity for consumers to make more pro-environmental purchasing decisions, the sustainable seafood industry/businesses should focus on characterizing these consumers through surveys or market data in order to market directly to them. In addition to this, I recommend that policymakers, non-profits, and private firms interested in increasing sales for sustainable seafood products focus on improving the public's pro-environmental attitudes by leveraging social norms and engaging in awareness campaigns.

Research investigating environmental attitude's effect on consumer behavior is currently lacking (Bolderdijk et al., 2013). Further research is needed that explores how different social, cultural, and educational/awareness interventions effect environmental attitudes in the long term. In addition, studies similar to this one should be carried out on sample populations with high pro-environmental attitudes to understand how different forms of information effects these individuals, specifically.

Limitations

Some of the primary limitations to this experiment were associated with the nature of online surveys (i.e. not in person), issues concerning external validity, and those concerning treatment products. Online experimental surveys are useful for reaching a large sample size quickly and relatively effortlessly (Lefever, Dal, and Matthiasdottir 2007). However, there will inherently always be issues regarding how "real" online responses are, as they are all self-reported. Further research should look into replicating this study or a similar study in a real-life shopping setting. Issues with external validity, i.e. results from this experiment being used to predict behavior of populations outside of this experiment, should also be considered (Lynch, 1999), as the results from this experiment may not resemble the purchasing behavior of other consumer populations. Further research should focus on identifying populations with similar background variables, such as price sensitivity or environmental attitude, to attempt to isolate the extent to which these background characteristics impact perception and WTP for sustainable seafood items (Lynch, 1999). Finally, a notable limitation to this experiment was that I decided to use wild-caught versus aquaculture (farm raised) seafood products. I chose wild-caught, as I was focused on improving the sustainability of wild-capture fisheries due to the extreme effects they are having on global ecosystems. However, aquaculture products are generally much

cheaper in both conventionally and sustainably produced categories, therefore very popular among consumers. Although wild-caught products are also very popular and highly valued by consumers, participants may have been quick to compare the price of the anchor and treatment products to significantly less expensive aquaculture products. This may have affected their WTP estimates and may be a partial reason behind why some consumers held very strong opinions regarding "how high" the prices seemed. A similar study to this should be conducted using aquaculture products.

Conclusion

Marine ecosystems worldwide are currently in a grave state due to the unsustainable practices and resource management strategies utilized by the commercial fishing industry (Keledjian et al., 2014). Over 90 percent of fisheries are either fully fished or currently subject to overfishing (FAO, 2016). Awareness of these issues exists among the vast majority of marine scientists and many policy makers; however, command and control interventions are extremely expensive and timely to implement, often taking decades. An impactful solution needs to be found soon in order to avoid severely depleting marine fish stocks, that are not only vital to the health of the oceans but to food security worldwide (FAO, 2013).

Within the last three decades, a number of seafood eco-labels have entered the scene, the most notable being the Marine Stewardship Council (MSC) label. These labels attempt to improve consumer utility for sustainably sourced products with hopes that consumers will be willing to pay more for these products than conventionally sourced alternatives. However, the effectiveness of these eco-labels remains to be seen. Many researchers have recommended that studies be done to better understand the role of increasing information in eliciting greater WTP.

In addition, strong correlations have been drawn between pro-environmental attitude in influencing consumers to pay premiums for sustainable products.

Results from my experimental survey that asked 529 participants in the U.S. to indicate their WTP for sustainable salmon and shrimp products whose packaging contained different types of information (i.e. eco-label, explanatory information, or both) found that: 1) There was no difference in WTP between the three product packaging types (label, info, info+label); 2) Environmental attitude played a significant role in determining WTP for sustainable products: the more pro-environmental a consumer's attitude was, the more they were WTP; and 3) Price acted as a significant barrier to the purchase of sustainable seafood.

These findings have several implications for producers, policymakers, and retailers. Businesses and retailers should not assume that MSC eco-labels more effectively increase WTP over explanatory information. They both seem to act only as signals of sustainability. In relation, neither signal in itself increased consumer WTP. Increasing consumer's pro-environmental attitudes and/or marketing directly to consumer groups with greater pro-environmental attitudes may lead to a higher likelihood that premiums associated with sustainable products are paid. Finally, if producers and retailers want to sell sustainable products to a general audience (with average or below average levels of pro-environmental attitude), they need to acknowledge that price will serve as one of the primary barriers to purchase. Further research is needed to better understand how to increase consumers' pro-environmental attitude, and through which marketing channels consumers with pro-environmental attitudes can be best reached. In addition, research relating to nudge marketing and leveraging social norms for behavioral change should be applied specifically to sustainable seafood products.

Appendices

Appendix A: In descending order, salmon anchor product and treatments (label, info, label+info)


POSEIDON'S
CATCH
U.S. Wild Caught
Coho Salmon
This salmon was sustainably caught
using trolling lines
PURCHASING THIS SALMON HELPS
AVOID
•Overfishing of
endangered salmon
•Negative impacts on
non-salmon species
•Ecosystem and
habitat damage
Net Weight 1lb (16oz)

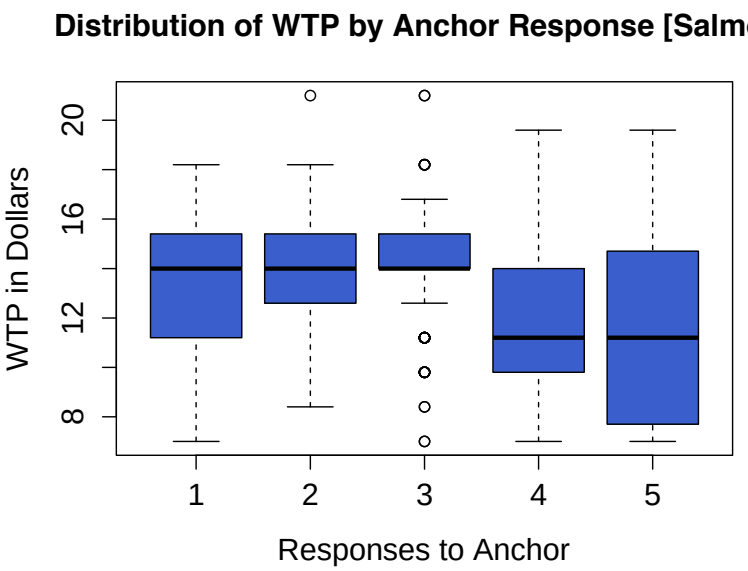

POSEIDON'S
CATCH
U.S. Wild Caught
Coho Salmon
This salmon was sustainably caught
using trolling lines
PURCHASING THIS SALMON HELPS
AVOID
•Overfishing of
endangered salmon
•Negative impacts on
non-salmon species
•Ecosystem and
habitat damage
CERTIFIED
SUSTAINABLE
SEAFOOD
MSC
www.msc.org
Net Weight 1lb (16oz)

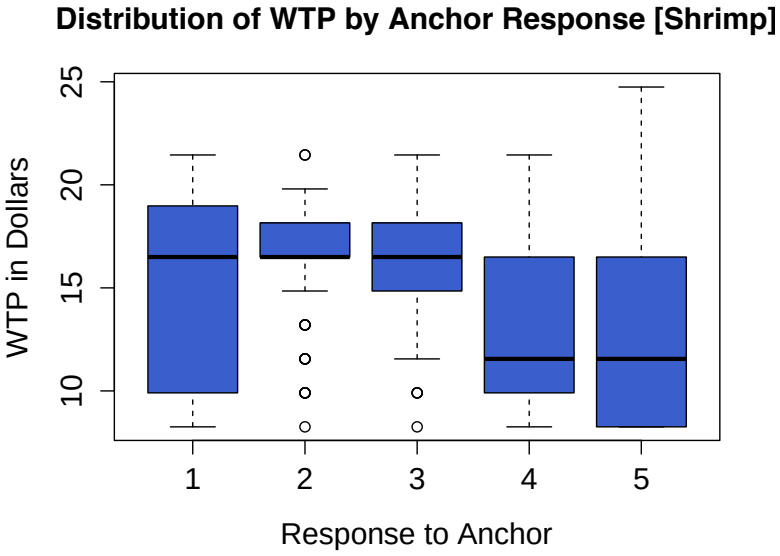
Appendix B: The New Ecological Paradigm Scale

	Strongly Disagree	Mildly Disagree	Unsure	Mildly Agree	Strongly Agree
1. We are approaching the limit of the number of people the Earth can support.	○	○	○	○	○
2. Humans have the right to modify the natural environment to suit their needs.	○	○	○	○	○
3. When humans interfere with nature it often produces disastrous consequences.	○	○	○	○	○
4. Human ingenuity will insure that we do NOT make the Earth unlivable.	○	○	○	○	○
5. Humans are seriously abusing the environment.	○	○	○	○	○
6. The Earth has plenty of natural resources if we just learn how to develop them.	○	○	○	○	○
7. Plants and animals have as much right as humans to exist.	○	○	○	○	○
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	○	○	○	○	○
9. Despite our special abilities, humans are still subject to the laws of nature.	○	○	○	○	○

10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.	○	○	○	○	○
11. The Earth is like a spaceship with very limited room and resources.	○	○	○	○	○
12. Humans were meant to rule over the rest of nature.	○	○	○	○	○
13. The balance of nature is very delicate and easily upset.	○	○	○	○	○
14. Humans will eventually learn enough about how nature works to be able to control it.	○	○	○	○	○
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	○	○	○	○	○

Appendix C: Distribution of WTP responses by response to anchor for salmon and shrimp groups.

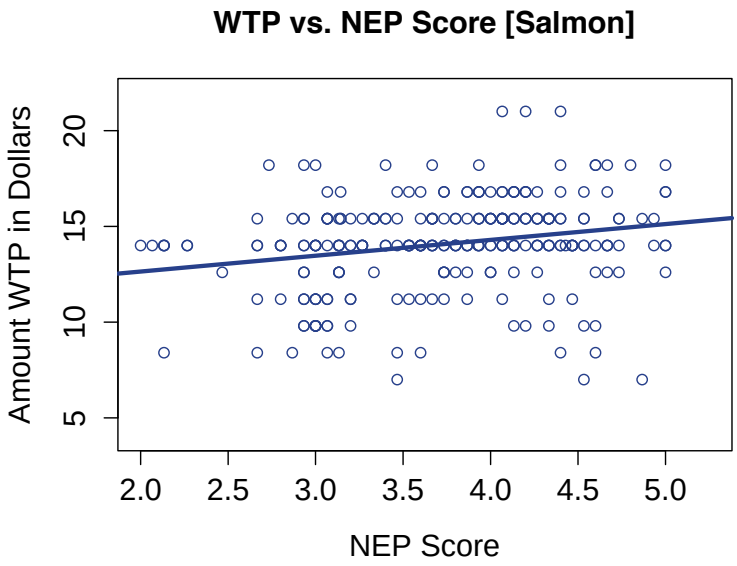


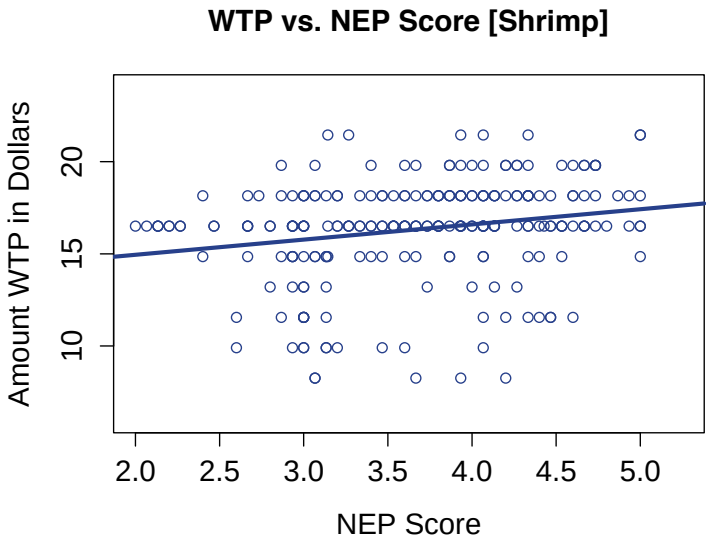


Appendix D: Pairwise T-test Results of WTP means between anchor responses for both treatment groups.

Pairwise T-test Results: WTP Responses by Anchor Responses (P-values)								
Anchor Group	**Salmon**				**Shrimp**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
2	1.00				1.00			
3	1.00	1.00			0.81	1.00		
4	0.08	0.00 ***	0.00 ***		0.50	0.00 ***	0.00 ***	
5	0.25	0.00 ***	0.00 ***	1.00	0.54	0.00 ***	0.00 ***	1.00
Significant codes: *p<.05,**p<.01,p<.001***								
1="Definitely would buy," 2="Probably would buy," 3="Might buy," 4="Probably wouldn't buy," 5="Definitely wouldn't buy"								

Appendix E: Scatter plot distribution of WTP vs. NEP Scores for filtered salmon and shrimp data.





Bibliography

Ajzen, Icek; Brown, Thomas C.; Rosenthal, Lori H. 1996. Information bias in contingent valuation: effects of personal relevance, quality of information, and motivational orientation. Journal of environmental economics and management. 30(1): 43-57

Alberini, A. (1995). Efficiency vs Bias of Willingness-to-Pay Estimates: Bivariate and Interval-Data Models. *Journal of Environmental Economics and Management*, *29*(2), 169-180. doi:10.1006/jeem.1995.1039

Bi, X., House, L., & Gao, Z. (2016). Impacts of Nutrition Information on Choices of Fresh Seafood Among Parents. Marine Resource Economics, 31(3), 355-372. doi:10.1086/686714

Bolderdijk, J. W., Gorsira, M., Keizer, K., & Steg, L. (2013). Values Determine the (In)Effectiveness of Informational Interventions in Promoting Pro-Environmental Behavior. PLoS ONE, 8(12). doi:10.1371/journal.pone.0083911

Bray, J., Johns, N., & Kilburn, D. (2010). An Exploratory Study into the Factors Impeding Ethical Consumption. Journal of Business Ethics, 98(4), 597-608. doi:10.1007/s10551-010-0640-9

Brécard, D., Hlaimi, B., Lucas, S., Perraudeau, Y., & Salladarré, F. (2009). Determinants of demand for green products: An application to eco-label demand for fish in Europe. Ecological Economics, 69(1), 115-125. doi:10.1016/j.ecolecon.2009.07.017

Brown, B., Hendrix, S., Hedges, D., & Smith, T. (2011). Overview of Multivariate and Regression Methods. *Multivariate Analysis for the Biobehavioral and Social Sciences,* 1-19. doi:10.1002/9781118131626.ch1

Brownstein, C., & Safina, C. (2008, July 29). Harnessing Consumer Power for Ocean Conservation. Conservation. Retrieved from http://www.conservationmagazine.org/2008/07/harnessing-consumer-power-for-ocean-conservation/

Brown, E. (2016, June 06). Fishing Gear 101. Retrieved April, from http://safinacenter.org/2015/03/fishing-gear-101-gillnets-entanglers/

Cargill. (2017, April). Survey says: Americans will splurge on sustainable seafood. Retrieved December 19, 2017, from https://www.cargill.com/2017/survey-says-americans-will-splurge-on-sustainable-seafood

Cliath, A. G. (2007). Seeing Shades. Organization & Environment, 20(4), 413-439. doi:10.1177/1086026607309406

Choi, A. S., & Fielding, K. S. (2013). Environmental attitudes as WTP predictors: A case study involving endangered species. Ecological Economics, 8924-32. doi:10.1016/j.ecolecon.2013.01.027

Delezie, E., Verbeke, W., De Tavernier, J., & Decuypere, E. (2006). Consumers' preferences toward techniques for improving manual catching of poultry. Poultry Science, 85(11), 2019–2027.

Dunlap, R. E., Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). New Trends in Measuring Environmental Attitudes: Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale. *Journal of Social Issues, 56*(3), 425-442. doi:10.1111/0022-4537.00176

Ellen, P., Wiener, J., & Cobb-Walgren, C. (1991). The Role of Perceived Consumer Effectiveness in Motivating Environmentally Conscious Behaviors. Journal of Public Policy & Marketing, 10(2), 102-117. Retrieved from http://www.jstor.org/stable/30000238

Engels, S. V., Hansmann, R., & Scholz, R. W. (2010). Toward a Sustainability Label for Food Products: An Analysis of Experts and Consumers Acceptance. Ecology of Food and Nutrition, 49(1), 30-60. doi:10.1080/03670240903433154

European Commision. (2008). 2008 Special Eurobarometer: Attitudes of European citizens towards the environment. Eurobarometer Surveys

FAO, F. and A. D. (2011). Review of the state of world marine fishery resources. World Bank.

FAO. (2013, December). Fish to 2030 Prospects for Fisheries and Aquaculture. World Bank.

FAO. (2016). The State of World Fisheries and Aquaculture. In Contributing to food security and nutrition for all. Rome: United Nations.

Fernbach, P. M., Sloman, S. A., Louis, R. S., & Shube, J. N. (2013). Explanation Fiends and Foes: How Mechanistic Detail Determines Understanding and Preference. Journal of Consumer Research, 39(5), 1115-1131. doi:10.1086/667782

Fonner, R., & Sylvia, G. (2015). Willingness to Pay for Multiple Seafood Labels in a Niche Market. Marine Resource Economics, 30(1), 51-70. doi:10.1086/679466

Gertz, R. (2005). Eco-labelling—a case for deregulation? Law, Probability and Risk, 4(3), 127-141. doi:10.1093/lpr/mgi010

Grunert, K. G., Hieke, S., & Wills, J. (2014). Sustainability labels on food products: Consumer motivation, understanding and use. Food Policy, 44, 177-189. doi:10.1016/j.foodpol.2013.12.001

Guo, E. (2017). People Don't Care if Their Fish Is Sustainable. Retrieved July 14, 2017, from https://www.hakaimagazine.com/article-short/people-dont-care-if-their-fish-sustainable

Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis. *Journal of Environmental Psychology, 30*(2), 143-158. doi:10.1016/j.jenvp.2009.10.003

Horne, R. E. (2009). Limits to labels: The role of eco-labels in the assessment of product sustainability and routes to sustainable consumption. International Journal of Consumer Studies, 33(2), 175-182. doi:10.1111/j.1470-6431.2009.00752.x

Iles, A. (2007). Making the seafood industry more sustainable: creating production chain transparency and accountability. Journal of Cleaner Production, 15(6), 577–589. https://doi.org/10.1016/j.jclepro.2006.06.00

Jahns, L., Raatz, S., Johnson, L., Kranz, S., Silverstein, J., & Picklo, M. (2014). Intake of Seafood in the US Varies by Age, Income, and Education Level but Not by Race-Ethnicity. Nutrients, 6(12), 6060-6075. doi:10.3390/nu6126060

Janssen, M., & Hamm, U. (2012). Product labeling in the market for organic food: Consumer preferences and willingness-to-pay for different organic certification logos. Food Quality and Preference, 25(1), 9-22. doi:10.1016/j.foodqual.2011.12.004

Jason Potts, Ann Wilkins, Matthew Lynch, Scott McFatridge, Potts, J., Wilkings, A., Lynch, M., & McFatridge, S. (2016). State of Sustainability Initiatives Review: Standards and the Blue Economy . State of Sustainability Initiatives . Retrieved 2017.

Kang, J., Liu, C., & Kim, S. (2013). Environmentally sustainable textile and apparel consumption: the role of consumer knowledge, perceived consumer effectiveness and perceived personal relevance. International Journal of Consumer Studies, 37(4), 442-452. doi:10.1111/ijcs.12013

Keledjian, A., Brogan, G., Lowell, B., Warrenchuk, J., Enticknap, B., Shester, G., and Stocco, D. (2014). Wasted Catch: Unsolved Problem In U.S. Fisheries. OCEANA.

Kelleher, K. (2005). Discards in the World's Marine Fisheries - An Update. Food and Agriculture Organization of the United Nations. Retrieved from http://www.fao.org/docrep/008/y5936e/y5936e00.htm#Contents

Lefever, S., Dal, M., & Matthíasdóttir, Á. (2007). Online data collection in academic research: Advantages and limitations. British Journal of Educational Technology, 38(4), 574-582. doi:10.1111/j.1467-8535.2006.00638.x

Loureiro, M. L., & Hine, S. (2004). Consumer Preferences and Willingness to Pay for Food Labeling: A Discussion of Empirical Studies. Food Policy, 29(5), 467-483. doi:10.1016/j.foodpol.2004.07.001

Loureiro, M. L., & Lotade, J. (2005). Do fair trade and eco-labels in coffee wake up the consumer conscience? Ecological Economics, 53(1), 129-138. doi:10.1016/j.ecolecon.2004.11.002

Lynch, J. (1999). Theory and External Validity. Journal of the Academy of Marketing Science., Volume 27(3), 367-376.

Lynch, J. J., Chakravarti, D., & Mitra, A. (1991). Contrast Effects in Consumer Judgments: Changes in Mental Representations or in the Anchoring of Rating Scales? Journal of Consumer Research, 18(3), 284. doi:10.1086/209260

Mainieri, T., Barnett, E. G., Valdero, T. R., Unipan, J. B., & Oskamp, S. (1997). Green Buying: The Influence of Environmental Concern on Consumer Behavior. The Journal of Social Psychology, 137(2), 189-204. doi:10.1080/00224549709595430

Martinez-Porchas, M., & Martinez-Cordova, L. R. (2012). World Aquaculture: Environmental Impacts and Troubleshooting Alternatives. *The Scientific World Journal, 2012*, 1-9. doi:10.1100/2012/389623

Moorman, C. (1998). Market-Level Effects of Information: Competitive Responses and Consumer Dynamics. Journal of Marketing Research, 35(1), 82. doi:10.2307/3151932

MSC. (2016). MSC consumer survey 2016 infographic: Seafood consumers put sustainability before price and brand. Retrieved 2017, from https://www.msc.org/documents/msc-brochures/msc-consumer-survey-2016-infographic-seafood-consumers-put-sustainability-before-price-and-brand/view

MSC. (2017). The MSC at 20. Wild. Certified. Sustainable. 2016 Annual Report . Retrieved 2017.

Myers, Jerome L. and Well, Arnold D. (2003). *Research Design and Statistical Analysis* (2nd ed.). Lawrence Erlbaum. p. 508. ISBN 0-8058-4037-0.

Myers, R. A., & Worm, B. (2003). Rapid worldwide depletion of predatory fish communities. Nature, 423(6937), 280–283. https://doi.org/10.1038/nature01610

NOAA. (2017). National Bycatch Reduction Strategy. U.S. Department of Commerce. ODPHP, & U.S. Department of Health and Human Services. (n.d.). Dietary Guidelines - health.gov. Retrieved July 13, 2017, from https://health.gov/dietaryguidelines/

Risius, A., Janssen, M., & Hamm, U. (2017). Consumer preferences for sustainable aquaculture products: Evidence from in-depth interviews, think aloud protocols and choice experiments. Appetite, 113, 246-254. doi:10.1016/j.appet.2017.02.021

Rucker, D. D., & Petty, R. E. (2006). Increasing the Effectiveness of Communications to Consumers: Recommendations Based on Elaboration Likelihood and Attitude Certainty Perspectives. Journal of Public Policy & Marketing, 25(1), 39-52. doi:10.1509/jppm.25.1.39

Swain, M. (2017). Plenty of Fish on the Farm -- Why Clean Energy Is Key for Next-Generation Aquaculture. Retrieved December 14, 2017, from https://thebreakthrough.org/index.php/issues/the-future-of-food/plenty-of-fish-on-the-farm

Simoes, J. S., Mársico, E. T., Cruz, A. G., Freitas, M. Q., Doro, L. H., & Conte-Junior, C. A. (2015). Effect of sustainability information on consumers liking of freshwater prawn (Macrobrachium rosenbergii). Journal of the Science of Food and Agriculture, 95(15), 3160-3164. doi:10.1002/jsfa.7055

Teisl, M. F., Roe, B., & Hicks, R. L. (2002). Can Eco-Labels Tune a Market? Evidence from Dolphin-Safe Labeling. Journal of Environmental Economics and Management, 43(3), 339-359. doi:10.1006/jeem.2000.1186

Tina Mainieri , Elaine G. Barnett , Trisha R. Valdero , John B. Unipan & Stuart Oskamp (1997) Green Buying: The Influence of Environmental Concern on Consumer Behavior, The Journal of Social Psychology, 137:2, 189-204, DOI: 10.1080/00224549709595430

Verbeke, W., Vanhonacker, F., Sioen, I., Van Camp, J., & De Henauw, S. (2006). Perceived importance of sustainability and ethics related to fish: a consumer behavior perspective. Ambio, 36(7), 580–585.

Vermeir, I., & Verbeke, W. (2007). Sustainable Food Consumption: Exploring the Consumer "Attitude – Behavioral Intention" Gap. Journal of Agricultural and Environmental Ethics, 19(2), 169-194. doi:10.1007/s10806-005-5485-3

Wessells, C. R., Johnston, R. J., & Donath, H. (1999). Assessing Consumer Preferences for Ecolabeled Seafood: The Influence of Species, Certifier, and Household Attributes. American Journal of Agricultural Economics, 81(5), 1084. doi:10.2307/1244088