Consumer Preferences for Oyster Attributes: Field Experiments on Brand, Locality, and Growing Method

Maik Kecinski, Kent D. Messer, Lauren Knapp, and Yosef Shirazi

Oyster aquaculture has experienced tremendous growth in the United States over the past decade, but little is known about consumer preferences for oysters. This study analyzed preferences for oysters with varied combinations of brands, production locations, and production methods (aquaculture vs. wild-caught) using dichotomous choice, revealed preference economic field experiments. Results suggest significant and distinct differences in behavior between first-time and regular oyster consumers. While infrequent oyster consumers were drawn to oysters labeled as wild-caught, experienced oyster consumers preferred oysters raised via aquaculture. These findings will be valuable for growers and policymakers who invest in aquaculture to improve surrounding ecosystems.

Key Words: aquaculture, consumer demand, field experiment, local foods, oysters, wild caught

Oyster aquaculture is rapidly expanding in the United States. When considering all oyster species and all U.S. states, the national oyster industry produced 9.5 billion pounds of oysters worth $5.5 billion in 2014 (NOAA 2016). Moreover, oyster landings in East Coast states increased substantially over the last five years (see Figure 1). Oyster landings from the Chesapeake Bay alone increased more than 1,600 percent between 2006 and 2014 (NOAA 2016).

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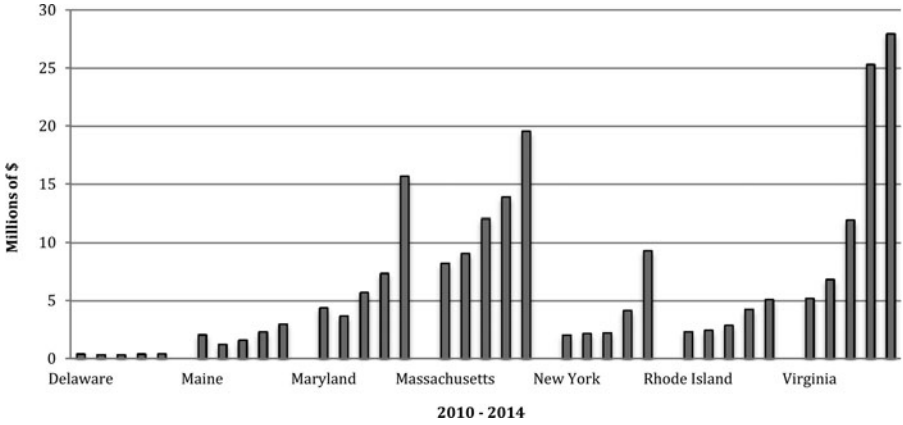

Figure 1. Oyster Landings in Mid and Northern U.S. Atlantic (Data for New Jersey and New Hampshire not available). Data for 2010–2014 taken from Annual Commercial Landing Statistics, NOAA (2016)

Rhode Island added seven oyster farms in 2014, bringing the total in the state to 61 farms spanning 241.4 acres (Beuttle 2015). Virginia has also reported substantial growth in shellfish aquaculture; revenue for oyster growers in 2014 was estimated at $15.4 million, a 39-percent increase over 2013 (Hudson and Murray 2015).

Delaware is currently the only East Coast state that lacks shellfish aquaculture. In 2013, Delaware legislature passed House Bill 160 (147th General Assembly), designating certain areas in Delaware's inland bays for development of shellfish aquaculture. Beuttle (2011) estimated that establishing 160 acres of oyster aquaculture in Delaware (the number of acres of oyster aquaculture in Rhode Island at the time) would not only create jobs and benefit the local economy but also provide environmental benefits by filtering between 9 percent and 22.5 percent of the water in Delaware's inland bays each day.

Given the growing popularity of oysters among consumers, it is surprising how little is known about consumer preferences for specific oyster attributes, such as brand, harvest location, and production method (wild-caught versus aquaculture). One of the few studies on this subject is from Manalo and Gempesaw (1997), which explored three attributes related to part-worth consumer preferences for oysters in the northeast United States – inspection information, price, and source information (wild-caught versus aquaculture). Using a survey mailed to a sample of 5,000 residents in the Northeast, the authors found that safety inspections ranked highest in importance, especially for consumers who believed that farm-raised oysters were grown in cleaner waters than wild-caught oysters. The consumers in that study generally were willing to pay a premium for information about the source of the oysters and for farm-raised oysters, suggesting that aquaculture oysters were considered by many to be "safer."

Recently, Bruner et al. (2014) estimated the effect of safety considerations in preferences for traditional raw and post-harvest-processed oysters using a random *nth*-price auction. Subjects submitted bids in four rounds to consume raw oysters served traditionally (no processing) and after four types of post-harvest processing designed to reduce or eliminate potential pathogens (quick-freezing, pasteurization, pressure treatment, and irradiation). Consumers were first presented with information about the health risks posed by untreated and processed oysters. While processing reduces the risk of foodborne illness, it also tends to negatively affect oyster taste. The authors found that, on average, consumers were willing to pay a premium for traditional raw oysters relative to processed oysters, despite the increased risk posed by untreated oysters, concluding that taste considerations were responsible for reducing processed oyster willingness to pay (WTP). Moreover, given a "normal" level of risk associated with consuming raw seafood, taste was more important to consumers than reducing risks associated with raw consumption.

Wessells and Anderson (1995) also looked at consumer safety preferences related to seafood and found that Rhode Island consumers were willing to pay a 10-percent price premium for assurances regarding the catch date, pointing to consumers' awareness of safety issues and their preference for fresher, safer seafood.

Dedah, Keithly, and Kazmierczak (2011) also focused on health risks associated with consuming oysters in a study investigating the effects of warning labels of risks associated with raw oyster consumption. They found that imposed warning labels about risks related to consuming raw seafood from the Gulf of Mexico had a negative impact on demand for oysters from the Gulf of Mexico and Chesapeake Bay, and a positive impact on demand for oysters from the Pacific coast of the United States and from other countries. Lusk and Briggeman (2009) showed that safety, nutrition, taste, and price are the most important factors for typical consumers when making food-purchasing decisions, and that a preference for safety may be especially important for oysters, which often are consumed raw.

Other studies have examined the effects of process labels on food products. Huffman et al. (2003) used experimental auctions to estimate consumers' WTP for vegetable oil, chips, and potatoes and found that genetic modification of a product or its ingredients had a negative impact on preferences; foods labeled as genetically modified were discounted 14 percent relative to unlabeled counterparts. For a detailed review on the effects of ingredients and process labeling, see Liaukonyte et al. (2013), Messer et al. (2015), and Streletskaya et al. (2015).

Preferences for other food attributes have also been explored. Alfnes et al. (2006), for example, showed that consumers associated the color of Atlantic salmon with quality and were willing to pay more for salmon that exhibited a deep, red color. Onken, Bernard, and Pesek (2011) investigated WTP for jam among consumers in the mid-Atlantic region based on various labels and

found that venue was an important factor in WTP, with farmers' markets fetching a premium relative to grocery stores. They also found that consumers would pay a premium for locally produced goods. Numerous studies have identified consumer preferences for local and organically grown foods (Skuras and Vakrou 2002, Darby et al. 2006, Batte et al. 2007, Carpio and Isengildina-Massa 2009, Hu, Woods, and Bastin 2009, Adams and Salois 2010).

Moreover, direct and indirect (actual and perceived) attributes affect consumers' WTP for food products such as oysters. We are aware of no prior studies addressing preferences for oyster attributes related to brand, harvest location, and growing method (aquaculture versus wild-caught). Thus, to shed light on which attributes drive demand, we conducted dichotomous-choice field experiments to elucidate consumer preferences for various oyster attribute types. We used these attributes to assess the informational elements consumers use when making oyster purchases and their relative importance. A combination of different attributes was randomly presented to participants. These different combinations of attributes allowed us to tease out information concerning each attribute individually. Participants were not given any additional information concerning the oysters. A random effects logit model shows that growing method is important to the decision process, while location and branding appear less so.[1]

We find that the participants generally preferred wild oysters, contradicting results of previous studies in which aquaculture (farm-raised) oysters were preferred because they were perceived as relatively safe, or seen as grown in purposely selected, cleaner waters. However, the opposite was true for participants who consumed oysters frequently (more than nine times a year). These avid oyster consumers preferred aquaculture oysters, as well as consuming raw and unprocessed oysters.

Traditionally, oysters are served in quantities of a dozen or half dozen. We find that participants who prefer to purchase a relatively large number of oysters (six or twelve at a time) were significantly more likely to purchase oysters in general, as were participants who were relatively familiar with oysters and consume them frequently. The average WTP for all participants was \$0.81 per oyster. These findings can be used to guide potential public and private investments in oyster aquaculture and inform policy makers' decisions regarding the marketability of oysters, used to improve environmental quality. For example, nuanced insight into consumer preferences can be leveraged by policy makers to optimally expand oyster aquaculture to strengthen local economies. Our results indicate that

[1] A potential question for future research is the importance of labeling in consumer decision making concerning oysters. Additionally, one might want to study preferences when oysters are visually accessible to participants, or after consumers have tasted the oysters prior to making their purchase decisions.

wild-caught oysters appealed more to new oyster consumers, whereas more experienced consumers preferred oysters raised with aquaculture methods. We find that frequent oyster consumers were willing to pay a significant price premium for aquaculture oysters, which signals to policy makers the potential for expanding oyster aquaculture. Therefore, understanding consumer preferences for oysters can benefit not only oyster producers and their marketing efforts, but also policy makers.

Experimental Design

We used a revealed-preference dichotomous-choice experimental design to elicit data on participants' WTP for oysters.[2] Data were collected from 155 individuals in field experiments carried out at four locations in the mid-Atlantic region of the United States: a craft brewery, a popular public house, a community event that serves more than 8,000 people each year, and a local Division of Motor Vehicles (DMV) office. None of the establishments offered in-house kitchen food, which was important because we did not want to compete with in-house kitchens. Given these diverse locations, including the DMV that provided access to a very diverse sample from the perspective of incomes and ethnic backgrounds, we believe our sample to be generally representative of the underlying population. Moreover, all participants were screened prior to participating in the experiment. Any potential participant who would never consider consuming oysters was excluded from participating. Participants were approached on site by one of the administrators who asked if they would be interested in participating in a study on oysters. All participants signed informed consent forms prior to participating in the experiments.

During the experiment, participants were told that they would receive an account balance of $10 they could use to make purchases during rounds of the experiment, and that there could be instances in which that $10 would not be sufficient to cover the full cost of a purchase. For any purchase that exceeded $10 for their oyster choice, participants were informed that the remainder of the purchase price in such cases would have to come "out of pocket." Next, the participants were trained in using the dichotomous-choice experimental design using several sample decisions to which they were to respond either *yes*, indicating they wanted to make the purchase, or *no*, indicating that they declined to make the purchase. Participants who declined to purchase in all rounds received the full account balance of $10 at the end of the experiment. We also indicated at multiple points during the

[2] These data were collected alongside and at the same time we collected data for another oyster study (see Li, Kecinski, and Messer 2017). However, no participant took part in both experiments. Participants were randomly assigned to one of the experiments to ensure that information obtained during one experiment would not affect decisions made in the other experiment.

experiment that none of the decisions were hypothetical and that they could decline to make a purchase in each round. The experiment instructions can be found in Appendix A.

To achieve incentive compatibility, we informed participants that the decisions from a single round, chosen at random, would be implemented at the end of the experiment, ultimately determining whether they made a purchase as well as how much they spent. Thus, this instruction allowed decision rounds to be independent, as respondents were encouraged to approach every decision as an independent candidate for possible implementation. Wu et al. (2014) showed that dichotomous-choice designs can provide better estimates of WTP than some auction designs. Arrow et al. (1993) recommended use of dichotomous-choice questions because they provide an environment that is closer to actual decision situations "as occurs with most real referenda" (Arrow et al. 1993, p. 53).

Each participant completed six purchase decisions that were randomly drawn from a set of nine possible combinations[3] (Table 1). These nine combinations of oyster attributes, along with randomly generated prices (described below), provided detailed data that allowed us to use statistical software to estimate WTP for three brands, three production locations, and two growing methods, despite not asking participants to identify their preferences for each individual attribute (Table 2).

Each dichotomous-choice question presented a randomly generated per-oyster price drawn from a normal distribution with a mean of $1.50 and a standard deviation of $0.50 (i.e., 95 percent of displayed prices ranged between $0.50 and $2.50). The prices were based on common market and restaurant prices for oysters at the time, as well as pretesting conducted with local oyster experts such as restaurant owners, fishers, and other stakeholders. Prior to beginning the experiment, participants preselected how many oysters they desired to purchase: three, six, nine, or twelve. These choice bundles were informed by expert opinions obtained during pretesting and corresponded to portions commonly served in restaurants in the United States. To avoid confusion, each question presented (a) the per-oyster price and (b) the total cost depending on the preselected number of oysters

[3] There is the possibility that participants may have made "guesses" about attributes based on information they had viewed for previous decisions. However, these inferences were not guaranteed, given participants did not have all of the relevant information for the vast majority of choices. Because each question was asked individually, participants not only had to remember the combination of attributes, but they also had to make guesses that the previous information would inform the decision. For example, the participant would have to assume that a *Blue Point* oyster is always wild-caught, which is not true. Furthermore, the choices were randomized during the experiment across and within all experiments, so the participants in the study saw the various information in a variety of different orders. Therefore, we do not believe that these inferences present a major challenge for this research. However, we recognize the fact that consumers in all types of settings make assumptions about food based on labels, and often these assumptions are incorrect (Messer et al., 2017).

Table 1. Nine Options Presented to Participants in the Six Rounds of Choice Decisions

1 = Nauti Pilgrim oysters from Plymouth Rock, Massachusetts
2 = Little Bitches oysters from Chesapeake Bay in Virginia
3 = Oysters from Long Island, New York. These are wild-caught oysters
4 = Nauti Pilgrim oysters. These are aquacultured oysters
5 = Little Bitches oysters. These are aquacultured oysters
6 = Oysters from Plymouth Rock, Massachusetts. These are aquacultured oysters
7 = Blue Point oysters from Long Island, New York
8 = Oysters from Chesapeake Bay in Virginia. These are aquacultured oysters
9 = Blue Point oysters. These are wild-caught oysters

Table 2. Attributes Used in the Field Experiment

Brand	Location	Growing Method
None	None	None
Nauti Pilgrims	Plymouth, MA	Aquaculture
Little Bitches	Chesapeake Bay	Aquaculture
Blue Point	Long Island, NY	Wild

(Figure 2). Despite the fact that participants preselected their preferred quantity, all participants were randomly placed into treatment groups. Hence, endogeneity did not drive any potential treatment effects.

Once the decisions were made, the participants completed a brief follow-up set of demographic questions (Appendix B) and decided how they would want their oysters prepared (raw, fried, or on ice in a bag for take-home). Then, a digital dice roll determined one decision to be implemented.

Participants who chose not to buy oysters during the implemented round received the entire $10 account balance. For those who chose to purchase oysters, the cost of oysters purchased was then deducted from their accounts, and they received the remaining balance in cash. For an implementing choice exceeding $10, respondents paid any additional out-of-pocket expense to an administrator[4]. The oysters were then prepared and shucked fresh on site by a professional oyster shucker who was part of the field team. All shucking was done in a location that was separate from the participants, so that they

[4] Twelve participants owed money at the end of the experiment. The total amount of money received by the research team was $69.70.

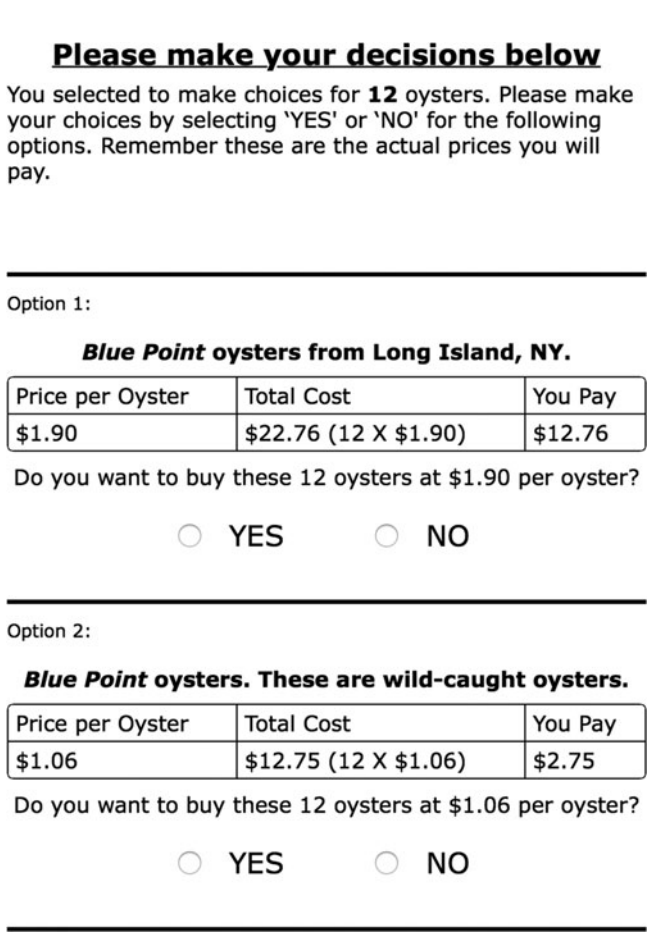

Figure 2. Sample Decision Questions (screenshot of experimental software)

did not see, taste, or smell the exact oysters for which they were making decisions. Participants were given as much time as they needed finish their selections. A typical participant took about 15 minutes to complete the experiment.

Results

We collected responses from 155 participants, generating 930 observations (155 participants $\times$ 6 choice decisions). Of those, 254 were *yes* decisions at a mean price of \$1.28 (standard deviation of \$0.57, minimum of \$0.00, and maximum of \$2.74) and 676 were *no* decisions at a mean price of \$1.60 (standard deviation of \$0.56, minimum of \$0.05, and maximum of \$3.83). Figure 3 presents the observations in histograms for the decisions by price

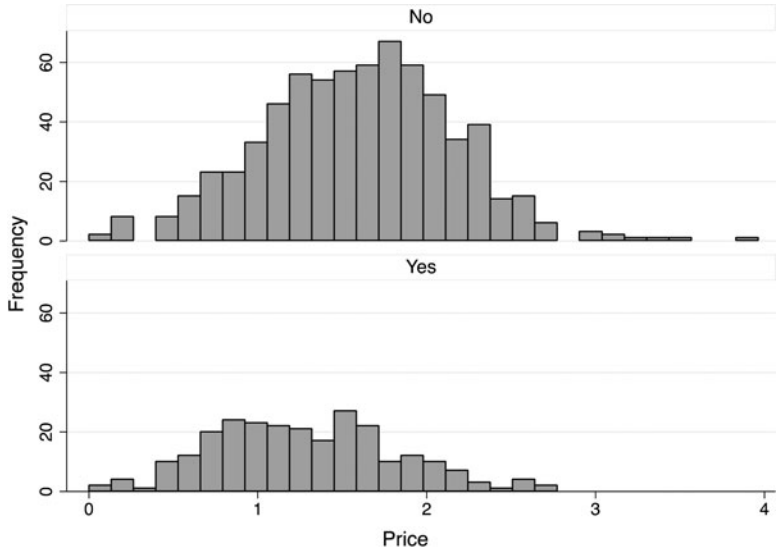

Figure 3. Histogram of Participants' *Yes* and *No* Decisions

Note: The upper figure displays all *no*-decision, and the lower figure displays all *yes*-decisions. The vertical axis shows the frequency, while the horizontal axis displays price. Overall the figure displays a decline in *yes*-decisions compared to *no*-decisions. Furthermore, we also observe a (proportionately) larger number of *yes*-decisions at lower prices.

quartiles. We find that the *yes* responses are slightly left-skewed, indicating that prices below the overall mean of $1.51 tended to result in more *yes* decisions than prices that exceeded the mean.

The participants' average annual household incomes were $50,000 to $75,000, while 86 participants described themselves as the primary household shopper. Approximately 25 percent ($N = 39$) of the respondents described themselves as 'first-time' oyster consumers. As a reminder, participants were given a screening question in the instructions prior to the experiment to exclude individuals who did not like oysters and would never want to try them. Most of the participants in the experiments (41 percent, or $N = 64$) consumed oysters once or twice per year; while 25 percent ($N = 39$) consumed oysters between three and nine times per year, and 8 percent ($N = 13$) consumed oysters more than nine times per year.

We used multiple random-effects logistic regression models with subject-specific effects to analyze the collected data. The model can be summarized as

$$log\frac{P_{ij}}{1-P_{ij}} = y_{ij} = \alpha + \beta' \boldsymbol{X}_{ij} + e_{ij}$$

where y_{ij} is the dependent variable; $\mathbf{X}_{ij}$ is a vector describing a set of explanatory variables; e_{ij} is the logistic error term; and α and β are the estimated regression

parameters. The WTP estimates were computed using a 5-percent significance level, so all of the estimates listed in the regression tables are significant at the 5-percent level or stronger. We do not list WTP estimates that were statistically insignificant.

Table 3 presents the results of the first regression, which included all of the variables presented to participants during the experiments (the nine oyster options listed in Table 1). Overall, the data suggest that oysters are an ordinary consumer good with a negative and significant price coefficient (1-percent level), indicating that the likelihood of consumers choosing to purchase oysters increases significantly as price decreases.

Several significant effects are evident when we compare various options to the omitted variable, Option 9, wild-caught *Blue Point* oysters. Furthermore, the WTP for a single oyster measured at the baseline (omitted variable Option 9) is \$0.81. Option 1 (*Nauti Pilgrim* oysters from Plymouth Rock, Massachusetts) has a significant and negative coefficient, indicating that participants were less likely to select this type of oyster relative to wild-caught *Blue Point* oysters, and the estimated WTP of \$0.28 is \$0.53 less than the baseline WTP of \$0.81. Options 4 (aquaculture, *Nauti Pilgrim* oysters) and 5 (aquaculture, *Little Bitches* oysters) also have negative coefficients and relatively low estimated WTP of \$0.27 and \$0.30 per oyster, respectively. Participants particularly disliked Option 7, *Blue Point* oysters from Long Island, New York. The coefficient for that option is negative and significant at the 1-percent level, and the estimated WTP was only \$0.04 per oyster. This result is particularly interesting because Option 9 (omitted variable) also involved *Blue Point* oysters.

We next separated the oyster options by brand, location, and growing method to identify the source of the large difference between *Blue Point* oysters from Long Island (Option 7) and wild-caught *Blue Point* oysters (Option 9). We created dummy variables for brand, location, and growing method and specified another random-effects logit model with subject-specific effects (see Equation 1) in which no brand, no location, and aquaculture were the omitted variables[5]. The results of that regression are presented in Table 4. Again, price is significant at the 1-percent level, and baseline WTP is \$0.81 per oyster. Interestingly, though, with the exception of wild-caught oysters, none of the coefficients are significant. The coefficient for wild-caught oysters is positive and significant at the 5-percent level with a price premium of \$0.42 per oyster, resulting in WTP for a wild-caught oyster of \$1.23. These results suggest that growing/harvesting method is the driver of the large

[5] Note, the omitted variable for growing method is "aquaculture", which is different from "no information", i.e., the omitted variables for brand name and location. Unfortunately, our design did not allow for a comparison of all three variables; therefore, we use aquaculture as the omitted variable.

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Table 3. Results of the Random-effects Logit Model for the Nine Combinations of Attributes Presented in the Experiment

Decision (Yes/No)	Coef.	Std. Dev.	p-Value	WTP
Price	−1.4990	0.1915	0.000	
Oyster Option Shown				
1 = Nauti Pilgrim oysters from Plymouth Rock MA.	−0.7859	0.3833	0.040	$0.28
2 = Little Bitches oysters from Chesapeake Bay in VA.	−0.6675	0.3797	0.079	
3 = Oysters from Long Island NY. These are wild-caught oysters	−0.5670	0.3805	0.136	
4 = Nauti Pilgrim oysters. These are aquacultured oysters	−0.8050	0.3890	0.039	$0.27
5 = Little Bitches oysters. These are aquacultured oysters	−0.7548	0.3774	0.045	$0.30
6 = Oysters from Plymouth Rock MA. These are aquacultured oysters	−0.6078	0.3744	0.105	
7 = Blue Point oysters from Long Island NY	−1.1435	0.4060	0.005	$0.04
8 = Oysters from Chesapeake Bay in VA. These are aquacultured oysters	−0.5894	0.3827	0.124	
9 = Blue Point oysters. These are wild-caught oysters		(omitted)		$0.81
Constant	1.4622	0.3900	0.000	

Notes: N = 930. WTP estimates are significant at the 5-percent level (nonsignificant WTP estimates are not reported).

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Table 4. Results of the Random-effects Logit Model on Brand, Location, and Growing Method

Decision (Yes/No)	Coef.	Std. Error	p-Value	WTP
Price	−1.4990	0.1915	0.000	
Brand Names				
No Brand		(omitted)		
Nauti Pilgrims	−0.1619	0.3168	0.609	
Little Bitches	−0.0948	0.3197	0.767	
Blue Point	0.0378	0.2951	0.898	
Harvest Location				
No Location		(omitted)		
Long Island, NY	−0.5293	0.2964	0.074	
Chesapeake Bay, MD	0.0711	0.3207	0.824	
Plymouth Rock, MA	0.0364	0.3218	0.910	
Growing Method				
Aquaculture		(omitted)		
Wild	0.6141	0.3009	0.041	$1.22
Constant	0.8098	0.4396	0.066	$0.81

Notes: N = 930. The WTP estimates are significant at the 5-percent level (nonsignificant WTP estimates are not reported).

difference between WTP for Long Island (Option 7) and wild-caught (Option 9) *Blue Point* oysters.

We then considered participants' preferences for the various types of oysters in relation to the quantities and preparation methods they chose prior to making their decisions in the experiment. Those results are reported in Table 5. Again, we find a significant price effect (1-percent level), baseline WTP of $0.82, and significance at the 5-percent level for wild-caught oysters. Overall, we find no significant preference for raw or fried oysters relative to the take-home option. However, the results show a strong preference for some of the preselected quantities (six, nine, or twelve oysters versus the omitted category of three oysters). Participants who chose to buy twelve oysters at a time were significantly more likely (1-percent level) to purchase oysters compared to those who had preselected three. Similarly, participants who selected six oysters were significantly more likely (5-percent level) to purchase oyster compared to three. In other words, oyster consumers preferring more traditional quantities (typically oysters are consumed by the dozen or half-dozen) were more likely to consume more.

The information collected in the post-experiment survey allowed us to analyze preferences for the various oyster characteristics in relation to frequency of oyster consumption. Table 6 presents the results of a regression of participants who had not previously consumed oysters. Those participants were price sensitive (WTP was low at $0.48 per oyster), but no other explanatory variable was significant, indicating that the behavior of first-time consumers substantively deviates from the behavior of more experienced consumers.

In a final regression, we considered the behavior of so-called "oyster pros." We used the survey responses to identify participants who usually consumed oysters raw and who consumed them often (more than nine times per year). We repeated the regression for those participants. Given the small sub-sample size ($N = 48$), meaningful estimates of WTP could not be obtained. Table 7 reports the results. We find that the behavior of experienced oyster consumers differs from that of participants overall in terms of preferences for growing method. While the overall results reported in Table 4 suggest that participants favored wild-caught oysters, the experienced oyster consumers preferred aquaculture oysters (significant at the 1-percent level) over wild-caught oysters and choices in which the location was not identified. Furthermore, the coefficients for the *Blue Point* oyster attributes are significant at the 5-percent level.

Interestingly, *Blue Point* oysters were also the only wild-caught oysters offered in the experiment. Therefore, participants may have had a preference for *Blue Point* oysters irrespective of whether they were wild-caught or might not have been aware that those oysters were wild-caught despite encountering Option 9 in the dichotomous-choice questions, which identified *Blue Point* as wild-caught.

Table 5. Results of the Random-effects Logit Model When Including Preferences for Oyster Preparation and Quantity

Decision (Yes/No)	Coef.	Std. Error	p-Value
Price	−1.4933	0.1910	0.000
Brand Names			
No Brand		(omitted)	
Nauti Pilgrims	−0.1511	0.3159	0.632
Little Bitches	−0.1081	0.3188	0.734
Blue Point	0.0298	0.2946	0.919
Harvest Location			
No Location		(omitted)	
Long Island, NY	−0.4914	0.2958	0.097
Chesapeake Bay, MD	0.0823	0.3202	0.797
Plymouth Rock, MA	0.0539	0.3212	0.867
Growing Method			
Aquaculture		(omitted)	
Wild	0.5823	0.3003	0.052
Preselected Preparation			
Raw	0.4553	0.4620	0.324
Fried	−0.2215	0.4344	0.610
Take Home		(omitted)	
Preselected Quantity			
Three		(omitted)	
Six	0.7863	0.3491	0.024
Nine	0.2457	0.6126	0.688
Twelve	0.4556	0.5738	0.000
Constant	0.5202	0.4493	0.427

Notes: N = 930.

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Table 6. Results of the Random-effects Logit Model When Including Preferences for Oyster Preparation and Quantity among First-time Oyster Consumers Only

Decision (Yes/No)	Coef.	Std. Error	p-Value	WTP
Price	−1.3609	0.4011	0.001	
Brand Names				
No Brand		(omitted)		
Nauti Pilgrims	−0.7315	0.7149	0.306	
Little Bitches	−0.4333	0.6163	0.484	
Blue Point	0.0739	0.5744	0.898	
Harvest Location				
No Location		(omitted)		
Long Island, NY	−0.6131	0.5740	0.285	
Chesapeake Bay, MD	0.0762	0.6390	0.905	
Plymouth Rock, MA	−0.9263	0.7125	0.194	
Growing Method				
Aquaculture		(omitted)		
Wild	0.1783	0.5790	0.758	
Preselected Preparation				
Raw	0.2931	0.9178	0.749	
Fried	−0.4572	0.6293	0.468	
Take Home		(omitted)		
Preselected Quantity				
Three		(omitted)		
Six	0.3631	0.6590	0.582	
Nine	−1.0998	1.3852	0.427	
Twelve	0.9269	1.0329	0.370	
Constant	1.0881	0.9971	0.275	$0.48

Notes: N = 240. The WTP estimates are significant at the 5-percent level (nonsignificant WTP estimates are not reported).

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Table 7. Results of the Random-effects Logit Model for Participants Who Consumed Oysters Raw and More Than Nine Times per Year.

Decision (Yes/No)	Coef.	Std. Error	p-Value
Price	−14.8399	3.2834	0.000
Brand Names			
No Brand		(omitted)	
Nauti Pilgrims	8.7109	5.3400	1.103
Little Bitches	5.3130	5.8694	0.365
Blue Point	15.1363	7.7977	0.052
Harvest Location			
No Location		(omitted)	
Long Island, NY	13.2722	5.8820	0.024
Chesapeake Bay, MD	8.7166	6.2356	0.162
Plymouth Rock, MA	6.6614	6.2668	0.288
Growing Method			
Aquaculture	12.8834	4.9752	0.010
Wild		(omitted)	
Constant	7.1479	7.9556	0.369

Notes: N = 48.

Conclusion

In the United States, consumers' interest in oysters has grown rapidly in recent years, coinciding with an increase in the number of oysters produced through aquaculture operations in the mid-Atlantic region over the past five years. Oyster aquaculture provides benefits that extend beyond dockside sale, from generation of local employment to tourism and environmental benefits associated with oysters' filtering of the water in which they are produced. Aquaculture, for the first time in U.S. history, is expected to produce more oysters than traditional wild catches, yet little is known about consumers' preferences for brand, location, and growing method.

The results of the present study suggest that, overall, participants have no preference for the brands tested, despite the fact that we chose the three from a diverse set of available brands, with considerable differences in the names, such as the level of vulgarity (e.g., *Little Bitches* versus *Blue Point*). Those who consumed oysters frequently, however, favor *Blue Point* oysters. Another difference between the participants overall and the participants who were frequent consumers is revealed in preference for aquaculture over wild-caught oysters. Experienced, frequent consumers prefer farmed oysters; they might be seen as a cleaner, safer product (Manalo and Gempesaw 1997). Overall, the participants preferred wild-caught oysters. Furthermore, participants (who were mostly from the mid-Atlantic region) showed no preference for a specific location. This finding therefore suggests that consumers do not exhibit preferences for 'local' oysters.

When considered individually, none of the oyster brands were preferred. However, when we compared preferences for brand-location and brand-method interactions, we found that participants strongly preferred *Blue Point* aquaculture oysters to *Nauti Pilgrim* oysters from Plymouth Rock, Massachusetts; *Blue Point* oysters from Long Island, New York; *Nauti Pilgrim* aquaculture oysters; and *Little Bitches* aquaculture oysters.

Furthermore, we found that participants who preselected a relatively large number of oysters to purchase at one time were significantly more likely to purchase oysters at any price. This tendency toward price inelasticity possibly indicates that they were relatively familiar with how oysters are typically sold and more serious about purchasing them. Furthermore, as mentioned previously, it makes intuitive sense that individuals serious about consuming oysters (i.e., who wish to eat many at a time) are probably more experienced and therefore value them more.

The results of the present study provide unique insights into consumer preferences for oysters in terms of branding, regional sources, and aquaculture versus wild catches for both producers and policy makers promoting bivalve aquaculture on the East Coast. It is particularly important to understand consumers' preferences for farmed oysters, which can contribute to water quality by filtering excess nutrients and provide a reprieve for oyster stocks in the mid-Atlantic, which have been devastated by

disease, overfishing, and pollution. Our results suggest that the location in which the oysters are produced is not an important factor in consumers' purchase decisions, and when marketing their products to frequent oyster consumers, producers will likely benefit from emphasizing that the oysters are grown in aquaculture environments. In terms of marketing, our finding that consumers preferred to purchase larger-quantity bundles will be of interest to owners of restaurants and seafood markets.

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Appendix A

Instructions

Please read these instructions carefully and do not communicate with anyone while you are making your decisions.

- **We will give you $10 that you may keep or use to purchase oysters.** You may think of this money as a bank account from which you can withdraw money.
- Depending on the choices you make, you may receive a combination of cash and oysters. There is the possibility of you owing us money if the cost of your oysters is greater than $10.
- Your decisions are just like the ones you make in a store, you either buy at the listed price or you don't.

Guidelines:

1. Decide how many oysters you want to buy (3, 6, 9 or 12)
2. Decide if you want to buy the oyster options at the listed price by selecting 'Yes' or 'No'
3. Roll a die to determine which oyster option will be implemented (only one will be implemented)

4. Fill out a short survey

Example 1: If you selected 'Yes' for an oyster option that cost \$7 and this option is implemented, you will receive the oysters and \$3 cash (\$10 - \$7 = \$3).

Example 2: If you selected 'No' for an oyster option and this option is implemented, you will receive \$10 and will not receive any oysters.

Example 3: If you selected 'Yes' for an oyster option that cost \$15 and this option is implemented, you will receive the oysters and owe \$5 (\$10 - \$15 = -\$5).

Appendix B

Survey (Note: Question 22 was specific to one of the four sampling locations.)

1. What is your age? [ ]
2. Are you male or female?
   - ○ Male
   - ○ Female
3. How often do you consume oysters?
   - ○ 0 times per year
   - ○ 1–2 times per year
   - ○ 3–5 times per year
   - ○ 6–9 times per year
   - ○ >9 times per year
4. Are you the primary shopper in your household?
   - ○ Yes
   - ○ No
5. What is your profession?
   - ○ Government
   - ○ Academia
   - ○ Business
   - ○ Agriculture
   - ○ Other (please specify) [ ]
6. Are you:
   - ○ Politically liberal
   - ○ Politically moderate
   - ○ Politically conservative

- ○ Other (please specify) _____

7. Which category best describes your household income (before taxes) in 2014?
   - ○ Less than $10,000
   - ○ $10,000–$14,999
   - ○ $15,000–$24,999
   - ○ $25,000–$34,999
   - ○ $35,000–$49,999
   - ○ $50,000–$74,999
   - ○ $75,000–$99,999
   - ○ $100,000–$149,999
   - ○ $150,000–$199,999
   - ○ $200,000–$249,999
   - ○ $250,000 and above
8. What is the highest level of education that you have completed?
   - ○ Grade school
   - ○ Some high school
   - ○ High school graduate
   - ○ Some college credit
   - ○ Associate degree
   - ○ Bachelor's degree
   - ○ Graduate degree/Professional
9. On average, how often do you go to the beach each year?
   - ○ 0 times per year
   - ○ 1–2 times per year
   - ○ 3–5 times per year
   - ○ 6–9 times per year
   - ○ >9 times per year
10. Are you a first time oyster consumer?
    - ○ Yes
    - ○ No

11. In a typical month, approximately how often do you eat seafood?

12. In a typical month, approximately how often do you eat at restaurants?

13. When you eat at a restaurant, what is the percentage of seafood versus other food? **0%**
Other (100%) Seafood (100%)

14. How often do you eat seafood at home versus at a restaurant? **0%**
Home (100%) Restaurant (100%)

15. Are you the primary seafood shopper in your household?
    - ○ Yes
    - ○ No

16. How often do you catch your own seafood? **5**
Never (1) Often (9)

17. How important is location in your oyster choice? **5**
Not Important (1) Very Important (9)

18. For oysters from the Delaware Bay, I would…
    - ○ pay more than other locations.
    - ○ pay less than other locations.
    - ○ pay the same as other locations.

19. For oysters from the Delaware Inland Bays, I would…
    - ○ pay more than other locations.
    - ○ pay less than other locations.
    - ○ pay the same as other locations.

20. How do you usually prefer the preparation of your oysters?
    - ○ Raw on the half shell
    - ○ Raw in a shooter

- ○ Fried
- ○ Grilled
- ○ Other

21. How important are the following oyster characteristics to you?
Oyster Species: **5**

Not Important (1) Very Important (9)

Size of the oyster shell: **5**

Not Important (1) Very Important (9)

Size of the oyster meat: **5**

Not Important (1) Very Important (9)

Appearance of the oyster shell: **5**

Not Important (1) Very Important (9)

Saltiness of the oyster: **5**

Not Important (1) Very Important (9)

Smell of the oyster: **5**

Not Important (1) Very Important (9)

Color of the oyster shell: **5**

Not Important (1) Very Important (9)

Color of the oyster meat: **5**

Not Important (1) Very Important (9)

Location of harvest: **5**

Not Important (1) Very Important (9)