

Taste Test: Summary Report

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INTRODUCTION

The development of a significant and sustainable marine aquaculture industry in Northern New England is largely dependent on the ability of the coastal resource managers and planners, aquaculturalists, and the scientific community to design and develop the marine aquaculture industry in such a way as to represent the interests and values of the public. To fully represent these interests, there is a need for scientific data that allows for an understanding of consumer's behaviors, attitudes, and preferences for cultured (farm raised products) relative to wild seafood products. Towards that end, this study assessed the behaviors, attitudes, and preferences of visitors to the 1999 Hampton Beach Seafood Festival. It measured their current seafood consumption related behaviors, knowledge, and attitudes towards marine aquaculture, and their preferences for farm raised/cultured seafood products versus wild captured fish. The results of this study will provide decision-makers, the fishing industry, and the aquaculture industry with information about marine aquaculture from the perspective of New England seafood consumers. Additionally, results will provide insight on whether or not information influences taste preferences and a preliminary understanding of whether seafood consumers would be willing to pay more for wild versus cultured products.

STUDY OBJECTIVES

The purpose of this study was to provide both an understanding of seafood consumer's knowledge of and attitudes towards marine aquaculture. New England seafood consumers are a significant and influential stakeholder group who may be greatly impacted by marine aquaculture development. This study was used to determine the relationship between knowledge, attitudes and information, and taste preference. It explored how these relationships affect preferences and willingness to pay for each product.

The specific objectives of this study were:

1. To document seafood consumers consumption patterns and habits and their general characteristics.
2. To determine seafood consumers familiarity with aquaculture and marine fisheries and their sources of information on issues surrounding each.
3. To determine the relationship between information and attitudes and between information and preference.
4. To identify consumers' preferences for a particular product and both purchase behavior and willingness to pay for the specific product.

SURVEY METHODS

Survey Implementation. A four-page questionnaire was administered at the 1999 Hampton Beach Seafood Festival. The festival is a three day event held in late summer and attracts local residents as well as residents from surrounding New England states. Large tents, set up along the beach, provided booth space for restaurant vendors to sell a variety of seafood products, desserts, beverages, and non-seafood dishes. Entertainment was provided and included live bands, prize booths, educational booths, and fireworks. The festival is estimated to attract 100,000 visitors over the three days.

Potential participants were asked to volunteer to participate in the study as they past by the survey booth space set among restaurant vendors. Four incentives were offered to participants: 1) an ice cold bottle of water; 2) a seat in the shade for approximately 10 minutes; 3) the opportunity to compare two seafood products (complete with crackers and a lemon slice); and 4) the opportunity to enter into a drawing for two \$50 gift certificates at a seafood restaurant of their choice.

Survey Design. The study consisted of two mutually dependent components: 1) an onsite survey (two experiments) and 2) a product taste test (two tests). Two different versions of the questionnaire were utilized. The first version provided information to the participants on the advantages and disadvantages of marine aquaculture. The second version did not provide information. In addition, each version of the survey was administered as a blind taste test and an informed taste test. Therefore, there were four survey designs: information provided and an informed taste test (n=62), information provided and a blind taste test (n=57), no information provided and an informed taste test (n=54), and no information provided and a blind taste test (n=59). A total of 232 surveys were completed.

The self-administered questionnaire was four pages long (see the two attached questionnaires). A group of participants (up to eight at a time) were seated at the booth space and provided with the same version of the survey (either information or no information). The first two pages collected information on participants seafood consumption behaviors, knowledge of marine aquaculture, and perceived personal relevance of both marine aquaculture and marine fisheries. The next page measured their attitudes towards marine aquaculture and included a measure of attitude certainty (where applicable the balanced information was provided prior to this set of ques-

tions). At the end of the third page, participants were asked to indicate which they would select, wild flounder or aquaculture grown flounder, if given the choice (without having tasted the two products).

Taste Test. Two alternative research designs were utilized: 1) a blind taste test (subjects were not told which product was the cultured and which product was the wild until after selecting their taste preference) and 2) an informed taste test (subjects were told the identity of the products prior to the test). The products were prepared by a professional cook with all due food safety checks and concerns. The products were prepared in identical electric frying pans (lightly sautéed) and cooked for identical times. Participants were provided a bottle of water and a cracker to clear pallet. Care was taken to insure that the researchers and the implementation of the taste test did not bias the sample population towards a predisposition to prefer either of the products (to support or oppose marine aquaculture development for that matter).

After completing the first three pages of the questionnaire, the participants were provided with the two seafood products to sample. They were asked to indicate their preference for how the products tasted, how much they would be willing to pay for each product, and which product they would be willing to pay a higher maximum price for. Included on the final page of the questionnaire was a series of demographic questions common to survey research.

PROFILE OF SURVEY PARTICIPANTS

Table 1 provides a summary of the demographic information for the participants in this survey. Most participants were female with a mean age of 49 years. Most of the participants live within 50 miles of a salt water coast, including 32% who live within 10 miles. Over half of the participants were New Hampshire residents (52.7%). Massachusetts residents made up the next largest group at 36.4%. All included, New England residents made up 93.6% of all participants. Many had participated in ocean recreation fishing, with over 61% participating at least once in the last year. The average household income of the participants was \$45,000 to \$59,999, above the national average. Over 70% of the participants were employed and 63.9% had some advanced education or degree. A vast majority were caucasian. The participants political beliefs were equally distributed between liberal, moderate, and conservative.

Seafood eating preferences. The average participant purchases seafood at the grocery store to eat at home at least on a monthly basis, with over 31% eating seafood at home weekly. In addition, the average participant eats seafood at a restaurant at least on a monthly basis, with 23.6% eating seafood at a restaurant weekly. The most common seafood preparation methods were baked, broiled and fried for both home and restaurant consumption. Fried seafood products were more popular for restaurant consumption (23.6% of participants) than for home preparation (12.3% of partici-

pants). The participants favorite finfish and shellfish were haddock (45.8%) and lobster (38.9%), respectively. Other popular finfish varieties were swordfish, salmon, and tuna. As for the participants favorite shellfish, shrimp (24%) and clams (17.5%) were closely behind lobster. Most participants (58.8%) did not know which type, wild harvested or farmed raised, they received when purchasing seafood. Table 2 provides a summary of the participants seafood eating behaviors, including frequencies and preferences. Overall, participants ate seafood quite frequently, both at home and in restaurants and enjoyed a wide range of different seafood varieties (participants listed a total of 37 different seafood varieties).

Summary of Demographic Information	
Age	49 years (mean)
Gender	63% female
	37% male
Distance of residence from salt water	32% 0-10 miles
	50.5% 10-50 miles
	9.9% 50-100 miles
	7.7% >100 miles
Participated in ocean recreation fishing	53.5%
Employment	70.6% Employed
	3.9% Unemployed
	21.1% Retired
	3.9% Students
Education	34.5% High School
	13.7% AD
	29.6% BA/BS
	18.1% MA/MS
	2.5% Ph.D./Professional
Political Party Affiliates	14.4% Liberal
	24.2% Moderate-Liberal
	32.6% Moderate
	16.7% Moderate-Conservative
	12.1% Conservative

Table 1: Summary of Participants Demographic Information

Summary of Participants Seafood Eating Behaviors

Frequency of seafood purchases

	For Home	Restaurant
weekly	31.1%	23.6%
once every two weeks	27.6%	30.1%
once per month	17.5%	34.5%
once every 3 months	13.6%	8.7%
once every 6 months	3.9%	1.7%
once a year	0.0%	0.4%
rarely	5.7%	0.9%
never	0.4%	0.0%

Purchase place (for home consumption)

Grocery Store	72.1%
Seafood Market	33.9%
Road/Dock Side	3.5%
Other	1.7%

Preparation of seafood

	At Home	Restaurant
Baked	52%	43.7%
Broiled	22.9%	22.3%
Fried	12.3%	23.6%
Grilled	4.0%	1.3%
Boiled	2.6%	0.9%
Other	6.2%	8.2%

Knowledge of type of product purchased (wild harvested or farm raised)

Yes	13.1%
No	58.8%
Sometimes	28.1%

Seafood Preferences

Favorite Finfish	Haddock
Favorite Shell fish	Lobster

Table 2: Summary Information on Participants Seafood Eating Behaviors and Preferences

PARTICIPANTS KNOWLEDGE OF MARINE AQUACULTURE

Familiarity with Aquaculture. Participants were asked to indicate their level of familiarity with aquaculture using a five-step Likert scale of "very unfamiliar," "unfamiliar," "unsure," "familiar," and "very familiar." Most participants (53.6%) were either very unfamiliar (15.4%) or unfamiliar (38.2%) with aquaculture, as indicated in Figure 1. Slightly more than twenty-seven percent indicated they were familiar with aquaculture and only 2.2% indicated that they were very familiar. The mean score for familiarity with aquaculture was 2.63.

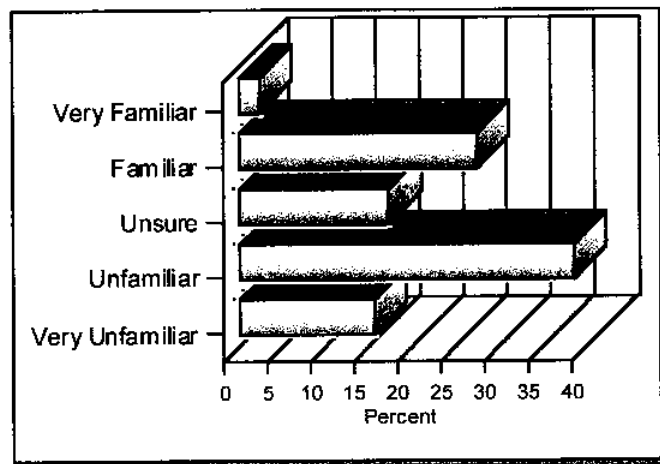


Figure 1: Participants Familiarity with Aquaculture

Information about Aquaculture. Figure 2 presents the percentages of participants that obtained their information about aquaculture from several different types of media. Most often the participants knowledge about aquaculture was obtained from television (38.7%), newspapers (23.1%), magazines (16.5%), and aquarium visits (15.3%). A portion of the participants gained their information about aquaculture from other sources; including family members and friends, school, visits to fish farms, and restaurants.

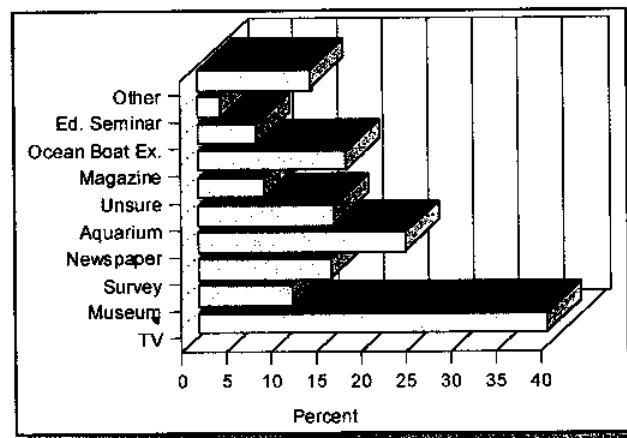


Figure 2: Source of Information about Aquaculture

Importance of Marine Aquaculture Issues. Participants were asked to indicate the level of importance of marine aquaculture issues to them personally using a five-step Likert scale of: "extremely unimportant," "unimportant," "not sure," "important," and "extremely important." Over 64% of participants viewed marine aquaculture issues as being important or extremely important to them personally. Participants also indicated that decisions made by the state (mean 3.82) and federal governments (mean 3.85) about marine aquaculture were important to them personally.

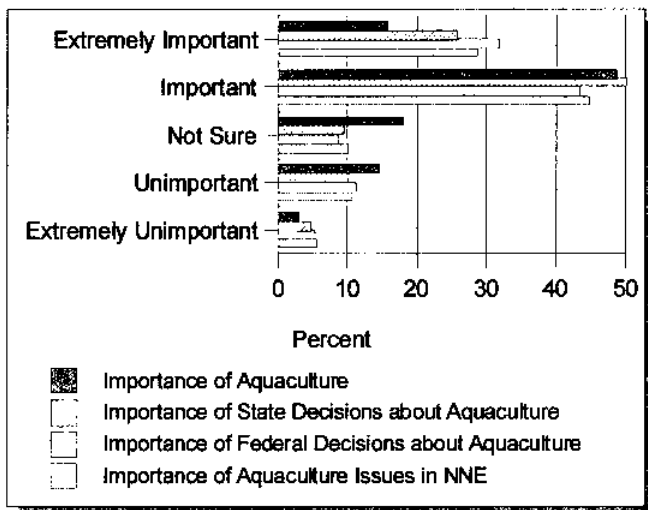


Figure 3: Personal Importance of Aquaculture Issues

PARTICIPANTS KNOWLEDGE OF MARINE FISHERIES IN NEW ENGLAND

Familiarity with Marine Fisheries. Participants were asked to indicate their level of familiarity with marine fisheries in New England using a five-step Likert scale. A majority of the participants (50.2%) were either unfamiliar or very unfamiliar with the current status of marine fisheries in New

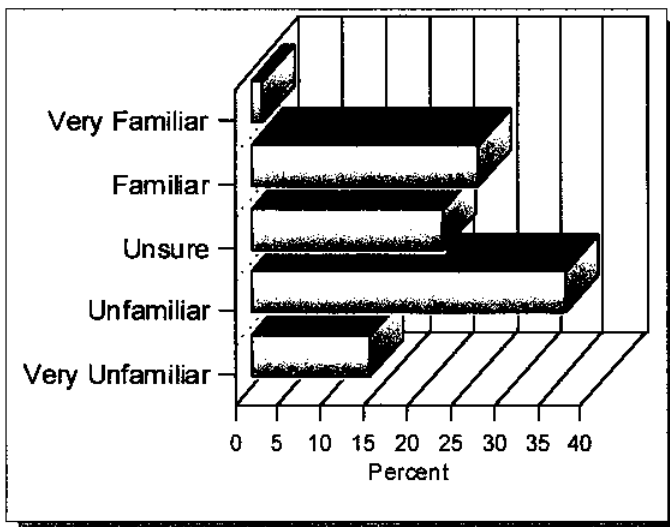


Figure 4: Familiarity with Marine Fisheries

England. The remainder of the participants were split between familiar (26.2%) or very familiar (1.3%) and unsure (22.2%). These results are shown in Figure 4.

Information about Marine Fisheries in New England. Figure 5 presents the percentages of participants that received their information from several different types of media. Most often the participants obtained information about marine fisheries from television (43.7%), newspapers (39.7%), and magazines (15.7%). Other sources of information included family and friends, work-related sources, and the radio.

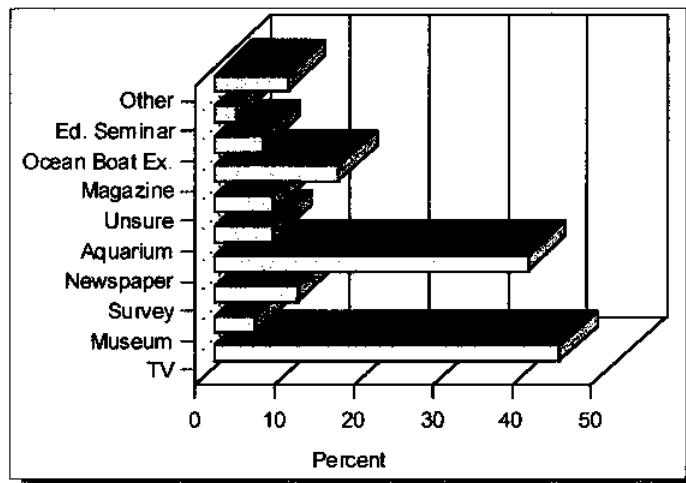


Figure 5: Source of Information about Marine Fisheries

Importance of New England Marine Fisheries. Participants were asked to indicate the level of importance of marine fisheries to them personally using a five-step Likert scale. A vast majority of the participants (76.5%) viewed marine fisheries as being important to them personally. Similarly, participants indicated that marine fisheries issues in New England were important to them personally (mean 3.82) and that decisions made by the state (mean 3.91) and federal government (mean 3.94) regarding marine fisheries were important to them personally. Figure 6 presents these results.

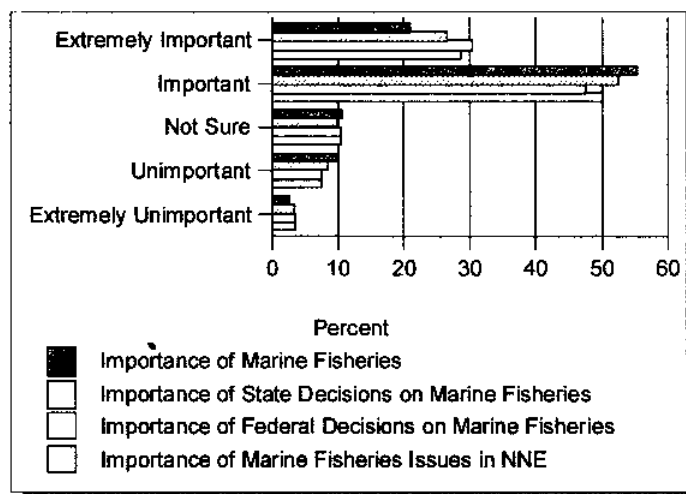


Figure 6: Personal Importance of Marine Fisheries

ATTITUDES ABOUT AQUACULTURE

Participants were asked several questions regarding their attitudes towards aquaculture. Specifically, participants were asked to indicate whether developing marine aquaculture in New England is a good or bad idea, beneficial or harmful idea, and wise or foolish idea based on a five-step Likert scale of "extremely bad," "moderately bad," "neutral," "moderately good," and "extremely good." After each question they were asked to rate on a scale of one to five how certain they were of their decision. The results are shown in Figure 7. Most participants had favorable attitudes towards aquaculture development.

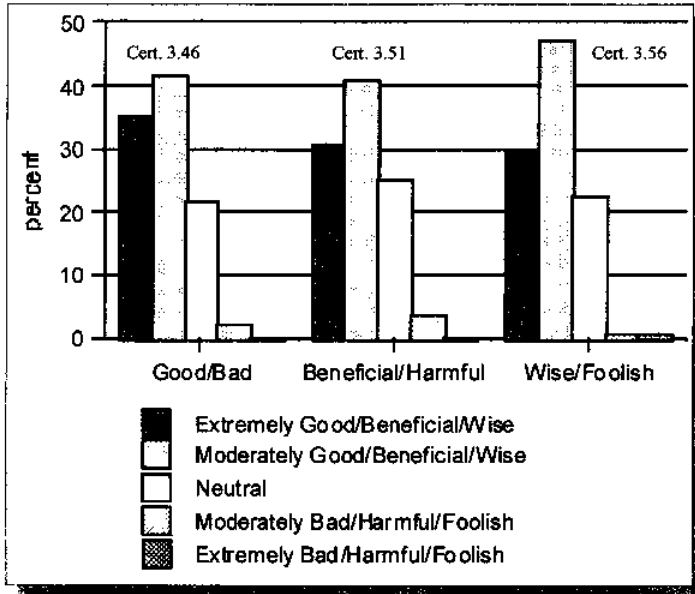


Figure 7: Attitudes about Aquaculture

Information and Attitudes about Aquaculture. Table 3 shows the mean attitude score for participants who were given balanced information and for participants not given balanced information prior to answering the attitude questions mentioned above. The information provided was balanced between reasons aquaculture should be developed in New England and reasons aquaculture should not be developed in New England. Specifically, participants were provided the following sets of statements:

Some people believe we should develop marine aquaculture in New England for the following reasons:

- improves the condition of the fisheries
- provides jobs for displaced fishermen
- provides economic development for coastal communities
- helps meet the global demand for fish products
- restores wild fish stocks
- provides a safer, higher quality product
- makes seafood products more affordable/ readily available
- preserves the cultural heritage of NE fishing communities
- helps the U.S. compete in global marketplace

Some people believe we should not develop marine aquaculture for the following reasons:

- causes pollution from feed and fish wastes
- causes marine mammal entanglements
- spreads disease to wild fish stocks
- threatens the genetic makeup of wild fish stocks, when cultivated fish escape into the wild
- introduces non-native species into the ecosystem
- requires lethal control of predatory animals who seek the easy prey of farmed fish
- privatizes what should remain a free, open-access resource
- is aesthetically undesirable
- negatively impacts commercial fisherman and New England coastal communities

Participants were shown to have more positive attitudes towards marine aquaculture development if they had not been given balanced information prior to answering. For example, when ask to indicate whether developing aquaculture in New England was a GOOD or BAD idea, participants who were given balanced information were less likely to say it was a good idea (mean= 3.95) than were participants who were given no information (mean= 4.25).

Attitude	Group	Mean	F#	Sig.
good/bad	info	3.9537	7.279	.008
	no info	4.2526		
certainty good/bad	info	3.4190	0.271	.603
	no info	3.5111		
beneficial/harmful	info	3.8333	8.007	.005
	no info	4.1648		
certainty beneficial/harmful	info	3.4528	0.427	.514
	no info	3.5682		
wise/foolish	info	3.9439	4.074	.045
	no info	4.1613		
certainty wise/foolish	info	3.5143	0.318	.574
	no info	3.6087		

Table 3: Participants Attitudes towards Aquaculture Development in New England

Pre-Taste Test Preferences. Participants were asked to choose between purchasing a wild seafood product or an aquaculture product based on their preferences prior to sampling each product. The results are shown in Figure 8. Participants chose the aquaculture product more often (49.7%) than they chose the wild product (46.1%).

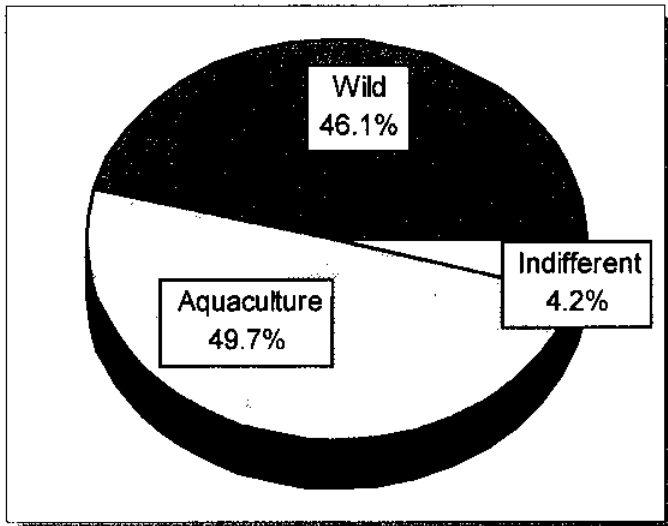


Figure 8: Pre-Taste Test Selection

Taste Test Results. Taste test participants were broken into two groups: blind and informed. In both groups, participants were given two different types of summer flounder, one captured from the wild and one taken from an aquaculture farm. The informed group was told the identification of the two different types of fish before sampling. Conversely, the blind group was not given the identification until the participants had tasted the fish and indicated their preference. Figure 9 shows the results of the taste test. Participants most often chose the wild product whether blind or informed. The most common reasons given for their preference were: tasted better (42.8%), better texture (10.8%) and more moist (9.8%).

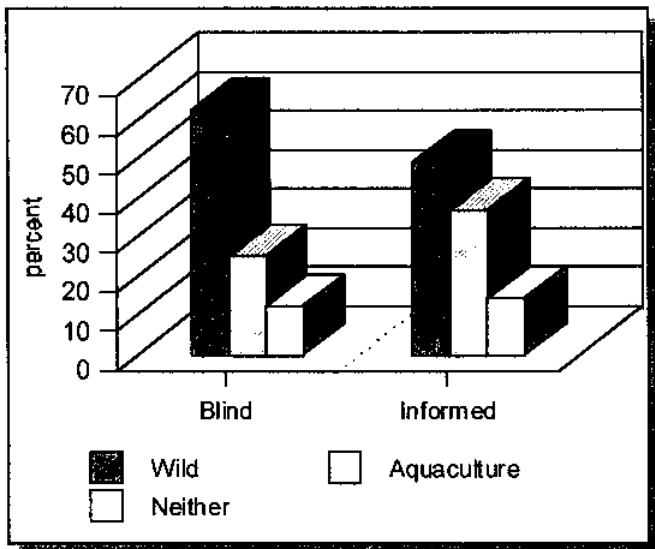


Figure 9: Taste Test Results

Potential Purchase Behavior. After the participants had sampled both types of fish and indicated their preference based on taste, they were asked to choose which product they would be willing to pay a higher price for and why and the

maximum amount they would pay for each. The results are shown in Figure 10. Participants were more often willing to pay more for the wild product. The most common reasons for choosing one product over the other were better taste (49.6%) and economic reasons (15.4%). Other less common reasons were: to reduce over fishing (2.4%), less pollutants (2.4%), more sustainable (4.1%), to support local fisherman (1.6%) and better for the environment (1.6%).

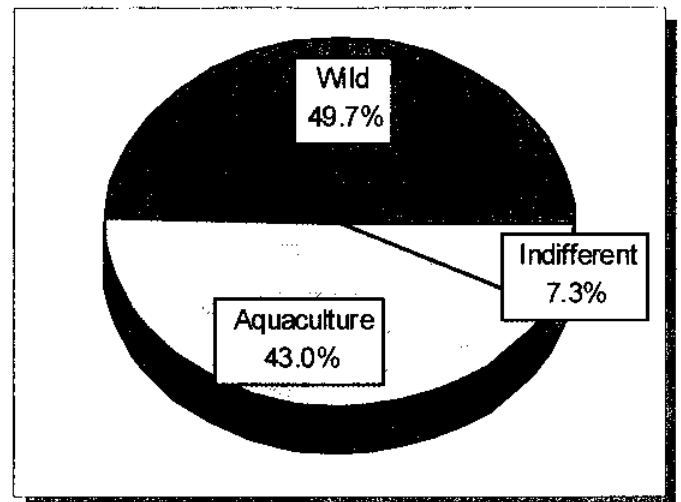


Figure 10: Potential Purchase Behavior

Willingness to Pay. Participants were also asked to indicate the maximum price they would pay for each product. The average maximum price they were willing to pay for the wild product was \$5.74 per pound. The average maximum price they were willing to pay for the aquaculture product was \$5.17 per pound. Figure 11 shows the ranges of prices indicated by the participants and percentage of participants indicating that price.

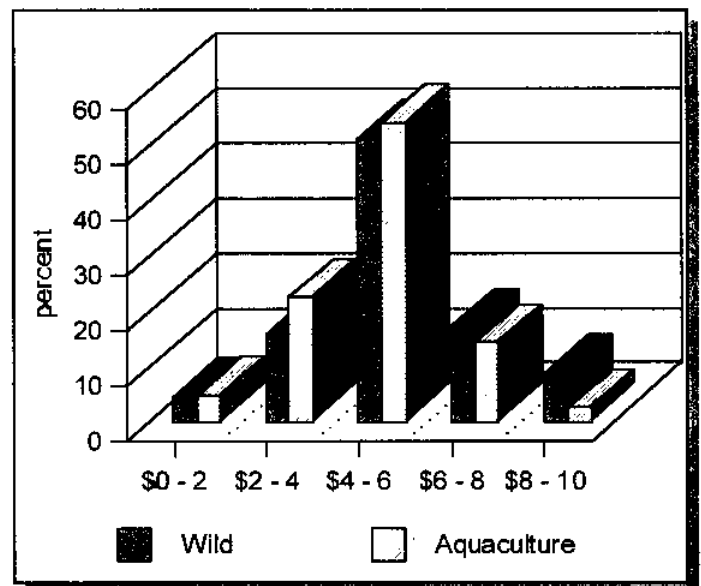


Figure 11: Willingness to Pay

CONCLUSIONS

The following general conclusions were drawn from the results of this report:

- Participants were frequent seafood consumers for restaurant consumption, with 23.6% ordering seafood at a restaurant weekly, and for home consumption, with 31% purchasing seafood to eat at home.
- Participants enjoyed a large variety of seafood products, a total of 37 varieties. Seafood products for home consumption were most often purchased at the grocery store.
- A majority of participants were unfamiliar or very unfamiliar with aquaculture, although a large portion of them felt that aquaculture and marine aquaculture issues were important to them personally. Similarly, they felt that decisions made by the federal and state governments regarding aquaculture were important to them personally.
- Participants were also unfamiliar or very unfamiliar with the status of New England marine fisheries. Notably, only 1.3% indicated that they were very familiar with the status of New England marine fisheries. However, a vast majority of the participants felt that marine fisheries were important or extremely important to them personally and that decisions made by the state and federal governments regarding marine fisheries were important to them personally.
- In obtaining their information, most often participants knowledge about aquaculture and marine fisheries came from television and newspapers. Other important sources of information included magazines, ocean boat excursions, and aquariums.
- Participants provided with balanced information on the positive and negative aspects of aquaculture residents were less likely to believe that development of aquaculture was a good idea. However, overall, seafood consumers in this survey had positive attitudes towards aquaculture development in New England.
- Prior to sampling each product, participants more often chose the aquaculture product than the wild product when provided with a choice.
- Participants who were informed of the identity of the two products before sampling were slightly more likely to choose the aquaculture product than those who were blind. This finding suggests that participants were predisposed to cultured products before tasting, indicating that their attitudes may have some influence on their preference.
- The taste preferences of the informed taste test participants who were and were not provided information were *not* significantly different. This indicates that although information affected consumers attitudes towards aquaculture, it did not significantly affect their attitudes towards aquaculture products.

- Overall, participants indicated a higher willingness to pay for the wild product, the reason for which may have been consumer taste preferences or a consideration of the issues surrounding the different methods.
- There was a significant difference in the percentage of people who preferred the taste of the wild product and the percentage of people who were willing to pay more for the wild product. This may indicate that there is a potential for people to choose aquaculture products over wild products based on considerations other than their taste preferences.

SUMMARY

The findings of this study provide important and needed information about seafood consumers and their attitudes towards aquaculture development and their potential preference for aquaculture seafood products. Although frequent seafood consumers, participants rarely knew whether the products they purchased were wild harvested or farm raised. Similarly, participants were unfamiliar with aquaculture and marine fisheries although they did consider issues surrounding each important to them personally.

Seafood consumers in this survey overwhelmingly supported aquaculture development in New England, however balanced information had a negative impact on seafood consumers attitudes. This finding indicates that the type of information provided to the public can influence attitudes; therefore, it would be important for a positive campaign to be undertaken early in the development process to preempt negative campaigns by opposition groups. Finally, the findings from this research are preliminary and warrant further investigation.

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University of New Hampshire Open Ocean Aquaculture Demonstration Project

The open ocean aquaculture demonstration project is a multi-year project that will attempt to determine whether it is biologically, technologically, economically, and socially feasible to grow finfish in containment structures in the open ocean. The project has developed a commercial-scale test site, complete with infrastructure, for applying the culture and grow-out protocols developed in research efforts. The goal is to test the economic viability and overall feasibility of open-ocean aquaculture, or fish farming.

The demonstration site is located in a fairly remote area near the Isles of Shoals, within sight of the New Hampshire and Maine coast. Fish pens held summer flounder until October. Mussels are still being grown in that area.

The specific objectives for the initial phase of the demonstration project included:

- The development of partnerships between cage manufacturers, commercial fishermen, aquaculturists, regulatory personnel, and university scientists who will jointly participate in commercial-scale projects at the demonstration site.
- Holding a planning meeting to review the concept of the project, outline the ideas that have been developed by UNH, have a discussion of those ideas and modify them as needed, and develop a long-term plan for use of the site (other species, other containment structures, etc.).
- Selecting and characterizing the demonstration site.
- Obtaining all required aquaculture permits by synthesizing and representing all site information, and all proposed biological and technical methods, in the appropriate format and level of detail to the necessary regulatory agencies.
- Developing a site monitoring program of hydrography (temperature, salinity, dissolved oxygen, and transmissivity profiles), water quality (turbidity, suspended sediments, chlorophyll and nutrients), and benthos.
- Evaluate and select containment structures.
- Identify the fish and shellfish species most appropriate for the demonstration projects using several criteria.
- Demonstrate summer flounder and blue mussel production in an open ocean aquaculture site. A thorough evaluation of production of these two model species, ranging from the hatchery phase through harvest and marketing, will allow us to begin to evaluate the efficacy of offshore aquaculture, and will set the stage for future projects.

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