Consumer Attitudes and Preferences about Farm-Raised Shellfish, Finfish, and Sea Vegetables in the Atlantic Coast States

Consumer Attitudes • Regional Preferences • Market Opportunities

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INTRODUCTION

This report highlights findings from the Atlantic States Consumer Seafood Survey, a comprehensive survey of consumers in coastal Atlantic states about their attitudes and preferences toward 16 varieties of seafood. It includes an overview of industry trends, information on consumer preferences for wild-caught and farmed seafood products, and a summary of market demand projections for different species and categories by location.

Completed in 2018, the Atlantic States Consumer Seafood Survey measured consumer attitudes and preferences about farm-raised shellfish, finfish, and seaweed and was used to inform the development of an online tool that allows users to explore seafood markets by state, sub-region, and region by species. This research gives aquaculture stakeholders new data and tools to examine potential new seafood market opportunities in the 14 Atlantic coast states.

Background on Global and U.S. Production Trends

Every year, we produce, catch, and harvest more seafood to feed the world. Whether seafood products feed people or animals, finfish (fish with bones, as opposed to a shell) are by far the most widely harvested type of seafood (FAO, 2016). In 2017, approximately 91.6 million metric tons of fish were captured, and 83.6 million metric tons of fish were raised for consumption (FAO, 2017).

Currently, Asia is the leading producer of aquaculture products, with a yearly production volume of more than 71 million tons. This production is equivalent to nearly 500,000 blue whales, the largest animal on Earth. The U.S. produces two-thirds the amount of Asian-produced aquaculture seafood, about 48 million tons, and is also the world’s largest importer of fishery products (FAO, 2017). Each year for the last 15 years, the U.S. imported more seafood than it produced, much of it from China, which contributes to the U.S. trade deficit.

Between 2001 and 2016, U.S. aquaculture production dropped by 20% despite Americans’ growing appetite for fish and shellfish. To meet current domestic consumer demand, the United Nation’s Food and Agriculture Organization estimates that the U.S. would need to increase the current value of annual seafood production nearly five times, to $15 billion (FAO, 2017).

By far the largest share of landings (amount of fish caught) come from Alaska, but the landings with the most value come from East Coast waters. The Atlantic seaboard region—the focus of our study—produces the third largest share of domestic seafood landings (Figure 1).

Figure 1. Seafood landings by state in 2016 (NOAA, 2016)

Seafood Consumption is Rising

Research shows the global population are consuming more seafood, which provides rich market opportunities for U.S. exports. Seafood represents approximately 16% of all animal protein consumed worldwide, and per capita consumption is increasing more than two pounds each year. Industry experts partly attribute increased consumption to marketing efforts that showcase seafood as a more environmentally responsible and healthier option than land-based animal meat (FAO, 2016; World Bank, 2013).

One study conducted in the seafood-rich Northeast region of the U.S. concluded that people decide to eat seafood primarily for four reasons: taste; nutrition; dietary variety; and ease of preparation. These qualities, plus experience preparing seafood, are important variables in whether or not seafood lands on American dining room tables (Gempesaw et al., 1995).

However, even with compelling propositions, most Americans do not eat the recommended two servings, eight ounces total, per week of seafood. In 2013-2016, only 20.1% of American adults reported eating seafood at least twice each week, and this eating pattern was most common among non-Hispanic Asian adults (Terry et al., 2018). Concerns about
taste, mercury contamination, and price—especially in the Midwestern states—impact consumer’s decisions about eating seafood.

A recent study from the University of Maine shows that across the country there is relatively low awareness of the risks and benefits associated with the U.S. aquaculture industry. People expressed more acceptance of domestic, rather than international, seafood products (Murray et al. 2017). These findings suggest that shifting consumer perceptions through strategic marketing could lead to people eating more U.S.-produced fish, which would net benefits for the seafood industry and local economies.

Another recent study focused on regional opportunities for specific types of seafood. Conducted by the Hale Group in partnership with the Gulf of Maine Research Institute (GMRI), researchers analyzed market opportunities for Maine-farmed shellfish, specifically Eastern oysters, blue mussels, and sea scallops. Their analysis showed that with careful planning, Maine aquaculture operations are well-positioned to capture much more of the growing U.S. market for these three mollusk varieties, which are currently valued at $700 million. Based on report data, researchers projected that the Maine-farmed shellfish industry could grow landed revenues from the current $6.5 million level to as much as $30 million by 2030 (Hale Group and GMRI, 2016).

Opportunities exist to expand U.S. aquaculture production, improve public health, stimulate local economies, and offset foreign seafood imports. This survey study increases our knowledge by identifying pent-up market demand and consumer preferences for a variety of farm-raised seafood. We believe the resulting data, used in combination with the user-friendly online tool, will help producers and other stakeholders build successful market strategies and business plans.

**SURVEY METHODS**

The 36-question Atlantic States Consumer Seafood Survey was developed by the extended Atlantic team and was reviewed by three aquaculture experts, two from the Mid-Atlantic and one from the Southeast regions. It was administered online in the summer of 2018 by Qualtrics®, a leading international business and market research company, on behalf of Atlantic Corporation. Resulting data were reviewed, analyzed and summarized by the Maine Statistical Analysis Center (MSAC).¹

A total of 5,989 adults participated in the survey, with at least 400 people representing each of 14 coastal Atlantic states. States were grouped into three distinct regions:

**Northeast**
- Maine
- Massachusetts
- New Hampshire
- Rhode Island
- New York

**Mid-Atlantic**
- New Jersey
- Delaware
- Maryland
- Virginia

**Southeast**
- North Carolina
- South Carolina
- Georgia
- Florida

The survey participants were recruited from established Qualtrics® panels of persons willing to answer online surveys. Throughout the survey, participants were asked to consider seven different types of finfish and eight types of shellfish (crustaceans and mollusks). We also included an “other” category for any unnamed finfish or shellfish species. Sea vegetables were defined as seaweed and not broken down by species. During analysis, survey responses were weighted according to the American Community Survey to ensure accurate representation of the target consumer population in terms of gender, age, race, income, and state.²

Despite some skewed distributions of data, means were analyzed rather than medians. Means were compared by analysis of variance (ANOVA). Categorical data relationships were analyzed by the Chi-Square Independence Test. Probabilities of 0.05 or lower were considered significant and reported here.

The survey consisted of questions about finfish, shellfish, and sea vegetables (Table 1).

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1 MSAC is affiliated with the Muskie School of Public Service and the Cutler Institute based at the University of Maine, and is part of a nationwide network of statistical analysis centers.

2 2010–2014 DP05 American Community Survey Demographic and Housing Estimates and 2011–2015 DP03 Selected Economic Characteristics were used for target proportions.
In addition to basic demographic, food expenditure, and general aquaculture data for all respondents, survey questions gathered information about seafood consumption from the 92% of respondents who consume seafood. Survey questions were designed to collect data on:

- Seafood knowledge and awareness of aquaculture (farm-raised seafood) operations
- Knowledge of different species of shellfish
- Seafood consumption and types of seafood consumed
- Preferences for different types of seafood
- Purchasing habits and prices paid for seafood
- Purchases by season
- Availability of seafood
- Environmental concerns
- Seafood labeling preferences
- Perceptions of seafood quality
- Production preferences (farm-raised, genetically modified organisms (GMO), 3rd party certified sustainable, fresh, etc.)
- Willingness to pay

**SURVEY DEFINITIONS**

Key terms used in the Atlantic States Aquaculture Survey were defined as follows:

**Seafood**—Finfish, shellfish, and sea vegetables in their natural state as well as in value-added food products (such as dairy foods, pasta, bread, soups/chowders, pies, frozen foods, and ready-to-serve meals).

**Marine aquaculture**—The cultivation of saltwater finfish, shellfish, and sea vegetables under controlled conditions.

**Farm-raised**—Seafood that has been grown by aquaculture operations.

**Finfish**—Any saltwater fish with fins.

**Shellfish**—Any saltwater invertebrate animals that have a shell, including mollusks, such as clams, mussels, and oysters, and crustaceans, such as lobsters, crabs, and shrimp.

**Sea vegetables**—All species of edible saltwater macroalgae/seaweed.

**KEY FINDINGS**

The survey resulted in both predictable and surprising results that will be of interest to aquaculture enterprises, business advisors, and industry stakeholders. This section includes a summary of key findings on consumer attitudes related to both seafoods in general and various types of marine aquaculture operations.

**Consumption Patterns**

Ninety-two percent of people surveyed reported they consume seafood. Maryland residents were most likely to have consumed at least one type of seafood (at 98%), and Virginia residents were least likely to have consumed at least one type of seafood (at 88%). Overall, data show that Southeast residents eat the most seafood.

When asked what types of seafood people consumed, more than 50% of respondents reported that they consumed the following species: shrimp, flounder, lobster, crabs, scallops, Atlantic salmon, or Pacific/Alaskan salmon. Less than 10% of respondents reported that they consumed: sturgeon, cobia, abalone, or drum (red or black) (Figure 2).

Predictably, the species consumed the most in each region reflected seafood native to that area. For example, people living in the Northeast eat more lobster than those in the Southeast, where crabs are a popular mealtime choice.

Of the varieties surveyed, regarding race/ethnicity, Hispanic respondents are more likely to have consumed striped bass, cobia, drum, lobster, and mussels than white, African American, or other participants. White survey participants were most likely to consume flounder, shrimp, clams, and scallops. Seventy percent of African Americans ate crabs, which is significantly more than other racial groups.

The age group most likely to eat seafood of any type was 55 to 64 years old (Figure 3). The age group least likely to consume seafood was 18 to 24 years old. These trends agree with data from the 2013-2016 U.S. National Health and Nutrition Examination Survey (NHANES) (Terry et al., 2018).
Figure 2. Types of seafood consumed the most

Figure 3. Percentage of respondents, by age, who consume seafood
Favored Species
Participants were asked to rate their favorite type of seafood on a scale of 1 to 5, 1 being “extremely dislike” and 5 = “extremely like.” The highest rated seafood type in the finfish, crustacean, and mollusk categories were Pacific Alaskan salmon, shrimp, and scallops. Only participants who reported having eaten a type of seafood in the previous question were asked to rate that seafood in the current question and that accounts for the wide range of number of responses, from 388 for abalone to 4,676 for shrimp.

Purchasing Patterns
The value of consumer seafood purchases in restaurants and stores are split about evenly (Figure 5). The survey showed that consumers spent the least amount on seafood bought through mail order or home delivery services.

Respondents from the Northeast reported that on average they spent more per month on seafood at stores and restaurants than did people from the other regions. Not surprisingly, the higher the household income, the more likely people were to buy seafood products whether for home consumption or dining out.

Figure 4. Most and least liked types of seafood (Note: Unlabeled bar chart sections have values of less than 10%)

Flounder, shrimp, scallops, and salmon are top choices amongst respondents.

Consumers purchase most of their seafood at stores and restaurants.
When we asked consumers where they bought seafood to eat at home, the results showed that supermarkets and big box stores were the most popular purchase locations. Only 9% of survey respondents’ monthly seafood purchases are made at a seafood market, truck, or stand (Figure 6).
Seafood Availability and Ease of Purchase

The survey showed only small differences in the availability of species by region, with seaweed being the most difficult to both find and purchase. When asked “How easy it is for you to purchase the following seafood in your immediate area?” the highest percentage of respondents said that Atlantic salmon, shrimp, and scallops were always available (Figure 7).

Seafood is easy to buy year-round, no matter where you live.
When asked to rate the quality of seafood available in their immediate area, 30% or more of consumers scored shrimp, lobster, and crab as excellent; 25% or more of respondents rated Atlantic salmon and scallops highly. These types of seafood were also some of the most liked according to the survey. More than one-third of respondents rated drum, cobia, sturgeon, abalone, and sea vegetables as lowest in quality (Figure 8).

**Shrimp, lobster, and crab score highest.**
Gender Differences
For most types of seafood, and in nearly all regions, males claimed higher awareness of aquaculture operations, knowledge about seafood, and both purchase and consume more seafood than females. However, data show that women eat more shrimp, crabs, and seaweed than men do.

Awareness of Farm-Raised Seafood
We asked survey takers if they were aware of finfish, shellfish, and sea vegetable aquaculture operations on the US east coast. Data show that consumers were most aware of shellfish operations, followed by finfish operations. One-quarter of the respondents were aware of sea vegetable operations (Figure 9).

The higher their income, the more likely people were aware of and knowledgeable about marine aquaculture operations. However, younger adults, those aged 18 to 24, were more likely to be both aware of and knowledgeable about aquaculture operations than adults older than 24 years old.

In general, Hispanic consumers were more apt to know about East Coast finfish and sea vegetable enterprises than were White or African American consumers. They also reported a higher level of aquaculture knowledge than the other ethnic and racial groups.

Regionally, Northeastern consumers reported the highest level of awareness of aquaculture operations and the most seafood knowledge (Figure 10). However, knowledge about specific species, especially crustaceans, varied depending on a consumer’s location. People living in the Southeast were more familiar with species of crabs, for example.
Regardless of their location, most people said they preferred their fish and shellfish to be wild-caught rather than farm-raised, but consumers will purchase more farm-raised seafood when it is readily available. For example, when asked, “If the following farm-raised seafood was more readily available for you to purchase in your area, approximately how much more would you purchase annually?” People surveyed said they would spend $145 more on farm-raised shrimp, $92 more on farm-raised Atlantic salmon, and $77 on farm-raised scallops annually if the products were readily available (Figure 11).

We also asked people how much more they would be willing to pay, if anything, for the following categories of farm-raised seafood:
- fresh
- local
- certified organic
- non-GMO
- domestic
- frozen
- third party certified sustainable

<table>
<thead>
<tr>
<th>Seafood Category</th>
<th>Willingness to Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic salmon</td>
<td>$92</td>
</tr>
<tr>
<td>Pacific/Alaskan salmon</td>
<td>$87</td>
</tr>
<tr>
<td>Flounder</td>
<td>$74</td>
</tr>
<tr>
<td>Striped bass</td>
<td>$44</td>
</tr>
<tr>
<td>Other finfish</td>
<td>$40</td>
</tr>
<tr>
<td>Drum (red or black)</td>
<td>$22</td>
</tr>
<tr>
<td>Cobia</td>
<td>$21</td>
</tr>
<tr>
<td>Sturgeon</td>
<td>$17</td>
</tr>
<tr>
<td>Shrimp</td>
<td>$145</td>
</tr>
<tr>
<td>Lobster</td>
<td>$123</td>
</tr>
<tr>
<td>Crabs</td>
<td>$100</td>
</tr>
<tr>
<td>Other crustaceans</td>
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</tr>
<tr>
<td>Scallops</td>
<td>$77</td>
</tr>
<tr>
<td>Clams</td>
<td>$65</td>
</tr>
<tr>
<td>Oysters</td>
<td>$54</td>
</tr>
<tr>
<td>Mussels</td>
<td>$50</td>
</tr>
<tr>
<td>Abalone</td>
<td>$19</td>
</tr>
<tr>
<td>Other mollusks</td>
<td>$18</td>
</tr>
</tbody>
</table>

**Figure 11.** Consumer willingness to expend more if readily available

People generally prefer wild-caught but will purchase more of certain types of farm-raised seafood if it is readily available.
Survey participants said they would pay the most for seafood that is “fresh,” followed by seafood that is “local” (Figure 12). Categories that consumers selected lower willingness to pay more for included “frozen” and “3rd party certified.”

**People want to know where their seafood comes from.**

**Labeling and Geographic Origins**

People look at labels or signage about half the time to find out the source of their seafood. Participants said they know where their seafood is from about 40% of the time, although awareness varied by state. Generally, Northeastern consumers were more likely to know a product’s geographical origin than those in Mid-Atlantic or Southeastern states.

When asked, “how much detail do you desire about the geographic origin of your seafood,” nearly one-third said they prefer to know which U.S. state produced the product (Figure 13). The desire for state-level detail on seafood varied by state, with Maine residents desiring information the most (Figure 14).
Perceived Benefits and Impacts of Farm-Raised Seafood

We asked participants “How would you characterize the impact of aquaculture on the following:"

- nutrition
- food systems
- local economies
- the U.S. economy
- keeping prices low
- job creation
- the environment
- wild stock
- rural fishing villages
- the U.S. international trade deficit.

Respondents said that nutrition is the top benefit of all types of aquaculture operations and that local economies also benefit from shellfish enterprises (Figure 15). The U.S. economy and food systems were also perceived as benefitting from marine aquaculture.

Participants also tended to report that aquaculture can lead to job creation and benefit to the environment as well as to rural fishing villages. Interestingly, consumers reported that finfish and shellfish aquaculture have a more positive impact on wild stock than sea vegetable aquaculture and that sea vegetable aquaculture has a more negative impact on the U.S. trade deficit than shellfish aquaculture.

Approximately one-third of respondents held neutral opinions regarding potential benefits of aquaculture, suggesting that there may be opportunities to educate these consumers about benefits and potentially increasing their interest in farmed seafood. Brayden et al. (2018) noted that consumers living in coastal regions might be more familiar with local seafood and thus the positive and negative aspects of aquaculture. Consumers living in other areas of the U.S. might have different attitudes towards aquaculture products.

Environmental Issues Related to Farm-Raised Seafood

We asked members of the online survey panels about the level of their environmental concerns related to aquaculture, specifically, chemical pollution, biological pollution, habitat modification, the source of feed, and organic pollution. Regardless of the type of seafood operation, participants claimed that chemical pollution was their greatest concern and organic pollution was their least concern. About one-quarter of respondents stated they were aware of positive environmental contributions made by aquaculture operations.
### Figure 15. Consumer Perceptions of Positive and Negative Impacts of Aquaculture

<table>
<thead>
<tr>
<th>Negative Category</th>
<th>Positive Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical pollution</td>
<td>Finfish</td>
</tr>
<tr>
<td>Biological pollution</td>
<td>Shellfish</td>
</tr>
<tr>
<td>Habitat modification</td>
<td>Sea Vegetables</td>
</tr>
<tr>
<td>Source of feed</td>
<td>Finfish</td>
</tr>
<tr>
<td>Organic pollution</td>
<td>Shellfish</td>
</tr>
<tr>
<td>Sea Vegetables</td>
<td>Sea Vegetables</td>
</tr>
<tr>
<td>Shellfish</td>
<td>Shellfish</td>
</tr>
<tr>
<td>Finfish</td>
<td>Finfish</td>
</tr>
</tbody>
</table>

### Figure 16. Consumers’ environmental concerns related to aquaculture

- Chemical pollution: 55%, 53%, 49%
- Biological pollution: 50%, 49%, 43%
- Habitat modification: 48%, 47%, 42%
- Source of feed: 46%, 44%, 39%
- Organic pollution: 45%, 44%, 41%

**Legend:** Finfish, Shellfish, Sea Vegetables
Market Projection Different Species by Location
Based on the survey data, Atlantic Corporation has created an online spatial tool for market analysis. Users can gain more in-depth information related to consumer willingness to pay for more readily available and specific categories of farm-raised seafood by species at the region, sub-region and state levels. This tool includes general insights and can be found on the Atlantic website: www.atlanticcorp.us

CONCLUSION
The comprehensive findings from this consumer survey fill several gaps in the existing literature and knowledge regarding consumer markets for farm-raised seafood. Perhaps the most useful contribution is the ability to calculate unmet market demand and opportunity by location. East Coast residents are willing to purchase more farm-raised finfish, shellfish, and sea vegetables if readily available. They are also willing to pay premium pricing for specific product categories. For example, participants indicated a willingness to spend 44% more on fresh seafood, 34% more on locally-produced items, and 27% more on certified organic seafood. Shrimp were the most commonly consumed species of seafood in thirteen states, second only to lobster in the state of Maine. Overall, crustaceans were the category that participants reported being most available and that were preferred more compared to finfish, mollusk, and sea vegetables.

These data are useful for understanding which areas seafood providers could focus on to grow sales channels and revenue streams. The importance of using recent and credible market research data to inform business strategies, models, and planning should not be underestimated. Both start-up and established aquaculture operations can benefit by growing and delivering what consumers are willing to purchase in any given location.

The results reported here and the spatial visualization tool we have developed can be used to project unmet consumer demand for domestic farm-raised seafood and untapped opportunities for businesses willing to explore consumer survey data. Given our data set about consumer attitudes and preferences about farm-raised seafood, future analyses can focus on the correlation of multiple variables (e.g., race, gender, age) and how they impact seafood preference. These data can be used to inform the development of seafood markets at the regional, sub-regional and state level, and allowing for marketing of specific types of seafood to certain demographics.

For more information on this survey and the interactive spatial visualization tool, visit Atlantic Corporation’s website at www.atlanticcorp.us.
BIBLIOGRAPHY


