



**U.S. Consumer Attitudes
and Preferences about
Domestic Farm-Raised
Finfish and Shellfish:**

**DESCRIPTIVE
STATISTICS
REPORT**

JANUARY 2023



ACKNOWLEDGEMENTS

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This report was prepared by Atlantic Corporation and is funded as part of a grant from the United States Department of Agriculture, National Institute of Food and Agriculture, Agriculture and Food Research Initiative under award number 2022-67023-36379. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the United States Department of Agriculture, National Institute of Food and Agriculture, or the Agriculture and Food Research Initiative.

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Citation: Atlantic Corporation, "U.S. Consumer Attitudes and Preferences about Domestic Farm-Raised Finfish and Shellfish: A Descriptive Statistics Report," Waterville, ME, 2023.

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LIST OF TERMS AND DEFINITIONS⁴

Aquaculture – the farming/cultivation of finfish and shellfish under controlled conditions

Finfish – any fish with fins

Shellfish – an aquatic invertebrate animal with a shell, including mollusks such as clams, mussels, and oysters, and crustaceans such as lobsters, crabs, and shrimp

Farm-raised – finfish/shellfish sourced from aquaculture operations

Wild-caught - finfish/shellfish gathered directly from coastal habitats

⁴List provided to respondents at beginning of survey.

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1. INTRODUCTION

This report presents the findings of a comprehensive survey of consumers in all 50 states about their attitudes and preferences towards domestic farm-raised finfish and shellfish. Completed in 2022, the goal of the survey was to inform the development of an online tool that allows users to explore seafood markets by state, sub-region, and region by species. The online data visualization tool will be further developed using key variables by region and state and then published on the Atlantic Corporation (Atlantic) dashboard, described in subsection 5.6, Next Steps. This research gives domestic aquaculture stakeholders new data and tools with which to examine potential seafood market opportunities.



Atlantic Corporation (Atlantic), in collaboration with Dynata, a first-party data company, collected a random and census-representative sample of at least 400 responses from each of the 50 U.S. states, resulting in 20,029 respondents. This sample size adequately represents consumers across the U.S. and their attitudes and preferences toward 13 species of finfish and shellfish.

This report includes an overview of survey methods and key findings derived from the survey data. In this report, we provide summary statistics of the consumer survey questions and discuss the implications of the results. From the summary statistics, we gained an understanding of (1) consumer perceptions and consumption habits of 13 seafood species; (2) consumer preferences and willingness-to-pay for various seafood attributes; (3) consumer perception and knowledge of aquaculture; and (4) consumer consumption habits, preferences, and attitudes toward value-added seafood products.

2. SURVEY METHODS

The project team designed a consumer survey and hired Dynata to field the survey through their U.S. consumer panel. Data collection occurred online in three stages and yielded 20,029 responses in the final dataset.

5/25/2022 – 5/26/2022

Pilot survey to collect preliminary choice experiment data to generate parameter priors to creating a Bayesian choice experiment design (n = 502)

6/8/2022 – 6/9/2022

Soft launch of the survey (n = 573)

6/13/2022 – 8/14/2022

Full launch of the survey (n = 19,234)

The goal of the data collection was to collect a random and census-representative sample of 400 participants from each U.S. state and this survey yielded 20,029 total responses used for the data analysis. A census-representative sample was collected for California, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Missouri, and Ohio without any challenges. Due to limited online panel penetration, it was challenging to achieve the target sample size for Alaska, Nevada, North Dakota, Oklahoma, Rhode Island, South Dakota, Tennessee, Vermont, Wisconsin, and Wyoming. For these 10 states, Dynata adjusted the demographic quotas, including gender, age, and race/ethnicity, in order to attract possible traffic. For the remaining states, some adjustments about gender and age quotas were applied to reach the targeted sample size.



3. SOCIO-DEMOGRAPHIC CHARACTERISTICS

3.1 Geographic Distribution

Table 1 shows the sample distribution by the U.S. Census regions and divisions, demonstrating the breakdown of the total 20,029 responses to the survey.

Table 1. U.S. Geological Survey 2022 budget for water programs (US Geological Survey)

Region	Frequency	Percent Frequency	Division	Frequency	Percent Frequency
Northeast	3,610	18%	New England	2,408	12%
			Middle Atlantic	1,202	6%
Midwest	4,803	24%	East North Central	2,001	10%
			West North Central	2,802	14%
South	6,410	32%	South Atlantic	3,207	16%
			East South Central	1,603	8%
			West South Central	1,600	8%
West	5,206	26%	Mountain	3,205	16%
			Pacific	2,001	10%
Total	20,029	100%	Total	20,029	100%

3.2 Age, Gender, Race, and Ethnicity

On average, the respondents were 47.2 years old with a standard deviation of 16.7. Ages ranged from 18 to 85 years old (**Figure 1**). The data collected was roughly evenly distributed among six age groups. All but the youngest age group represented between 16 and 20% of respondents.

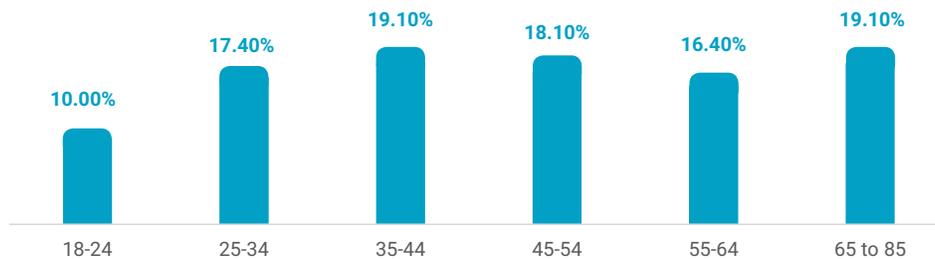
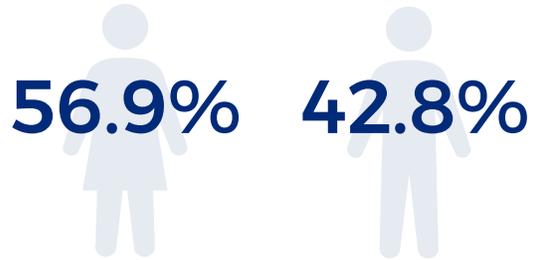


Figure 1. Age Distribution of respondents

A little over half of survey respondents were female (11,403 or 56.9%) and 8,572 (42.8%) were male (Table 2). Less than 1% did not specify a gender.

Table 2. Gender distribution

Gender	Frequency	Percent Frequency
Male	8,572	42.8%
Female	11,403	56.9%
Not Specified	54	0.3%
Total	20,029	100%



In total, 79.4% of the respondents identified as White, the largest race group among respondents (Table 3). The next largest race group identified as Black or African American (9.5%).

Table 3. Race distribution

Race	Frequency	Percent Frequency
American Indian or Alaska Native	274	1.4%
Asian	784	3.9%
Black or African American	1,899	9.5%
Native Hawaiian or Other Pacific Islander	129	0.6%
White	15,910	79.4%
Two or more races	508	2.5%
Other	424	2.1%
Prefer not to answer	101	0.5%
Total	20,029	100%

In terms of ethnicity, about 9.8% (1,956) of the respondents identified as Hispanic or Latino, with the large majority of respondents identifying as Not Hispanic or Latino (90.2% or 18,073) (Figure 2).

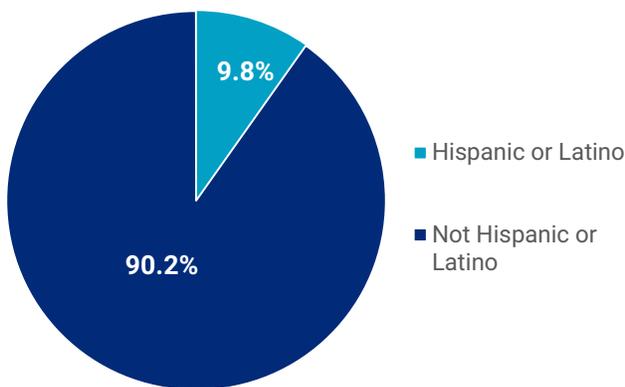


Figure 2. Ethnicity distribution



3.3 Shopper Status



Table 4. Distribution by shopping responsibilities

Shopper Status	Frequency	Percent Frequency
Primary	16,515	82.5%
Shared Equally	3,514	17.5%
Total	20,029	100%

The survey targeted individuals who were the primary food shoppers for their household or who shared shopping responsibilities equally with other members of their household. The majority of respondents (16,515 or 82.5%) identified as the primary food shoppers for their households (**Table 4**). The remaining respondents (3,512 or 17.5%) shared their shopping responsibilities equally with other household members.

3.4 Education and Income

Respondents with at least an associate degree represented more than half the respondents (59.5%) (**Table 5**). About one quarter of respondents held a bachelor's degree (27.8%).

Table 5. Education distribution

Education	Frequency	Percent Frequency
High School or GED	3,570	17.8%
Some college, no degree	4,525	22.6%
Associate degree	2,811	14.0%
Bachelor's degree	5,575	27.8%
Graduate or professional degree	3,548	17.7%
Total	20,029	100%

Table 6 shows the distribution of annual household income before taxes in 2021, using nine categories that range from less than \$15,000 to over \$200,000.

Table 6. Distribution of annual household income before taxes in 2021

Income	Frequency	Percent Frequency
Less than \$15K	1,544	7.7%
\$15k-\$24.99K	1,594	8.0%
\$25k-\$34.99K	1,871	9.3%
\$35k-49.99K	2,388	11.9%
\$50-74.99K	3,800	19.0%
\$75k-99.99K	3,098	15.5%
\$100k-149.99K	3,575	17.9%
\$150k-199.99K	1,280	6.4%
Over \$200K	879	4.4%
Total	20,029	100%



3.5 Household Size and Composition

On average, the households of the respondents had 2.66 people, with a standard deviation of 1.41 (**Table 7**). Nearly 90% of all respondents were from households with 4 persons or less, with the largest percentage of respondents reporting 2 members of their household (37.5%).

Table 7. Distribution of household size

Household Size	Frequency	Percent Frequency
1 member	3,897	19.5%
2 members	7,501	37.5%
3 members	3,556	17.8%
4 members	2,999	15.0%
5 members	1,311	6.6%
6 members	478	2.4%
7 members	163	0.8%
8 members	71	0.4%
9 members	19	0.1%
10+ members	34	0.2%
Total	20,029	100%

Table 8. Distribution of the number of children in the households

Children	Frequency	Percent Frequency
0 members	12,454	62.2%
1 member	3,348	16.7%
2 members	2,683	13.4%
3 members	968	4.8%
4 members	362	1.8%
5 members	133	0.7%
6 members	44	0.2%
7 members	19	0.1%
8 members	18	0.1%
Total	20,029	100%

Table 8 shows the distribution of the number of children in the households. About 62.2% of respondents said their household had no children, 16.7% had one child, 13.4% had two children, and 7.7% had three or more children present in their households. In comparison, in 2022 there was a national average of 1.94 children under 18 per family in the U.S.⁵

⁵Duffin E. U.S. average number of own children per family with own children, 1960-2022. Statista. Published December 13, 2022. <https://www.statista.com/statistics/718084/average-number-of-own-children-per-family/>.

3.6 Food Expenditure Demographics

The survey asked respondents for their household’s average monthly expenditure on food over the past 12 months at food stores (e.g., big box stores, convenience stores, farmer’s markets, gourmet markets, local organic markets, meat markets, seafood markets/trucks/stands, and supermarkets); for online orders, mail orders, and other home delivery services; and at restaurants (either dine-in or takeout).

In general, it is challenging to obtain accurate expenditure reports through surveys because respondents are unable to accurately recall spending amounts. In this survey, 77 respondents (less than 0.5%) entered zeros for food expenditure in all three categories, which were considered error observations. **Table 9** reports summary statistics of average household monthly food expenditures for the sub-sample that removes these 77 observations. Their median food expenditure is \$400 in food stores, \$20 through online/mail/delivery orders, and \$150 in restaurants/takeout. Based on the sub-sample, in each month over the past year, a household’s mean food expenditure was \$660 in food stores; \$159 through online orders, mail orders, and other home delivery services; and \$322 in restaurants. The means are much larger than the medians, due to extremely large expenditure values reported by some respondents. Hence, in this case, we consider the median a more reliable measure to represent the household’s average monthly food expenditure in the three categories.

Table 9. Household’s average monthly food expenditure, by shopping venues/methods

Category	Sub-Sample (n = 19,952)		
	Median	Mean	Std Dev
Food stores	\$400.00	\$659.60	\$980.70
Online orders, mail orders, and other home delivery services	\$20.00	\$159.00	\$466.90
Restaurants (dine-in or takeout)	\$150.00	\$321.60	\$633.30

Taking the household size into consideration, **Table 10** shows summary statistics of household’s per capita average monthly food expenditure for the sub-sample, in a similar format as in **Table 9**. Based on the median values in the sub-sample, on average, consumers spent about \$167 in food stores, \$8 through online/mail/delivery orders, and \$60 in restaurants/takeout per person each month over year preceding the survey.

Table 10. Household’s per capita average monthly food expenditure, by shopping venues/methods

Category	Sub-Sample (n = 19,952)		
	Median	Mean	Std Dev
Food stores	\$167.00	\$301.30	\$512.10
Online orders, mail orders, and other home delivery services	\$8.00	\$65.30	\$216.80
Restaurants and prepared takeout	\$60.00	\$145.70	\$330.40

3.6 Seafood Purchasing Frequency

Figure 3 shows the frequency of respondents purchasing finfish/shellfish to prepare at home over the past 12 months. Overall, consumers purchase finfish to prepare at home slightly more frequently than purchasing shellfish. About 13.5% of respondents purchased finfish to prepare at home once a week, versus 9.8% who purchased shellfish at that frequency. About 20.1% of respondents purchased finfish to prepare at home once every two weeks, versus 19.6% who purchased shellfish at that frequency. Interestingly, 19.4% of respondents never purchased finfish to prepare at home, while only 12.5% never purchased shellfish for home consumption.

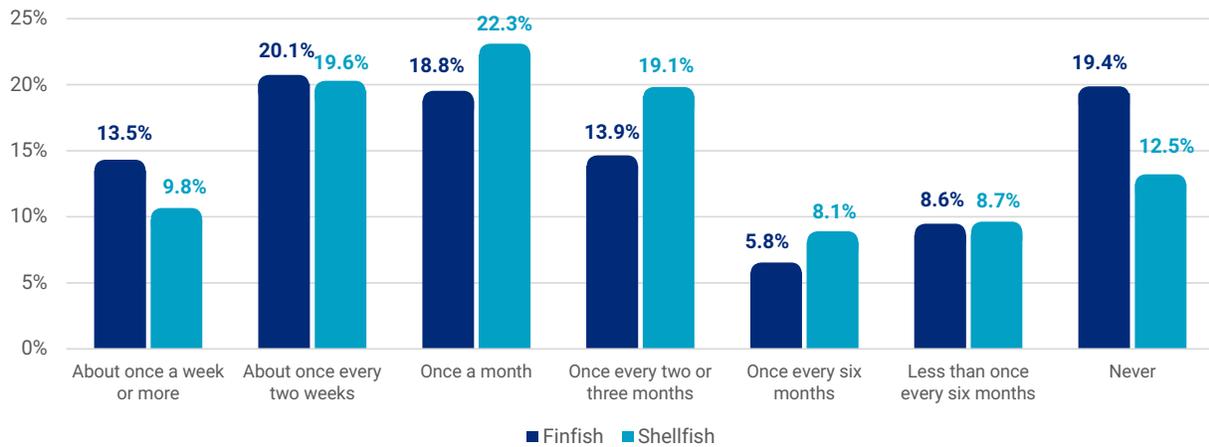


Figure 3. Frequency of purchasing finfish/shellfish to prepare at home

This might be due to that shrimp, the most popular seafood, belongs to the shellfish category.



4. KEY FINDINGS

4.1 Consumer consumption habits and perceptions of a list of seafood species

Consumers' likeness rating of seafood species

Based on input from stakeholders in the aquaculture industry, this project focused on 13 seafood species: striped bass/hybrid, California yellowtail, cobia, drum red or black, halibut, salmon, sturgeon, shrimp, abalone, clams, mussels, oysters, and scallops.

The survey asked respondents if they have eaten each of the seafood species and if so, how well they like the species on a scale from 1 to 5 (1 = extremely dislike and 5 = extremely like). **Table 11** shows the results listed from most-liked to least-liked species. On average, consumers like all 13 seafood species with a mean likeness score ranging from 3.66 to 4.58. Shrimp is the most liked and eaten (91.6%) species by the respondents. Salmon is the second most liked and eaten seafood (88.2%). Scallops are the third most liked and eaten seafood (74.5%). The three seafood species ranked at the bottom of this list are sturgeon, oysters, and mussels. A few finfish species such as cobia, drum, and sturgeon are less common and only a small percentage of consumers had eaten them. Shrimp is the favorite shellfish species, followed by scallops and clams, while mussels and oysters are ranked the lowest. Salmon dominates the finfish species category with the highest percentage of respondents having eaten the species and the highest likeness score mean. Less consumers have tried finfish species, with percentages falling from 88.2% for salmon to the second most common halibut with 64.9% of consumers having eaten it. Abalone and Sturgeon have the two lowest likeness score means of finfish despite slightly higher percentages of consumers having tried them in the past than other finfish such as cobia or drum.

Table 11. Consumers' rating on how much they like the seafood

Species	Consumers who have eaten the species		Likeness Score Mean	Likeness Score Std Dev
	N	Percent		
Shrimp	18,350	91.6%	4.58	0.76
Salmon	17,661	88.2%	4.31	0.96
Scallops	14,929	74.5%	4.18	1.00
Halibut	13,006	64.9%	4.05	0.90
California yellowtail	5,348	26.7%	4.00	0.88
Striped bass/hybrid	7,454	37.2%	3.91	0.86
Clams	13,127	65.5%	3.90	1.07
Cobia	2,601	13.0%	3.86	0.99
Drum - red or black	2,933	14.6%	3.82	0.99
Abalone	5,458	27.3%	3.81	0.98
Mussels	10,925	54.5%	3.76	1.12
Oysters	12,420	62.0%	3.75	1.23
Sturgeon	3,952	19.7%	3.66	1.05

Rating Scale: 1 = "very strongly disagree" to 10 = "very strongly agree"

Consumer purchase habits of the seafood species

The survey also asked the respondents how frequently they purchase each seafood species in food stores or online/mail orders for home preparation and how much they spend annually. Consumers may not be able to provide accurate answers to this question. In the dataset, some respondents reported a zero number of purchases but provided a positive dollar amount for the annual cost. Some respondents reported a positive number of purchases but a zero-dollar amount for the cost. These error responses were excluded from the analysis of this question. For the consumers who reported non-zero values for the number of purchases and annual cost, we categorize them as have purchased the seafood. Accordingly, we categorize the consumers who reported a zero number of purchases, and a zero cost as haven't purchased the seafood.

Table 12 presents the annual number of purchases and total cost of seafood purchase for home preparation. We report the summary statistics for two groups of consumers: the consumer group including those who had and hadn't purchased the seafood species, and the consumer group including only those who had purchased the species. The statistics of the "All Consumers" group provide an estimate of the average number of purchases and total cost per year on the seafood species for home preparation for an "average" U.S. consumer. The calculation of the average takes into consideration both consumers who had purchased the seafood species and who hadn't purchased it.

Table 12. The annual number of purchases and total cost of seafood purchase for home preparation

Species	All Consumers (Have Purchased + Haven't Purchased the Species)					Consumers Who Have Purchased the Species				
	N	# of Purchases		Total Cost (\$)		N	# of Purchases		Total Cost (\$)	
		Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	Mean	Std Dev
Shrimp	19,574	20.7	15.6	\$143.30	\$128.40	18,878	21.5	15.3	\$148.60	\$127.70
Salmon	19,287	17.1	15.0	\$136.00	\$132.10	17,806	18.5	14.7	\$147.30	\$131.20
Scallops	18,506	11.5	14.3	\$89.70	\$118.30	13,823	15.4	14.6	\$120.10	\$122.80
Oysters	17,948	9.7	14.2	\$77.30	\$119.90	10,716	16.3	15.2	\$129.40	\$131.60
Halibut	17,769	9.2	12.8	\$76.30	\$112.10	12,426	13.2	13.4	\$109.10	\$119.90
Clams	18,047	10.0	13.8	\$75.70	\$115.40	11,839	15.2	14.5	\$115.50	\$125.40
Mussels	17,847	8.6	13.4	\$67.10	\$112.70	10,070	15.3	14.7	\$118.90	\$127.90
Striped bass/ hybrid	16,950	6.8	11.8	\$58.20	\$106.70	8,190	14.1	13.7	\$120.50	\$126.60
California yellowtail	17,078	6.5	12.1	\$57.80	\$112.00	7,188	15.5	14.5	\$137.40	\$137.30
Abalone	17,238	6.5	12.3	\$54.80	\$109.90	6,821	16.5	14.8	\$138.60	\$137.50
Sturgeon	17,078	5.8	11.9	\$51.40	\$108.80	5,873	17.0	14.9	\$149.40	\$140.60
Drum – red or black	17,004	5.7	11.8	\$49.00	\$106.80	5,569	17.3	15.0	\$149.60	\$140.50
Cobia	17,034	5.4	11.5	\$47.70	\$105.70	5,425	17.0	14.9	\$149.70	\$140.70



For home prepared shellfish, consumers spent the most on shrimp, followed by scallops, oysters, clams, mussels, and abalone. For home prepared finfish, consumers spent the most on salmon, followed by halibut, striped bass/hybrid, California yellowtail, sturgeon, drum, and cobia. On average, U.S. consumers made about 20.7 purchases of shrimp at a cost of \$143.30 per year (i.e., approximately 1.7 times per month at about \$11.90) and made about 17.1 purchases of salmon at a cost of \$136 per year (i.e., approximately 1.4 times per month at about \$11.30).

In contrast, the statistics of the group of consumers who had purchased the species reflect purchasing patterns of consumers who indeed had purchased the species. It is worth noting that for each of the 13 seafood species, consumers purchased the species at a relatively high frequency (from 13.2 times per year for halibut to 21.5 times per year for

shrimp) and at a relatively large cost (from \$109.10 per year for halibut to \$149.70 per year for cobia). Although most of the consumers had purchased halibut (12,426 out of 17,769), the annual purchase frequency and total cost are lower than the other species, probably due to the high price of halibut. Cobia, drum, and sturgeon are less popular and only a small percentage of consumers had purchased them (5,425 out of 17,034 had purchased cobia, 5,569 out of 17,004 had purchased drum, and 5,873 out of 17,078 had purchased sturgeon). However, consumers spent the highest amount on these three species (\$149.70 per year for Cobia, \$149.60 per year for drum, and \$149.40 per year for sturgeon) and at a relatively high frequency (17 times per year for cobia, 17.3 times per year for drum, and 17 times per year for sturgeon).

The survey also asked the respondents how frequently they purchase each seafood species annually in restaurants/takeout and the annual cost of their purchase. Again, the answers about expenditures may not be absolutely accurate, and observations in which respondents provided a zero number of purchases but a non-zero annual cost or provided a non-zero number of purchases but a zero annual cost were excluded.

Table 13 presents the annual number of purchases and total cost of seafood purchase in restaurants/takeout. Based on the statistics of All Consumers group, in terms of shellfish, U.S. consumers spent the most on shrimp in restaurants/takeout, followed by scallops, oysters, clams, mussels, and abalone. In terms of finfish, U.S. consumers spent the most on salmon, followed by halibut, California yellow tail, striped bass/hybrid, sturgeon, drum, and cobia. It is interesting to note that the species on which respondents spent the most in restaurants/takeout closely mirrors those for home preparation, except that they spent more on striped bass/hybrid than California yellowtail at home but the opposite way in restaurants/takeout.

Table 13. The annual number of purchases and total cost of seafood purchase in restaurants/takeout

Species	All Consumers (Have Purchased + Haven't Purchased the Species)					Consumers Who Have Purchased the Species				
	N	# of Purchases		Total Cost (\$)		N	# of Purchases		Total Cost (\$)	
		Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	Mean	Std Dev
Shrimp	19,041	14.6	13.9	\$125.70	\$125.70	17,473	15.9	13.8	\$137.00	\$125.20
Salmon	18,479	11.5	13.2	\$112.90	\$125.60	15,177	14.0	13.4	\$137.50	\$125.80
Scallops	18,550	9.0	12.6	\$84.90	\$117.10	12,879	13.0	13.3	\$122.30	\$123.10
Oysters	18,317	7.9	12.5	\$75.40	\$119.40	10,048	14.4	13.9	\$137.50	\$132.20
Clams	18,189	8.0	12.3	\$72.30	\$114.00	10,802	13.4	13.5	\$121.70	\$126.00
Halibut	17,755	6.8	11.3	\$69.40	\$110.20	10,320	11.7	12.8	\$119.40	\$122.10
Mussels	18,179	7.0	12.0	\$64.40	\$112.10	9,152	13.9	13.8	\$127.90	\$129.80
California yellowtail	18,040	5.4	11.0	\$54.90	\$110.10	6,629	14.6	13.9	\$149.50	\$137.20
Striped bass/hybrid	17,800	5.0	10.2	\$51.90	\$103.60	6,692	13.2	13.1	\$138.10	\$129.00
Abalone	18,105	5.1	11.1	\$49.30	\$106.90	5,692	16.3	14.4	\$156.70	\$139.70
Sturgeon	18,005	4.8	10.8	\$47.40	\$106.10	5,097	17.1	14.3	\$167.30	\$140.50
Drum – red or black	18,163	4.6	10.6	\$45.70	\$104.10	4,979	16.9	14.2	\$166.60	\$139.20
Cobia	18,166	4.5	10.4	\$44.90	\$103.60	4,803	16.9	14.2	\$169.80	\$139.20

Based on statistics of the group of consumers who had purchased the species, consumers purchased each seafood species at a relatively high frequency (from 11.70 times per year for halibut to 17.10 times per year for sturgeon) and at a relatively high cost (from \$119.40 per year for halibut to \$169.80 per year for cobia). Consumer purchases in restaurants/takeout show similar patterns as home consumption.

It is important note that the number of respondents who had purchased each species varies substantially between purchases for home preparation or at restaurants/takeout. The annual total market value of each species can be calculated by multiplying the number of respondents who had purchased the species and their total annual purchase cost (**Table 14**). For both at-home and restaurant/takeout consumption, the five seafood species that account for the largest market value are shrimp, salmon, scallops, oysters, and clams. The three species with the lowest market value are cobia, drum, and sturgeon. Comparing at-home versus restaurant/takeout seafood purchases, except for sturgeon, consumers purchased all the seafood species more frequently for home preparation. In terms of seafood purchase cost, except for shrimp and salmon, consumers spent more in the other seafood species in restaurants/takeout.

Table 14. The annual market value of seafood consumed at home and in restaurants/takeout

Species	Home Preparation						Restaurants/Takeout					
	N	# of Purchases		Total Cost (\$)		Total Value (\$)	N	# of Purchases		Total Cost (\$)		Total Value (\$)
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev	Mean	Std Dev	
Shrimp	18,878	21.5	15.3	\$148.60	\$127.70	\$2,804,554	17,473	15.9	13.8	\$137.0	\$125.20	\$2,393,072
Salmon	17,806	18.5	14.7	\$147.30	\$131.20	\$2,622,996	15,177	14.0	13.4	\$137.50	\$125.80	\$2,086,707
Scallops	13,823	15.4	14.6	\$120.10	\$122.80	\$1,659,665	12,879	13.0	13.3	\$122.30	\$123.10	\$1,575,120
Oysters	10,716	16.3	15.2	\$129.40	\$131.60	\$1,386,793	10,048	14.4	13.9	\$137.50	\$132.20	\$1,381,649
Clams	11,839	15.2	14.5	\$115.50	\$125.40	\$1,367,034	10,802	13.4	13.5	\$121.70	\$126.00	\$1,315,132
Halibut	12,426	13.2	13.4	\$109.10	\$119.90	\$1,355,147	10,320	11.7	12.8	\$119.40	\$122.10	\$1,232,625
Mussels	10,070	15.3	14.7	\$118.90	\$127.90	\$1,197,662	9,152	13.9	13.8	\$127.90	\$129.80	\$1,170,291
California yellowtail	7,188	15.5	14.5	\$137.40	\$137.30	\$987,296	6,629	14.6	13.9	\$149.50	\$137.20	\$991,197
Striped bass/hybrid	8,190	14.1	13.7	\$120.50	\$126.60	\$987,139	6,692	13.2	13.1	\$138.10	\$129.00	\$924,205
Abalone	6,821	16.5	14.8	\$138.60	\$137.50	\$945,072	5,692	16.3	14.4	\$156.70	\$139.70	\$892,146
Sturgeon	5,873	17.0	14.9	\$149.40	\$140.60	\$877,674	5,097	17.1	14.3	\$167.30	\$140.50	\$852,693
Drum – red or black	5,569	17.3	15.0	\$149.60	\$140.50	\$833,267	4,979	16.9	14.2	\$166.60	\$139.20	\$829,548
Cobia	5,425	17.0	14.9	\$149.70	\$140.70	\$812,392	4,803	16.9	14.2	\$169.80	\$139.20	\$815,775



Consumers' perceived availability and quality of the seafood species

The survey also evaluated consumer perceptions on the availability of this study's seafood species in their immediate area - where they typically purchase or consume seafood. Respondents rated the availability on a scale of 1 to 5, where 1 indicates "never available" and 5 indicates "always available." **Table 15** presents statistics for the full sample and for a sub-sample of respondents who have eaten or purchased the seafood. For both the full sample and respondents who have actually purchased or eaten the species, shrimp, salmon, scallops, clams, and oysters were ranked as the most available species and sturgeon, drum, and cobia as three least available.

Table 15. Consumer perceptions of seafood availability in their immediate area

Species	Full Sample			Have eaten or purchased the seafood		
	N	Mean	Std Dev	N	Mean	Std Dev
Shrimp	20,029	4.57	0.78	19,615	4.58	0.76
Salmon	20,029	4.31	0.93	19,060	4.36	0.88
Scallops	20,029	3.73	1.18	16,628	3.91	1.07
Clams	20,029	3.55	1.22	15,149	3.76	1.13
Oysters	20,029	3.51	1.23	14,226	3.73	1.14
Mussels	20,029	3.33	1.28	13,112	3.66	1.17
Halibut	20,029	3.21	1.22	15,364	3.46	1.14
Striped bass/hybrid	20,029	2.54	1.24	10,166	3.04	1.22
Abalone	20,029	2.36	1.27	8,478	3.03	1.30
California yellowtail	20,029	2.32	1.28	8,423	3.08	1.30
Sturgeon	20,029	2.23	1.24	7,050	3.00	1.31
Drum - red or black	20,029	2.08	1.24	6,247	2.98	1.35
Cobia	20,029	2.03	1.21	5,858	2.98	1.34

Rating Scale: 1 = "very strongly disagree" to 10 = "very strongly agree"



Table 16 presents consumer perceptions of the quality of these seafood species. Respondents rated the quality on a scale of 1 to 5, where 1 means "poor quality" and 5 means "excellent quality." Similar to **Table 15**, we provide statistics for the full sample and for a sub-sample of respondents who have eaten or purchased the seafood.⁶ Consumers rated shrimp, salmon, scallops, oysters, and clams as the top five species having the best quality.

⁶ Note that by responding to the question summarized in Table 13, respondents indicated if they have eaten the seafood species. By responding to the question summarized in Table 14, respondents indicated if they have purchased the seafood species for home consumption (for themselves, or for their families but not for themselves to eat). Here, the category of respondents who have eaten/purchased the seafood includes the respondents who indicated that they have eaten the species and/or who indicated that they have purchased the species for home consumption. The rest of the respondents are categorized as haven't eaten/purchased the seafood.

Table 16. Consumer perceptions of seafood quality

Species	Full Sample			Have eaten or purchased the seafood		
	N	Mean	Std Dev	N	Mean	Std Dev
Shrimp	20,029	4.19	0.89	19,615	4.21	0.88
Salmon	20,029	4.07	0.95	19,060	4.11	0.91
Scallops	20,029	3.65	1.13	16,628	3.83	1.04
Oysters	20,029	3.45	1.19	14,226	3.69	1.13
Clams	20,029	3.46	1.16	15,149	3.68	1.09
Halibut	20,029	3.41	1.13	15,364	3.63	1.04
Mussels	20,029	3.30	1.19	13,112	3.60	1.12
California yellowtail	20,029	2.86	1.21	8,423	3.43	1.20
Striped bass/hybrid	20,029	2.98	1.17	10,166	3.40	1.14
Cobia	20,029	2.66	1.15	5,858	3.33	1.19
Sturgeon	20,029	2.76	1.17	7,050	3.32	1.20
Drum - red or black	20,029	2.68	1.17	6,247	3.32	1.23
Abalone	20,029	2.81	1.18	8,478	3.31	1.18

Rating Scale: 1 = "very strongly disagree" to 10 = "very strongly agree"

Consumers' willingness to purchase increment for the seafood species

To gain an understanding of the market potential of expanding the production of these seafood species, the survey asked respondents how much more they would purchase annually if farm-raised versions of these seafood species were more readily available for them to purchase in their area. **Table 17** shows the summary statistics of the response to this question, where respondents are divided into two categories: those who have eaten/purchased the seafood, and those who haven't eaten/purchased the seafood.¹ In each category, respondents are further divided into two sub-categories: those willing to purchase more (i.e., they provided a positive value), and those not willing to purchase more (i.e., they provided an answer of zero). The team calculated the total value that the respondents indicated they were willing to purchase and reported the values for the two categories separately and further added them up to obtain the total willingness to purchase value for the full sample.

For the respondents who have eaten/purchased the seafood, 68% 84% indicated they would be more inclined to purchase more if the farm-raised species was more readily available in their area, but their willingness to pay more varied by species. On average, they would be willing to pay between \$130.60 more for halibut and \$172.70 more for cobia or drum annually if more readily available. For the respondents who haven't eaten/purchased the seafood, only a small portion (16% 26%) stated they would be willing to purchase more if the seafood was more readily available. On average, they would be willing to purchase between \$48.20 more for striped bass/hybrid and \$69.10 more for shrimp annually if was more readily available. Based on the willingness to purchase values for the full sample, if the seafood is more readily available, the top six species that could potentially gain the most market value through expansion are shrimp, salmon, scallops, oysters, clams, and halibut. Note that these species are consistent with the top six species that consumers spent the most for home preparation or in restaurants/takeout.

Table 17. If the following farm-raised seafood was more readily available for you to purchase in your area, how much more would you purchase annually?

Species	Have eaten/purchased the seafood						Haven't eaten/purchased the seafood						Full Sample
	Willing to purchase more			Not willing to purchase more	All		Willing to purchase more			Not willing to purchase more	All		Total WTP Value, \$ (WTP1 +WTP2)
	N _{1a}	Mean	Std Dev	N _{1b}	N _{1a} + N _{1b}	Total WTP* Value, \$ (WTP ₁)	N _{1a}	Mean	Std Dev	N _{1b}	N _{1a} + N _{1b}	Total WTP* Value, \$ (WTP ₂)	
Shrimp	15,134	157.4	137.2	4,481	19,615	\$2,381,562	81	69.1	90.4	333	414	\$5,600	\$2,387,162
Salmon	14,327	150.2	133.3	4,733	19,060	\$2,152,118	221	60.4	84.9	748	969	\$13,341	\$2,165,459
Scallops	11,842	143.2	132.7	4,786	16,628	\$1,695,702	634	60.6	83.6	2,767	3,401	\$38,434	\$1,734,136
Oysters	9,772	151.2	137.2	4,454	14,226	\$1,477,863	907	56.6	89.0	4,896	5,803	\$51,366	\$1,529,229
Clams	10,272	140.6	133.6	4,877	15,149	\$1,444,011	842	59.0	90.1	4,038	4,880	\$49,678	\$1,493,689
Halibut	10,788	130.6	124.5	4,576	15,364	\$1,408,448	1,192	63.4	81.5	3,473	4,665	\$75,601	\$1,484,049
Mussels	8,951	144.3	135.4	4,161	13,112	\$1,291,456	1,092	52.3	84.7	5,825	6,917	\$57,132	\$1,348,588
Striped bass/hybrid	7,519	139.8	126.7	2,647	10,166	\$1,051,000	2,409	48.2	66.6	7,454	9,863	\$116,184	\$1,167,184
California yellowtail	6,471	157.6	135.6	1,952	8,423	\$1,019,949	2,771	52.4	74.3	8,835		\$145,280	\$1,165,229
Abalone	6,200	159.6	138.6	2,278	8,478	\$989,363	2,207	55.7	83.7	9,344		\$122,999	\$1,112,362
Sturgeon	5,456	170.4	139.2	1,594	7,050	\$929,513	2,518	53.3	78.8	10,461		\$134,251	\$1,063,764
Drum – red or black	5,120	172.7	137.7	1,127	6,247	\$884,043	2,599	49.3	75.6	11,183		\$128,020	\$1,012,063
Cobia	4,915	172.7	137.6	943	5,858	\$848,958	2,671	50.2	77.7	11,500		\$133,959	\$982,917

*WTP = Willingness-to-purchase



4.2 Consumer preferences and willingness to pay for various seafood attributes

Consumer preferences and willingness to pay for labels/certifications on farm-raised seafood

Figure 4 graphically presents survey findings regarding consumers’ willingness to pay a premium for certain labels/certifications on farm-raised seafood. The premiums indicated here refer to the percentage exceeding the average price the consumer usually would pay. About 80% of consumers indicated they are willing to pay premiums for farm-raised seafood with a “U.S. domestically produced” or “locally raised” label. About 65% of respondents indicated they are willing to pay premiums for Certified Organic or Fair-Trade labels, while 63% indicated they were willing to pay premiums for Non-GMO or 3rd Party certified sustainable labels. Based on this data, consumers are most willing to pay a premium for farm-raised seafood with a “U.S. domestically produced” or “locally raised” label. About 46.5% and 49.3% of respondents indicated they are willing to pay a premium higher than 20% for a U.S. domestically produced label or a locally raised label, respectively, compared to a product without such labels.

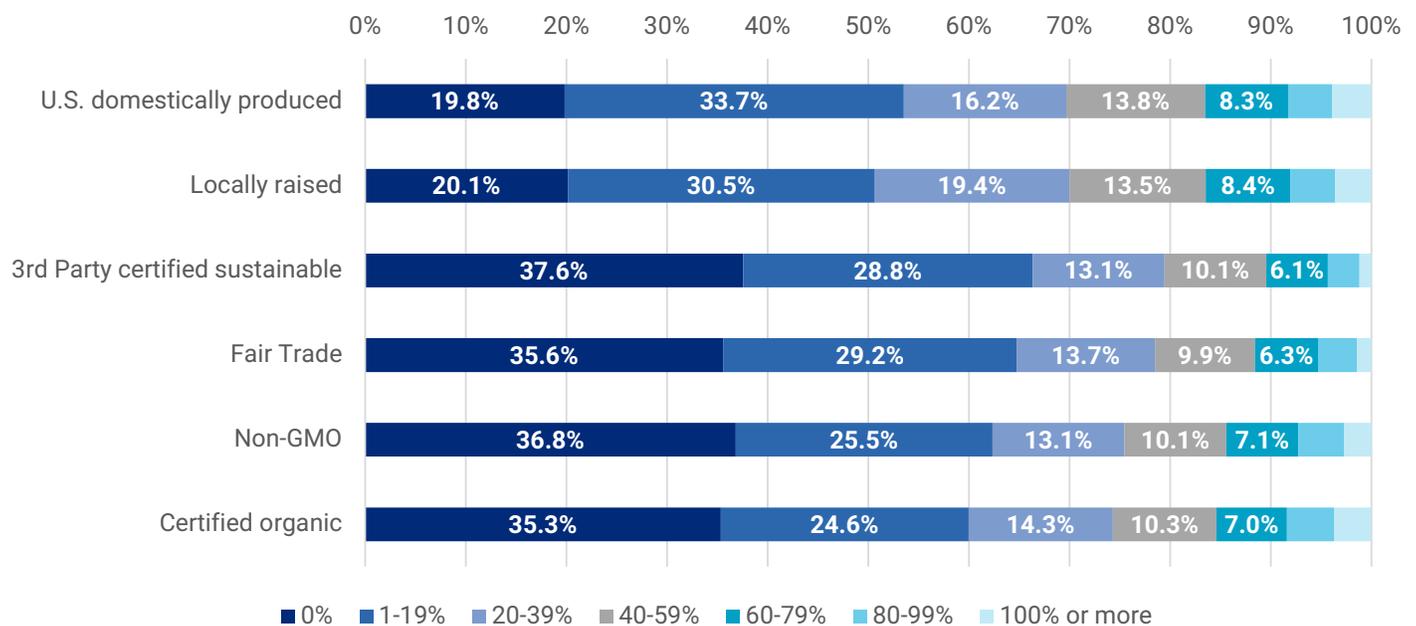


Figure 4. Willingness to pay for labels/certifications on farm-raised seafood

Consumer preferences and willingness to pay for farm-raised finfish and shellfish products raised locally in the home state

Figure 5 presents survey findings regarding consumers' willingness to pay for a farm-raised finfish/shellfish product raised locally in their home state. Respondents reported similar willingness to pay for finfish and shellfish products. Similar to findings shown in **Figure 4**, about 77% of respondents indicated they are willing to pay premiums for locally raised finfish/shellfish, compared to those from other states.

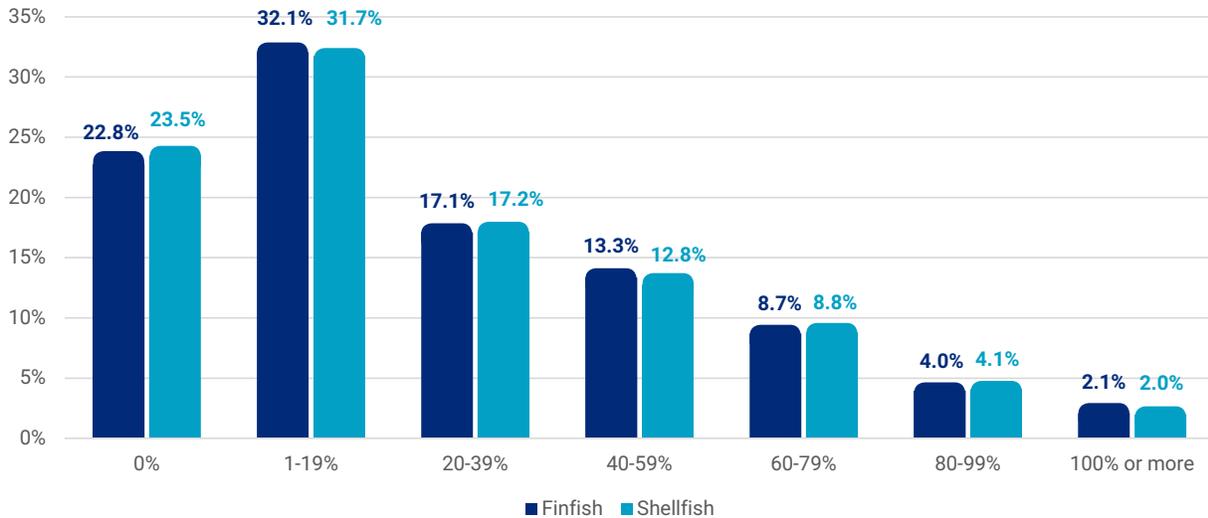


Figure 5. Willingness to pay for a farm-raised finfish/shellfish product raised locally in their home state

Consumer preferences for origin information

Figure 6 presents survey findings regarding consumer preferences for information on the geographic origin of seafood products. About 41.7% of respondents desire to know the country of origin of their seafood. About 22.4%, 8.5%, and 10.1% desire to know the state, city/town, or producer of their seafood, respectively. About 17.3% indicated they desire no detail about the geographic origin of their seafood.

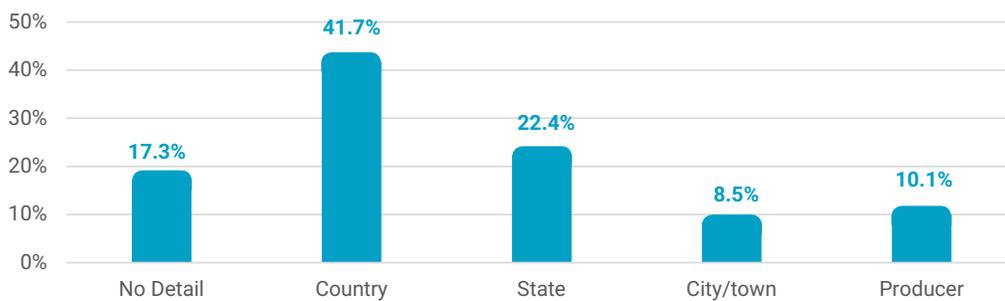


Figure 6. Consumer preferences for detail about the geographic origin of their seafood

Figure 7 shows how frequently responding consumers are aware of where the seafood is grown prior to purchasing. About 13.2% of respondents were never aware of the origin of seafood prior to purchase, about 56.2% were aware of it sometimes or about half the time, and about 30.6% were aware of it most of the time or always.

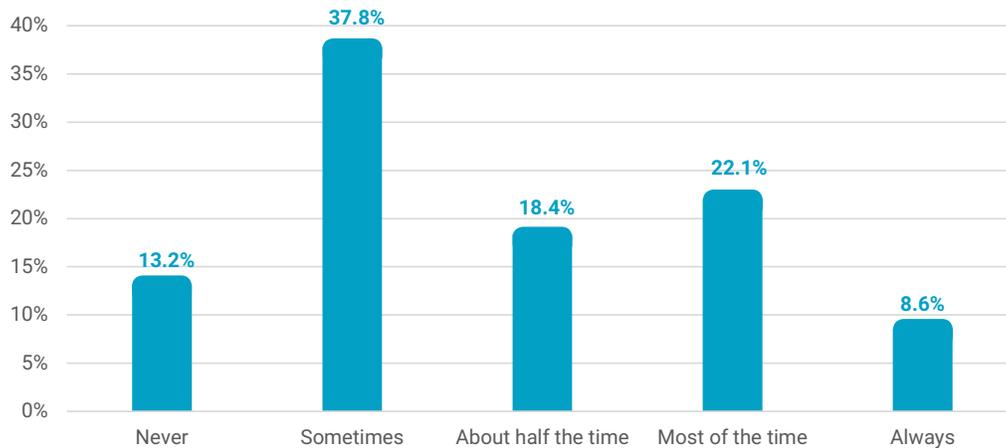


Figure 7. Consumers' awareness of the geographic origin of their seafood

Figure 8 shows how frequently responding consumers look for a label or store signage for seafood information prior to purchasing. About 10.9% of respondents never searched labels or store signage for seafood information prior to purchasing, about 47.8% search for such information sometimes or about half the time, and about 41.4% of respondents search for it most of the time or always.

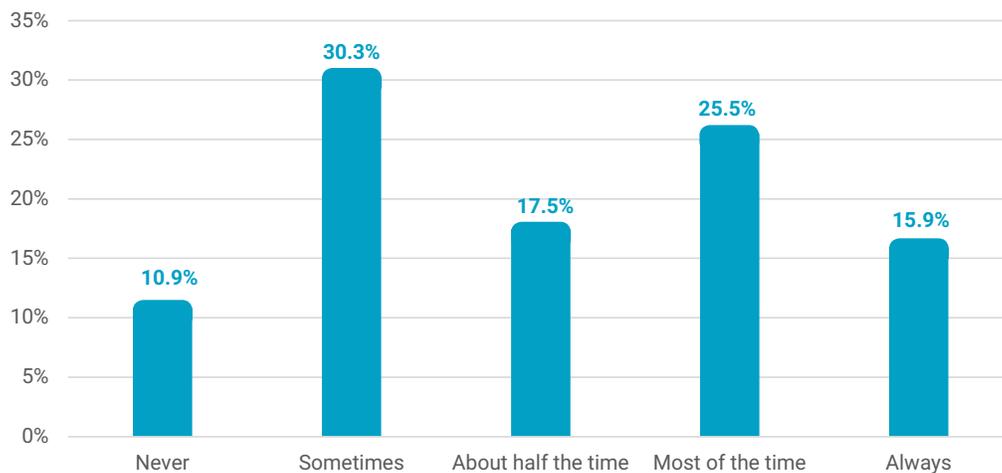


Figure 8. Frequency of searching labels or store signage for seafood information prior to purchasing

4.3 Consumer perception and knowledge of aquaculture

Consumers' knowledge of aquaculture

Figure 9 presents survey findings regarding consumers' knowledge of aquaculture in their state, the U.S., and foreign countries. Consumers' knowledge of finfish and shellfish aquaculture is similar. About 38%, 60%, and 40% of respondents were aware of aquaculture in their state, the U.S., and foreign countries, respectively.

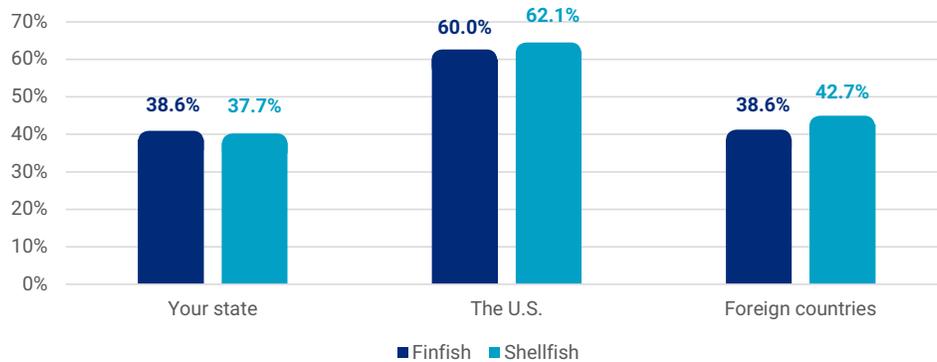


Figure 9. Consumer awareness of finfish/shellfish aquaculture

Consumer perceptions of the health/environmental/welfare impact of aquaculture

The survey asked respondents to respond to a set of statements about their perceptions of the health, environmental, and welfare impacts of farmed vs. wild-caught seafood. Respondents answered the questions by indicating a value between 1 and 10, where 1 indicates “very strongly disagree” and 10 indicates “very strongly agree.” Table 18 shows consumer perceptions of the health impact of farmed/wild fish. Based on this survey, the majority of consumers believe that both farmed and wild seafood are healthy and safe foods.



Table 18. Consumer perceptions of the health impact of farmed/wild fish

I agree with:	Median	Mean	Std Dev
Farmed fish is healthy food	7	7.00	2.34
Wild fish is healthy food	8	7.87	1.95
Farmed fish is safe food	8	7.21	2.26
Wild fish is safe food	8	7.54	2.00

Rating Scale: 1 = “very strongly disagree” to 10 = “very strongly agree”

Table 19 shows consumer perceptions of the environmental and welfare impact of farmed vs. wild fish. On average, U.S. consumers were more concerned about the environmental impact, sustainability, and welfare of wild fisheries than fish farming. In other words, they consider fish farming as having less environmental impact, being more sustainable, and providing better welfare than wild fisheries.

Table 19. Consumer perceptions of the environmental and welfare impact of farmed vs. wild fish

I am concerned about the:	Median	Mean	Std Dev
Environmental impact of the production of farmed fish	6	6.10	2.63
Environmental impact of wild fisheries	7	6.36	2.58
Environmental sustainability of fish farming	6	6.19	2.60
Environmental sustainability of wild fisheries	7	6.54	2.56
Welfare of farmed fish	6	6.18	2.71
Welfare of wild fish	7	6.31	2.69

Rating Scale: 1 = “very strongly disagree” to 10 = “very strongly agree”

Consumer perceptions of the country of origin of farmed/wild fish



Table 20 shows consumer perceptions of the country of origin of farmed and wild fish. The U.S. consumers perceived the fresh farmed fish from the U.S. as the best, followed by farmed fish from other developed countries, and ranked farmed fish from developing countries the lowest. They perceived fresh wild fish from the North Atlantic as the best, followed closely by fish from the Pacific, and ranked wild fish from the Mediterranean as the lowest. This data suggests that overall consumers have a slightly lower view of fresh farmed fish than wild fish, regardless of where it was caught or raised.

Table 20. Consumer perceptions of the country of origin of farmed and wild fish

I have a very positive view of:	Median	Mean	Std Dev
Fresh farmed fish from:			
The U.S.	7	6.94	2.35
Other developed countries	6	5.63	2.49
Developing countries	5	4.92	2.64
Welfare of farmed fish			
The North Atlantic	8	7.54	2.04
The Pacific	8	7.44	2.03
The Mediterranean	7	6.60	2.22

Rating Scale: 1 = “very strongly disagree” to 10 = “very strongly agree”

Consumer perceptions of the social impact of aquaculture

Table 21 shows consumer perceptions of the social impact of aquaculture. On average, U.S. consumers perceived that aquaculture plays a positive role in all the impacts queried. The top five categories that consumers believed aquaculture plays a positive role in are providing nutrition for U.S. consumers, job creation, building the U.S. food system, benefiting local economies, and keeping seafood prices low. Consumers ranked environmental impacts at the bottom of this list, meaning that although they consider that aquaculture has a positive impact on the environment, the benefit of it is not as large as the other social impacts.

Table 21. Consumer perceptions of the social and environmental impacts of aquaculture

	Finfish Aquaculture		Shellfish Aquaculture	
	Mean	Std Dev	Mean	Std Dev
Nutrition for U.S. consumers	3.62	0.96	3.64	0.93
Job creation	3.59	0.92	3.63	0.90
Building the U.S. food system	3.55	0.93	3.59	0.92
Benefitting local economies	3.52	0.96	3.56	0.94
Keeping seafood prices low	3.49	1.03	3.53	1.03
U.S. economy	3.46	0.91	3.54	0.92
Rural fishing villages	3.26	1.08	3.32	1.08
Wild stock	3.22	0.99	3.27	0.99
U.S. international trade deficit	3.13	0.93	3.20	0.94
Environmental impacts	3.07	1.01	3.13	1.01

Rating Scale: 1 = "very strongly disagree" to 10 = "very strongly agree"

4.4 Consumer consumption habits, preferences, and attitudes toward value-added seafood

Consumers' consumption habits of value-added seafood



The survey included a set of questions to understand consumers' consumption habits, preferences, and attitudes toward value-added seafood. It first asked respondents, on average over the past 12 months, how often they purchased value-added seafood products to consume at home. We divided the products into two categories and asked the question for each category. One category is simple-step value-added seafood products, such as breaded, marinated, and smoked seafood. The other category is ready-to-eat value-added seafood products, such as fresh, frozen, or canned chowders, stews, sticks, cakes, casseroles, entrees, appetizers, and ready-made meals.

Figure 10 shows the frequency of purchasing the two categories of value-added seafood products to consume at home. Consumers purchase ready-to-eat value-added seafood more frequently than simple-step value-added seafood. Specifically, about 37.9% of respondents purchased simple-step value-added seafood once a month or more frequently, compared to 42.7% of respondents who purchased ready-to-eat value-added seafood at this frequency. About 20.4% of respondents never purchased simple-step value-added seafood, while only 16.4% never purchased ready-to-eat value-added seafood.

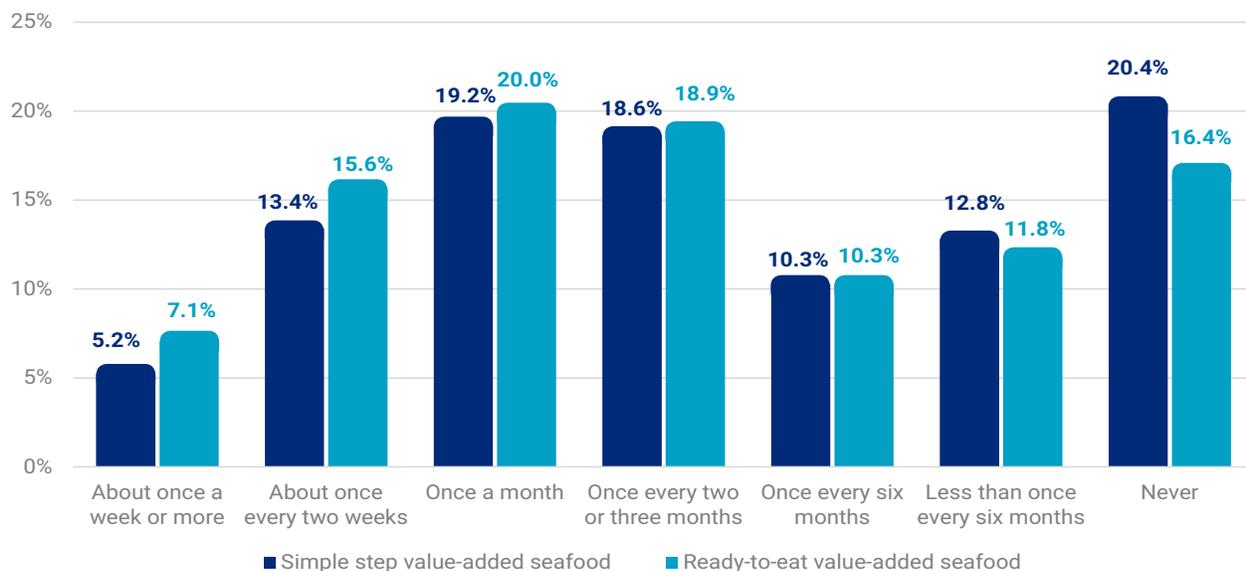


Figure 10. Frequency of purchasing value-added seafood products to consume at home

Consumers' intentions of purchasing value-added seafood

The survey used breaded butterfly shrimp and a frozen shrimp entry to assess consumers' intention of buying simple-step and ready-to-eat value-added seafood products, respectively. As shown in **Figure 11**, 59.9% of respondents indicated they are likely or extremely likely to purchase breaded butterfly shrimp, 18.3% of respondents were neutral or not sure, and 21.8% were unlikely or extremely unlikely to purchase breaded butterfly shrimp this year. In terms of a frozen shrimp entry, about 61.7% indicated they are likely or extremely likely to purchase it, 18.6% were neutral, and 19.8% were unlikely or extremely unlikely to purchase it. The results indicate that consumers have a slightly greater intention to purchase a frozen shrimp entry, indicating a preference for ready-made meals.



Assuming the price is acceptable, how likely are you to try a shrimp product this year?

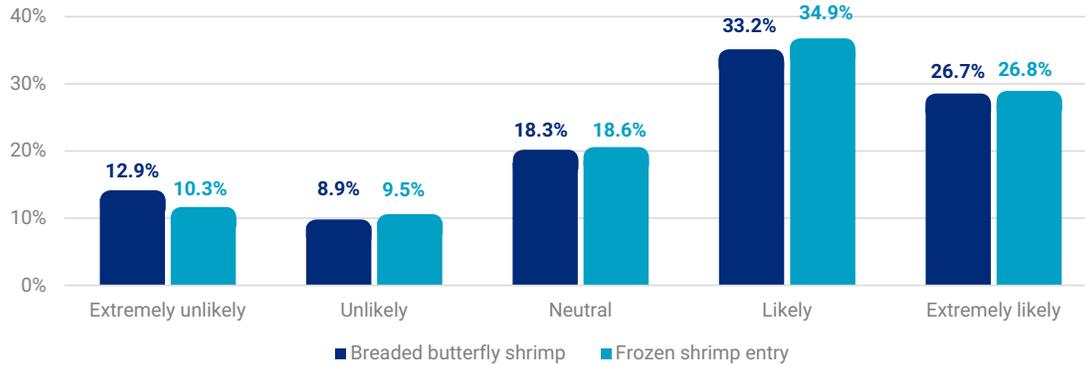


Figure 11. Consumers’ intentions to purchase a value-added shrimp product this year

Consumers’ perceived importance of attributes of value-added seafood

Table 22 presents consumers’ perceived importance of several attributes when choosing value-added seafood products. Consumers rated taste, safety, price, nutritional value, and convenience as most important. In contrast, some of the credence attributes (i.e., environmentally sustainable, traceable, locally sourced, or U.S. domestically produced) were not rated as less important attributes. Also, the production method (farmed vs. wild-caught) is not as important as other attributes for consumers when purchasing value-added seafood.

Table 22. Perceived importance of attributes when choosing value-added seafood products

Attributes	Mean	Std Dev
Taste	4.53	0.77
Safe	4.47	0.85
Price	4.16	0.91
Nutritional value	3.81	1.02
Convenience	3.73	0.97
U.S. domestically produced	3.50	1.22
Traceable	3.44	1.17
Wild-caught	3.42	1.26
Locally sourced	3.32	1.25
3rd Party certified sustainable	3.12	1.23
Farm-raised	3.00	1.29

Rating Scale: 1 = “very strongly disagree” to 10 = “very strongly agree”



5. CONCLUSION

This report serves as the first-stage data analysis of a large-scale consumer survey about U.S. consumer attitudes and preferences of domestic farm-raised finfish and shellfish. From the summary statistics we gained an understanding of consumer (1) consumption habits and perceptions of a list of seafood species; (2) preferences and willingness-to-pay for various seafood attributes; (3) knowledge and perceptions of aquaculture; and (4) consumption habits, preferences, and attitudes toward value-added seafood. We conclude the findings of this analysis from four perspectives and summarize the next steps of this project.

5.1 Consumption habits and species preference

The results provided an understanding of consumer perceptions and consumption habits of a list of seafood species. Out of the list of 13 seafood species, the number of respondents who have eaten each species varies substantially. Based on scores assigned by respondents who have eaten each species, consumers indicated they like these species in the following (descending) order: shrimp, salmon, scallops, halibut, California yellowtail, striped bass/hybrid, clams, cobia, drum – red or black, abalone, mussels, oysters, and sturgeon.

For both at-home and restaurant/takeout consumption, the top five seafood species that account for the largest market value are shrimp, salmon, scallops, oysters, and clams. Comparing at-home versus restaurant/takeout seafood purchases, consumers purchased all the seafood species, except for sturgeon, more frequently for home preparation. In terms of seafood purchase cost, consumers spent more on shrimp and salmon for home consumption and more on other species for restaurants/takeout.



5.2 Willingness to purchase farm-raised seafood

If any of the farm-raised seafood species were more readily available, consumers' willingness to purchase more of these species varies by their consumption experience. Most consumers (68% 84%) who have previously eaten or purchased the seafood species are willing to purchase more and pay between \$130.60 and \$172.70 more annually, depending on the species, if farm-raised options were available. In contrast, only 16% 26% of consumers who haven't eaten or purchased the seafood species are willing to purchase more and would pay between \$48.20 and \$69.10 more annually. Based on the willingness to purchase values for the full sample, if a farm-raised option is more readily available, the top six species that potentially gain the most market value through expansion are shrimp, salmon, scallops, oysters, clams, and halibut. Note that these species are consistent with the top six species that consumers already spent the most for home preparation or in restaurants/takeout.

The results suggest that when considering expanding aquaculture businesses, the business and marketing strategies should vary by species. To expand sales of species consumed by most consumers such as shrimp and salmon, business expansion and marketing efforts can be applied to the general consumer segments. In contrast, to expand sales of species consumed by only a limited number of consumers, the stakeholders need to focus on niche markets and the specific consumer segment to apply appropriate expanding and marketing strategies.

5.3 Attitudes around product attributes

Labels/certifications on farm-raised seafood affect consumers' valuation of the seafood. About 80% of consumers indicated they are willing to pay premiums for farm-raised seafood with a "U.S. domestically produced" or "locally raised" label as compared to a product without such labels. About 65% of respondents indicated they are willing to pay premiums for products with "Certified Organic" or "Fair-Trade" labels, while 63% indicated they were willing to pay premiums for products with "Non-GMO" or "third-party certified" sustainable labels. Data was also collected for how frequently consumers look for a label or store signage for seafood information prior to purchasing. Almost 90% of respondents indicated that they searched for such information at least sometimes. This data demonstrates the potential importance of specific labeling on farm-raised seafood to gain more market share.





5.4 Knowledge and perceptions of aquaculture

Overall, U.S. consumers perceived the social and environmental impact of aquaculture as positive, including providing increased nutrition for U.S. consumers, job creation, building the U.S. food system, benefiting local economies, and keeping seafood prices low. Although consumers believe aquaculture has a positive impact on the environment, they ranked environmental impacts lower than all the other social impacts. From this data, U.S. consumers were more concerned about the environmental impact, sustainability, and welfare of wild fisheries than of fish farming. They considered aquaculture and fish farming as having less environmental impact, being more sustainable, and providing better fish welfare than wild fisheries. These results suggest a positive opportunity for aquaculture to continue to grow and better compete with wild fish market offerings as consumer demand for farmed fish may continue to increase. There is an opportunity for the aquaculture industry to continue to educate consumers about aquaculture and its benefits in order to gain more market share.

5.5 Preferences and attitudes toward value-added seafood products

These data show that consumers purchase ready-to-eat value-added seafood more frequently than simple-step value-added seafood. Taste, safety, price, nutritional value, and convenience are the top five attributes of value-added seafood for consumers. In contrast, some of the credence attributes, such as environmentally sustainable, traceable, locally sourced, or U.S. domestically produced, were rated as less important attributes. Additionally, the production method (farmed vs. wild-caught) is not as important as other attributes for consumers when purchasing value-added seafood. Using value-added shrimp products as an example, most consumers indicated high intentions to purchase value-added seafood this year. Aquaculture stakeholders may want to further explore and expand their value-added seafood product offerings based on these results, with specific focus on products featuring the most popular seafood species.

5.6 NEXT STEPS

In the next stages of this project, Atlantic will create data visualizations to categorize key variables by region and state and publish them on a dashboard on Atlantic's website. We will strengthen our analysis by incorporating economic modeling and inferential statistics to examine factors affecting consumer attitudes and preferences and provide insights into marketing strategies to penetrate the consumer market and expand aquaculture business. Atlantic designed a choice experiment to elicit consumers' preferences for production method (farm-raised vs. wild-caught) and country of origin (domestic vs. import) attributes of four major seafood species and will use economic modeling to estimate consumers' willingness to pay for domestic farm raised seafood species. These findings are designed to inform marketing strategies that can be of benefit to aquaculture businesses entering or expanding in a specific category to meet consumer needs and preferences. We will present the findings in a visually appealing report format for print and electronic distribution.