

# Determining the Demand for Locally Produced Baitfish in the Northeast

by

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The objectives of the project are:

1. Determine the species, sizes, seasonality and pricing of live baits sold in the Northeast, by area within the region.
2. Determine bait dealers' attitudes toward aquaculturally-produced baits and determine how much more, if any, dealers would be willing to pay for aquaculturally-produced bait.
3. Determine which live bait species appear to be most feasible for marketing by aquaculturists in the Northeast.

In the proposal the method of determining this information was to do a mail survey to be sent to 5000 bait fish dealers and wholesalers in the northeast. Upon the advice of our advisory board it was decided that a mail survey would not be answered by enough businesses to get useful results. It was decided to do interviews instead. Interviews are much more expensive in terms of both time and expense. Eventually approximately 170 interviews were accomplished during the period from Fall 2003 through January 2006. Ten of the interviews were done with wholesalers and the rest were with bait fish dealers in seven regions, Inland New England, Coastal New England, Lake Champlain Valley, Upstate New York and Pennsylvania, New Jersey Delaware and Long Island, West Virginia and Maryland and the Chesapeake Bay. The number of (usable) interviews and the percent of the total is summarized in Table 2 and Table 1 summarizes the number of interviews of dealers and wholesalers respectively. It was also decided to conduct some experimental auctions at several locations in the Chesapeake Bay region to get some understanding of the attitudes of anglers toward aquaculturally produced bait.

**Table 1. Types of interview**

Type of Business	Number	Percent
Retail	155	93.94
Wholesale	10	6.06

**Table 2. Interviews of Dealers by Region**

<b>Region</b>	<b>Count</b>	<b>Percent</b>
Inland New England	20	12.90
Coastal New England	20	12.90
Lake Champlain Valley	20	12.90
Upstate New York and Pennsylvania	27	17.42
New Jersey, Delaware and Long Island	29	18.71
West Virginia & Western Maryland	12	7.74
Chesapeake Bay	27	17.42

The survey asked dealers and wholesalers about the number of years they were in business, the seasons they operated, their preferences for wild and farm-raised bait, their sources of bait, their interest in educational materials for reducing holding mortality, their interest in using a fee-based maintenance service for baitfish, a conjoint study to determine the relative importance of several attributes of a baitfish product (such as price, size, mortality, locally produced and delivery time), a comprehensive inventory including what baits they sell, what sizes, how much and for what price as well as holding mortality and finally a question asking information about what baits they could sell if they were available. The results will be discussed in the order given. Then the auction experiments will be briefly discussed and finally results and conclusions will be made.

The median years of operation for the dealers was 13 years and about 25 years for the wholesalers. The retailers range from just starting to 53 years.

**Table 3. Years in Operation**

<b>Type of Business</b>	<b>Number</b>	<b>Minimum</b>	<b>Lower Quartile</b>	<b>Median</b>	<b>Upper Quartile</b>	<b>Maximum</b>	<b>Mean</b>
Retail	155	0.2	6.0	13.0	23.0	53.0	16.6
Wholesale	10	—	19.0	24.5	30.0	—	26.2

\* Not reported to ensure confidentiality.

Over the whole region Table 4 shows that wholesalers for the most part are open year round. Most retailers are open in the spring, summer and fall with a substantial percentage closing in the winter. When this is looked at on a regional basis, it is to be noted that inland New England, the Lake Champlain Valley and to a lesser extent Upstate New York and Pennsylvania are open in the Winter sometimes more often than spring and fall due to the large amount of ice fishing in those areas. The other regions show a greater percentage of winter closings.

**Table 4. Seasons of operation**

<b>Percent of Firms open by season</b>	<b>Spring</b>	<b>Summer</b>	<b>Fall</b>	<b>Winter</b>
<b>Type of Business</b>				
Retail	94	98	94	70
Wholesale	100	100	100	90

**Table 5. Seasons of Operation by Region**

<b>Percent of Firms open by season</b>	<b>Spring</b>	<b>Summer</b>	<b>Fall</b>	<b>Winter</b>
<b>Region</b>				
Inland New England	83	92	83	96
Coastal New England	100	100	100	50
Lake Champlain Valley	100	95	95	100
Upstate New York and Pennsylvania	100	100	100	81
New Jersey, Delaware and Long Island	86	100	90	45
West Virginia & Western Maryland	92	100	83	58
Chesapeake Bay	96	100	100	63

A critical question for the acceptance of farm-raised bait fish are the dealers' and wholesalers' preferences for farm-raised and wild captured bait. An overwhelming preference for wild captured bait would make bait fish farming infeasible. The results show that while at least 50 percent in every region are indifferent to farmed versus wild caught, there are substantial percentages especially in the New Jersey, Long Island and Chesapeake Bay regions that highly prefer wild caught. A possible reason for the strong preferences may be due to early experiences of high mortality in either wild caught or farm-raised baitfish (This is somewhat supported by off hand comments in some of the interviews).

The small number of wholesalers makes it inappropriate to display the table above but it can be revealed that there were several indifferent but also some strongly preferring wild caught and also some strongly preferring farm raised.

In general an aquaculture producer will need to be aware of the preferences of their customers. A strong preference among them for wild-caught would be a serious problem.

**Table 6. Wild Captured Versus Farm-raised**

Preferences for Wild Caught and Farm Raised (Percent)	Preferences					Total
	Highly prefer farm raised	Somewhat prefer farm raised	Indifferent	Somewhat prefer wild	Highly prefer wild	
Combined	9	8	63	7	13	100
Inland New England	5	0	68	11	16	100
Coastal New England	0	0	88	6	6	100
Lake Champlain Valley	5	16	58	5	16	100
Upstate New York and Pennsylvania	24	16	60	0	0	100
New Jersey, Delaware and Long Island	4	4	52	17	22	100
West Virginia & Western Maryland	9	9	82	0	0	100
Chesapeake Bay	8	8	50	8	25	100

From Table 7 it is noted that in general the vast majority of bait is purchased although there is a substantial amount of self caught wild bait used in inland New England and the Lake Champlain valley. For wholesalers on average 77 percent was purchased, 8 percent was cultured and 22 percent was self-caught. The sources of purchased bait represent a more complex picture. For the wholesalers (Table 9) the greatest source 67 percent is out of state baitfish farms. Ten percent of their purchases are from local baitfish farms and 16 percent are from out-of-state wholesalers. For the retailers (Table 8) a combination of local bait fish wholesalers and out-of-state baitfish wholesalers accounts from 50 to 80 percent of their purchases. In the New York and Pennsylvania area nearly 30 percent of the purchases are from local baitfish farms. In the inland and coastal New England, Chesapeake Bay and New Jersey, Delaware and Long Island regions a substantial portion from 15 to 30 percent of their purchases are from local fishermen. In the Lake Champlain Valley, New Jersey, Delaware and Long Island and the Chesapeake Bay regions about ten percent of their purchases are directly from out-of-state baitfish farms.

**Table 7. Sources of Bait**

Sources of Bait (Percent)	Purchased	Self-Cultured	Self-Caught Wild
Region			
Inland New England	81.6	0.0	18.4
Coastal New England	98.5	0.0	1.6
Lake Champlain Valley	77.3	1.8	21.0

<b>Sources of Bait (Percent)</b>	<b>Purchased</b>	<b>Self-Cultured</b>	<b>Self-Caught Wild</b>
Upstate New York and Pennsylvania	100.0	0.0	0.0
New Jersey, Delaware and Long Island	83.6	0.0	16.4
West Virginia & Western Maryland	95.0	0.0	5.0
Chesapeake Bay	86.0	4.0	10.0

**Table 8. Sources of purchased bait**

<b>Sources of Purchased Bait Percent</b>	<b>Local Baitfish Farms</b>	<b>Out-of-State Baitfish Farms</b>	<b>Local Baitfish Wholesalers</b>	<b>Out-of-State Baitfish Wholesalers</b>	<b>Local Fishermen</b>	<b>Out-of-State Fishermen</b>
<b>Region</b>						
Inland New England	0.0	0.0	67.5	11.5	19.3	1.8
Coastal New England	1.1	0.0	27.8	45.8	20.8	4.4
Lake Champlain Valley	0.0	12.5	72.0	12.5	3.0	0.0
Upstate New York and Pennsylvania	28.1	3.7	50.7	17.4	0.0	0.0
New Jersey, Delaware and Long Island	0.0	10.4	33.8	25.8	29.6	0.4
West Virginia & Western Maryland	8.3	0.0	16.7	75.0	0.0	0.0
Chesapeake Bay	4.3	11.7	41.3	23.9	15.2	3.5

**Table 9. Sources of Purchased Bait for Wholesalers**

<b>Local Baitfish Farms</b>	<b>Out-of-State Baitfish Farms</b>	<b>Local Baitfish Wholesalers</b>	<b>Out-of-State Baitfish Wholesalers</b>	<b>Local Fishermen</b>	<b>Out-of-State Fishermen</b>
9.4	67.7	1.3	16.0	4.4	1.3

From Table 10 it is seen that a substantial portion of the dealers are either interested in or very interested in educational materials to help reduce holding mortality. From these numbers generation of extension materials and/or training programs on reducing or controlling holding mortal-

ity would seem to be a reasonable project for extension personnel.

**Table 10. Interest in Mortality Reduction Educational Materials**

<b>Interest in Educational Materials to Help Reduce Baitfish Mortality</b>	<b>Very Interested</b>	<b>Interested</b>	<b>Not at All</b>
<b>Region</b>			
Inland New England	40	45	15
Coastal New England	60	27	13
Lake Champlain Valley	40	40	20
Upstate New York and Pennsylvania	41	26	33
New Jersey, Delaware and Long Island	52	21	28
West Virginia & Western Maryland	25	33	42
Chesapeake Bay	22	37	41

Many firms such as restaurants rely on fee-based maintenance services to take care of their tropical fish tanks. This question explored the possibility of baitfish farmers being able to provide a similar service which would be something out-of-state baitfish farms would find difficult to provide. However, the results (Table 11) show little or no interest. From Table 10 it appear that the dealers are interested in learning how to improve their own maintenance skills.

**Table 11. Interest in Fee-based Maintenance Service**

<b>Interest in Fee based Maintenance Service Provided by Local Firm</b>	<b>Very Interested</b>	<b>Interested</b>	<b>Not at All</b>
<b>Region</b>			
Inland New England	5	15	80
Coastal New England	0	14	86
Lake Champlain Valley	0	25	75
Upstate New York and Pennsylvania	0	7	93
New Jersey, Delaware and Long Island	3	28	69
West Virginia & Western Maryland	0	17	83
Chesapeake Bay	0	11	89

In table 12 are average estimates by region for percent revenue due to baitfish and other aquatic baits. They range from 12 percent in West Virginia and Western Maryland to 32 percent in

Coastal New England. It is possible that these numbers are high. It was simply impossible or infeasible to assemble a comprehensive list of baitfish dealers in many states and the ones who advertise probably know already that this is a substantial proportion of their sales.

**Table 12. Percent Revenue Due to Baitfish (and other aquatic baits)**

<b>Revenue Due to Bait</b>	<b>Percent</b>
<b>Region</b>	
Inland New England	19.8
Coastal New England	32.5
Lake Champlain Valley	17.8
Upstate New York and Pennsylvania	16.2
New Jersey, Delaware and Long Island	18.3
West Virginia & Western Maryland	11.6
Chesapeake Bay	25.7

A very important part of this study was a conjoint marketing study. In a conjoint study of a product or potential product a number of key attributes are selected. Then using special computer software a number of profiles with various combinations of these attributes are created. In an interview based survey such as ours the respondents are shown cards representing pictorially and in words the different profiles and asked to rate each profile. Then using a statistical analysis (in our case a double tobit analysis) the relative importance of each attribute can be determined for the range of values chosen for the study. In our study the respondents were asked to first separate the nine cards into three piles based whether they rated them low, medium or high. Then in the low pile each profile was rated 1 or 2, in the medium each profile was rated 3 or 4 and those in the high pile were rated 5 or 6. The two-stage procedure was done to facilitate the ratings and also to encourage respondents to use the whole rating scale from 1 to 6.

The attributes used were price from 20 percent below average to 20 percent above, delivery time 0 to 3 days versus 4 to 7 days, from below average to above average holding mortality, sizes uniform to variable and non-locally produced versus locally produced. As an example of what a card portrays, one card described baitfish with an average purchase price, non-locally produced, delivery within 4 to 7 days, below average holding mortality and variable fish sizes in the shipment.

Because there are so few wholesalers and a number of them did not rate the conjoint cards, it was not possible to do a conjoint analysis for the wholesalers. Separate analyses were done for each region and are displayed in Table 13.

From Table 13 it can be seen that price is the most important attribute in all regions except for the Chesapeake Bay region where holding mortality is the most important. About 40 percent of

the variability is explained. It is as expected a negative effect. Higher prices have lower ratings.

Holding mortality is significant for all regions and has an expected negative sign. It is the most important attribute in the Chesapeake Bay region and next most important in inland New England, upstate New York and Pennsylvania, New Jersey, Delaware and Long Island as well as West Virginia and Western Maryland. It is the third most important attribute in Coastal New England and the Lake Champlain Valley.

Since it was expected that retailers would want a uniform size product the negative sign was expected for all regions was expected. It is significant for all regions except upstate New York and Pennsylvania the Chesapeake Bay region. Size is the second most important attribute in Coastal New England and the Lake Champlain Valley. It is the third most important attribute for inland New England, upstate New York and Pennsylvania, New Jersey, Delaware and Long Island as well as Western Maryland and West Virginia and the least important in the Chesapeake Bay region where it is essentially of no importance.

In general delivery time and locally versus non-locally produced are the least important attributes. Local versus non-local is significant only in coastal New England where there is a preference for non-locally produced baitfish. This indicates some care should be taken by anyone hoping to produce and sell farm-raised baitfish in this region. Delivery is significant in upstate New York and Pennsylvania where an early delivery time is preferred. Surprisingly there is a significant preference for a later delivery time in the Lake Champlain region. There is apparently some reason why dealers prefer to wait for the baitfish to be delivered.

**Table 13. Relative Importance Table For Conjoint Study by Region**

<b>Region</b>	<b>20 Percent Below Average Price to 20% Above</b>	<b>Delivery From 0 to 3 To 4 to 7 days</b>	<b>Below Average Mortality to Above Average</b>	<b>Size Uniform to Variable</b>	<b>Non-Local to Local</b>
Inland New England	<b>45.9*</b>	<b>0.4</b>	<b>35.9*</b>	<b>17.1*</b>	0.7
Coastal New England	<b>46.1*</b>	<b>0.2</b>	<b>17.7*</b>	<b>25.1*</b>	<b>11.0*</b>
Lake Champlain Valley	<b>40.7*</b>	11.2*	<b>19.5*</b>	<b>23.9*</b>	4.7
Upstate New York and Pennsylvania	<b>40.5*</b>	<b>11.1*</b>	<b>31.2*</b>	<b>11.6</b>	<b>5.6</b>
New Jersey, Delaware and Long Island	<b>44.5*</b>	<b>3.8</b>	<b>28.8*</b>	<b>21.9*</b>	1.0



<b>Region</b>	<b>20 Percent Below Average Price to 20% Above</b>	<b>Delivery From 0 to 3 To 4 to 7 days</b>	<b>Below Average Mortality to Above Average</b>	<b>Size Uniform to Variable</b>	<b>Non-Local to Local</b>
West Virginia & Western Maryland	<b>38.8*</b>	<b>10.0</b>	<b>27.7*</b>	<b>15.5*</b>	8.0
Chesapeake Bay	<b>40.5*</b>	<b>8.3</b>	<b>46.5*</b>	<b>0.5</b>	4.2

Bold text indicates negative sign. For example increasing price lowers the rating of the product. A star (\*) indicates the value is statistically significant at the 5 percent level in the analysis.

As mentioned above there was a comprehensive question to gather information about the kinds of baitfish sold by dealers and wholesalers requesting detailed information about the kinds of fish they are used to catch, the sizes used, the seasons, interest in getting more, quantities and prices sold as well as percent holding mortality. It was realized that this kind of information might be difficult to summarize. However, it is unfortunately far more difficult than was hoped. The variety of sizes, units of purchase and sale have made it difficult to give the price and volume information that would be helpful to potential baitfish producers. It has been decided to report only the species that are carried by at least 20 percent of the sampled wholesalers and at least 20 percent of the sampled retailers in each region.

Table 14. Species Carried by 20 Percent or More of Dealers Interviewed

<b>Species Carried by 20 Percent or More of Dealers Interviewed</b>		
<b>Region</b>	<b>Species</b>	<b>Percent carrying</b>
Inland New England	Golden shiner	85
	Emerald shiner	60
	Northern crayfish	50
	Rainbow smelt	45
	Fathead minnow	40
	Sucker	35
	Common shiner	30
	Silvery minnow	20

<b>Species Carried by 20 Percent or More of Dealers Interviewed</b>		
<b>Region</b>	<b>Species</b>	<b>Percent carrying</b>
Coastal New England	Eels	85
	Golden shiner	70
	Mummichog	25
Lake Champlain Valley	Emerald shiner	75
	Golden shiner	65
	Northern crayfish	60
	White sucker	60
	Fathead minnow	55
	Silvery minnow	55
	Common shiner	35
	Northern chub	25
	Creek chub	20
	Upstate New York and Pennsylvania	Fathead minnow
Common shiner		63
Golden shiner		37
New Jersey, Delaware and Long Island	Mummichog	41
	Eels	38
	Fathead minnow	28
West Virginia & Western Maryland	Fathead minnow	50
	Emerald shiner	36
	Golden shiner	36

<b>Species Carried by 20 Percent or More of Dealers Interviewed</b>		
<b>Region</b>	<b>Species</b>	<b>Percent carrying</b>
	Common shiner	21
	Leech	21
Chesapeake Bay	Fathead minnow	45
	Mummichog	45
	Common shiner	24
	Northern crayfish	21

Table 15. Species Carried by 20 Percent or More of Wholesalers Interviewed

<b>Species Carried by 20 Percent or More of Wholesalers Interviewed</b>	
<b>Species</b>	<b>Percent carrying</b>
Golden shiner	100
Fathead minnow	80
Northern crayfish	60
Emerald shiner	50
White sucker	50
Eels	20
Fall fish	20
Longnose sucker	20
Rosy Reds	20
Spottail shiner	20

The last question to be discussed asked dealers and wholesalers about what species they would like to have that were not currently available along with how much they thought they could sell. It was hoped that they would suggest some species that might have a competitive advantage for Northeast region baitfish farmers. Unfortunately all the suggestions were scattered and there were no clear trends. Many of the species suggested such as Menhaden have very challenging production problems. None of the wholesalers interviewed chose to answer the question.

## **Auctions**

In this section a brief mention of the results of the experimental auctions is made. At three separate fishing clubs in the Chesapeake Bay region a Vickrey sealed-bid auction was used to determine the value of three baits, bull minnows (mummichogs), grass shrimp and crayfish. For all three baits there was no evidence that the participants preferred either locally or non-locally produced nor farm-raised versus wild-caught. The Vickrey auction is designed to elicit the true value of the product from the participant. For further details see (Ding, 2004). A limitation of the study is that fishing club members usually have higher incomes than the general public and so are likely not typical anglers.

## **Conclusions**

At the start of this project there was a natural desire on the part of the participants to find one or more species that would be easy to produce, easy to market and for which aquaculture farmers in the Northeast would have a natural competitive advantage. So there were natural apprehensions about the possibility of finding none. However, it was pointed out to us by several people that aquaculture farmers have been led on by “rosy” forecasts in the past and had suffered from doing so. It is far better to be negative when the data warrants it and steer farmers away from risky opportunities. No such dream species have been discovered by this study. However, there is evidence of three potential opportunities. One are mummichogs in coastal New England. There is demand for them there and the mechanics of their aquaculture have been worked out by Andrew Lazur (personal communication). They are currently being produced commercially in Arkansas where they are mostly sold on the gulf coast. Another is raising northern crayfish and indeed this is already done in upstate New York and recently elsewhere. The third is rainbow smelt for which there are apparently some recent progress for production in Maine.

As with all such ventures it is necessary to repeat the standard cautions especially to people for whom this is their first venture into business. And that is that baitfish must be treated as a business. For a venture to work it must be run on business principles that takes into account the costs of production, distribution, marketing and customer service. It is important that the activity is not merely something the person enjoys doing but which has a reasonable chance of making money. It is also important to be aware of the competition. It is unreasonable that to think that producers could out compete out-of-region producers of golden shiners with their growing season advantages.

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## References

Ding, H., 2004. Consumer Willingness to Pay for Farm-Raised Baitfish in the Chesapeake Bay Region. Master's thesis. University of Delaware.