Massachusetts Shellfish Aquaculture Economic Impact Study

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UNIVERSITY OF MASSACHUSETTS DARTMOUTH
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Executive Summary

- Forty-nine percent of the shellfish farmers surveyed had a total of 256.11 acres in production located in Cape Cod towns, 161.25 acres are located on the South Coast (31%), 70.74 acres are located in South Shore towns (13%), 37.75 acres are located on the Islands (7%) and 2 acres are located in North Shore towns (<1%).

- Two percent of respondents had growing areas located in North Shore towns, 18% in South Shore towns, 64% in Cape Cod towns, 10% on the Islands and 6% on the South Coast.

- Shellfish farming is the primary source of income for 48% of respondents and the secondary source for 53%.

- The surveyed leaseholders reported 423 jobs in 2013. Of those employed, 169 worked full-time throughout the year (40% of all reported jobs), 121 worked part-time on a seasonal basis (29%), 74 worked part-time throughout the year (17%) and 59 worked full-time on a seasonal basis (14%).

- Sixteen percent of leaseholders are 25-39, 31% are 40-59, 31% are 55-64 and 23% are 65 and over.

- Ninety-six percent of respondents farmed oysters in 2013, 18% farmed hard-shell clams, 6% farmed soft-shell clams, 1% farmed bay scallops and no one farmed mussels.

- Forty-five percent of respondents who farmed oysters in 2013 raised seed, 46% raised petites, 92% raised legal and 5% raised some other class of oysters.

- Of the 19,135,928 oysters sold by respondents, 58% were farmed in Cape Cod towns, 26% were farmed on the South Coast, 11% were farmed in South Shore towns, 5% were farmed on the Islands and none were farmed in the North Shore towns.

- Forty-three percent of respondents who farmed hard-shell clams in 2013 raised seed, 86% raised littlenecks, 19% raised cherrystones and 5% raised chowders.

- Almost all of the reported hard-shell clam sales originated in the Cape Cod towns.

- Thirty-seven percent of respondents reported sales of $9,999 or less, 13% reported sales between $10,000 and $49,999, 21% reported sales between $50,000 and $99,999, 13% reported sales between $100,000 and $199,999, 10% reported sales between $200,000 and $499,999 and 6% reported sales of $500,000 or more.

- Fifty-nine percent of respondents sell their shellfish to small, local wholesalers/retailers, 48% sell to larger, statewide/interstate wholesalers and 18% sell their shellfish themselves as wholesale/retail dealers. Of those who classified themselves as a wholesale/retail dealer, 62% sold all of their shellfish in Massachusetts.

- Thirty-six percent of expenditures are for employee compensation, 16% are for purchases of gear, 16% are for purchases of shellfish seed, 14% are for self-pay, 7% are for truck/gas expenses, 4% are for boat expenses, 3% are for insurance, 1% is for leases and permits and 3% are for other expenditures.

- We estimate that the output of the shellfish aquaculture industry in Massachusetts was valued at approximately $25.4m in 2013, which in turn generated approximately $45.5m in the Massachusetts economy, or 1.79 times the activity.

- Shellfish farmers were responsible for approximately 769 direct jobs in 2013. They also generated an additional 140 jobs through indirect and induced activity, resulting in a total of 909 jobs in Massachusetts.

- Shellfish farmers paid approximately $11.9m in wages in 2013. Their economic activity generated additional labor income of $8.2m, for a total of approximately $20.1m in labor income in Massachusetts.

Introduction

Aquaculture is the farming of aquatic organisms, such as fish, shellfish and plants, conducted in land-based, freshwater and marine facilities. The farming of shellfish is a relatively recent undertaking in the United States. Although the cultivation of aquatic species, specifically shellfish and crustaceans, was practiced by the Native Americans and later by the Colonists on Cape Cod, more efficient cultivation techniques were not developed for commercial activities until the 1970s.[1]

Since then, the aquaculture industry has experienced significant growth. By 2021, worldwide aquaculture production is expected to grow to about 172m metric tons, an increase of 15% over 2009-2011 levels.[2]

Over 1,500 leases, permits and licenses for place-based aquaculture are held in New England alone. The value of shellfish aquaculture in the region is between $45m and $50m, with oysters being the most valuable product being raised.[2] According to the Northeastern Regional Ocean Council, the future growth potential for shellfish aquaculture in New England is significant as demand grows in the market.

In Massachusetts, aquaculture is managed by the Division of Marine Fisheries and coastal municipalities. In 2011, 349 aquaculture license holders held 378 licenses totaling 1,030 acres.[2] With no commercial finfish sites in the marine environment in Massachusetts, shellfish farming is the dominant form of aquaculture. Species produced include oysters, hard-shell clams (quahogs), soft-shell clams, bay scallops and blue mussels. Shellfish are typically cultivated for food, research, biomedical, sport and ornamental purposes.[3]

Shellfish aquaculture in the state has demonstrated sizable growth over the past decade. Between 2001 and 2004, $3.5m of shellfish were produced annually.[2] In 2006, that number increased to $6.2m.[1] By 2010, annual production included 71,831 bushels of oysters, 18,398 bushels of hard-shell clams and 1,815 bushes of soft-shell clams (valued at $10.22m).[2]

The purpose of this study is to identify and quantify the economic impact of the Massachusetts shellfish aquaculture industry during 2013. Of the approximate 334 leaseholders with acreage in production in 2013, 118 individuals were surveyed. Lease locations were categorized within five coastal regions: North Shore towns, South Shore towns, Cape Cod towns, the Islands, and the South Coast. In order to provide current insights on the nature of the industry, the study aims to pinpoint shellfish pricing and sales, identify regional differences in farming behaviors and determine leaseholder and farm demographics.

[1] Massachusetts Department of Agriculture Resources. 2014. Aquaculture Industry. http://www.mass.gov/eea/agencies/agr/about/divisions/aquaculture-industry-generic.html

[2] NROC. March 2013. Overview of the aquaculture sector in New England. http://northeastoceancouncil.org/wp-content/uploads/2013/03/Aquaculture-White-Paper.pdf

[3] Woodshole Sea Grant. September 2010. Shellfish aquaculture in Massachusetts. http://www.whoi.edu/seagrant

Methodology

The purpose of this study is to investigate and quantify the economic impact of the shellfish farming industry in Massachusetts. In addition, the goals of this study are to:

- Determine leaseholder and farm demographics.
- Provide insight on shellfish sales in-state versus out-of-state by farmers in Massachusetts.
- Identify potential leaseholders who are also wholesale/retail dealers and provide insight into the percentage of sales in-state versus out-of-state.
- Determine regional differences in farming behaviors and output.

To achieve these goals, the University of Massachusetts Dartmouth Center for Marketing Research (CMR) contracted with the Southeastern Massachusetts Aquaculture Center (SEMAC) to conduct a leaseholder survey via mail and through an online link.

CMR mailed a hard copy of the survey to 334 leaseholders. A postage paid envelope was enclosed. An electronic copy of the survey was also made available to the farmer-leaseholders and email reminders were sent out periodically. SEMAC informed the farmers that the returned surveys would be handled by the UMass Dartmouth Center for Marketing Research.

The mailing went out on October 13, 2014 with a deadline for reply by November 29, 2014. The data was tabulated December 12, 2014 to assure that all leaseholders had the opportunity to participate in the study. Fifty-three percent (63) of the surveys were mailed back and 47% (55) were taken online.

Of the 334 leaseholders contacted, 118 responded, yielding a response rate of 35%. Similar studies report response rates of less than 15%.

The findings in this study are statistically valid at $\pm$ 6.5%.

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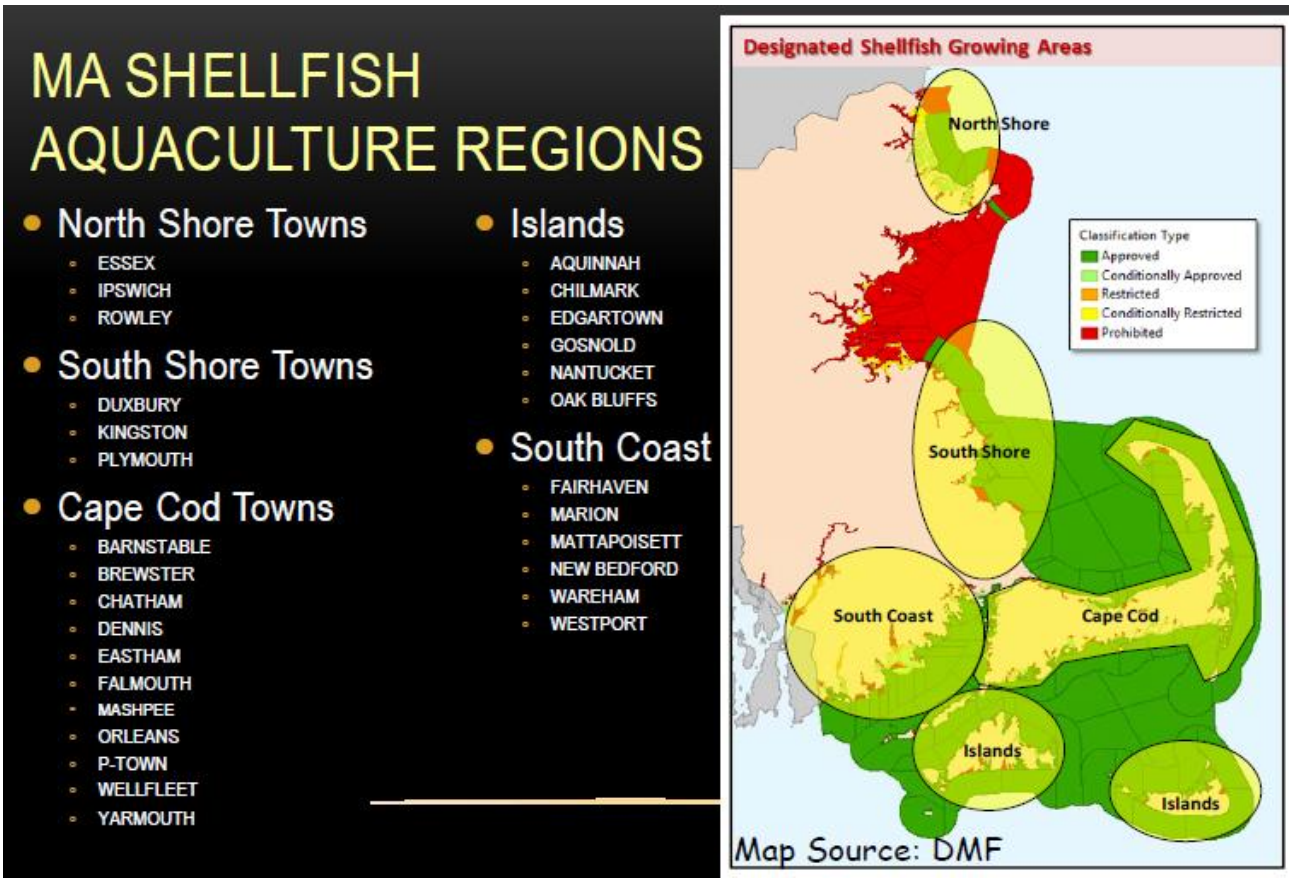
1. **How many acres did you have in production in 2013? _____**

2. **Which region(s) were these growing areas located within?**
   Check all that Apply
   North Shore Towns _____ South Shore Towns ____ Cape Cod Towns _____
   Islands ____ South Coast _____



3. **Is shellfish farming your primary or a secondary source of income?**
   Primary ____ Secondary _____

4. **How many employees did you have in 2013 (including yourself)?**
   Full-Time, All Year: _____ Part-Time, All Year: _____
   Full-Time, Seasonal: _____ Part-Time, Seasonal: _____

5. **What is the age of the leaseholder?**
   24 and under ____ 25-39 ____ 40-54 ____ 55-64 ____ 65 and Over ___

6. If you farmed <u>oysters</u> in 2013, please fill out the following table (If not, skip to Question 7).

Class of Oysters	Did you raise/sell this class of oysters?	If yes, how many oysters of this class did you sell?	If yes, on average, what was the selling price per oyster?
Seed	Yes No		
Petites (2.5-3")	Yes No		
Legal (3"+)	Yes No		
Other, Please Specify: _____	Yes No		

7. If you farmed <u>hard-shell clams</u> in 2013, please fill out the following table (If not, skip to Question 8).

Class of Hard-shell Clams	Did you raise/sell this class of clam?	If yes, how much of this class did you sell (by the piece)?	If yes, on average, what was the selling price (by the piece)?
Seed	Yes No		
Littlenecks	Yes No		
Cherrystones	Yes No		
Chowders	Yes No		

8. If you farmed <u>soft-shell clams</u>, <u>mussels</u>, or <u>bay scallops</u> in 2013, please fill out the following table (If not, skip to Question 9).

Species	Did you raise/sell this species?	If yes, how much of this species did you sell (by the pound)?	If yes, on average, what was the selling price (by the pound)?
Soft-shell Clams	Yes No		
Mussels	Yes No		
Bay Scallops	Yes No		

9. What were your total annual sales for 2013? $_____

10. Which of the following do you sell your shellfish to?

Check all that Apply

Small, local wholesalers/retailers ____

Larger, statewide/interstate wholesalers ____

Myself, as a wholesale and/or retail dealer ____ **If so, percent sold <u>in-state</u>**: _____%

11. Approximately, how much did you spend on each of the following in 2013?

Seed: $_____

Gear/Equipment: $_____

Employee Compensation (Including Benefits): $_____

Payments to Self (Personal Salary): $_____

Lease: $_____

Permit/Licenses: $_____

Boat Expenses: $_____

Truck/Transport Expense: $_____

Insurance: $_____

Other: $_____

Significance Test

Test Statistics

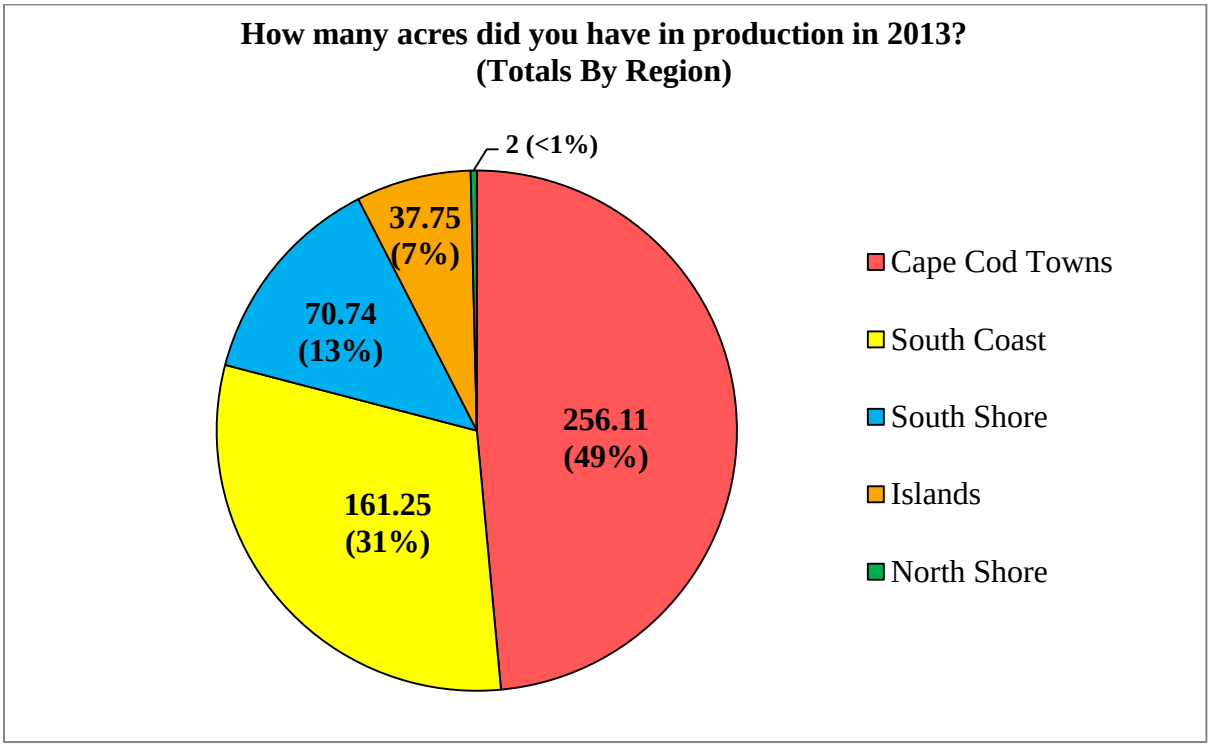
	Which region were these growing areas located within? (North Shore Towns)	Which region were these growing areas located within? (South Shore Towns)	Which region were these growing areas located within? (Cape Cod Towns)	Which region were these growing areas located within? (Islands)	Which region were these growing areas located within? (South Coast)
Chi-Square	110.136[a]	48.949[a]	9.797[a]	74.881[a]	91.661[a]
df	1	1	1	1	1
Asymp. Sig.	.000	.000	.002	.000	.000

A Chi-Square test was performed on this data. The data in this study test significant at .000, which indicates the findings are statistically valid.

Question 1: How many acres did you have in production in 2013?

Of the approximately 334 shellfish growers that had acreage in production in 2013 within the state of Massachusetts, a total of 118 (35%) responded to the survey. With 527.85 acres reported, these respondents accounted for 48% of all acreage used for aquaculture production in the state.[4]

On average (excluding outliers), each individual leaseholder held approximately 2.60 acres. A breakdown of the acreage totals by the five coastal regions is illustrated in the chart below.



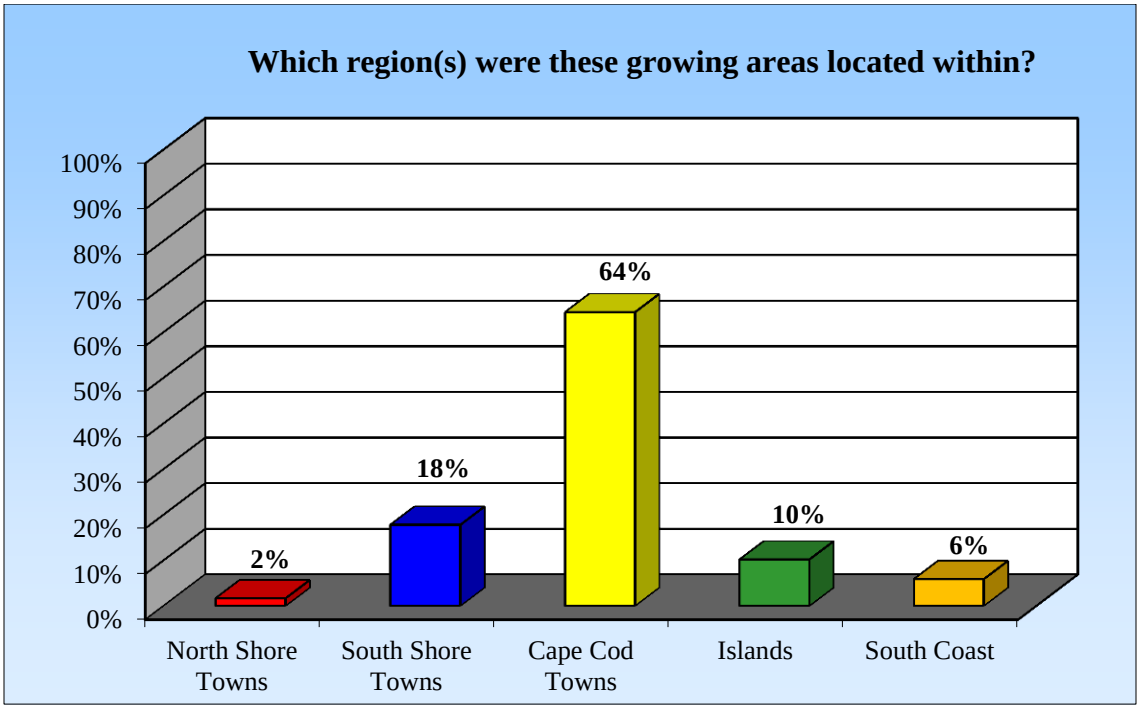
The shellfish farmers surveyed had a total of 256.11 acres in production located in Cape Cod towns (49% of our sample), 161.25 acres are located on the South Coast (31%), 70.74 acres are located in South Shore towns (13%), 37.75 acres are located on the Islands (7%) and 2 acres are located in North Shore towns (<1%).

[4] According to 2013 Census of Aquaculture data, 1,103 acres were used for aquaculture production in Massachusetts.

Question 2: Which region(s) were these growing areas located within?

Which region(s) were these growing areas located within?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	North Shore Towns	2	1.7	1.7	1.7
	South Shore Towns	21	17.8	17.8	19.5
	Cape Cod Towns	76	64.4	64.4	83.9
	Islands	12	10.2	10.2	94.1
	South Coast	7	5.9	5.9	100.0
	Total	118	100.0	100.0	

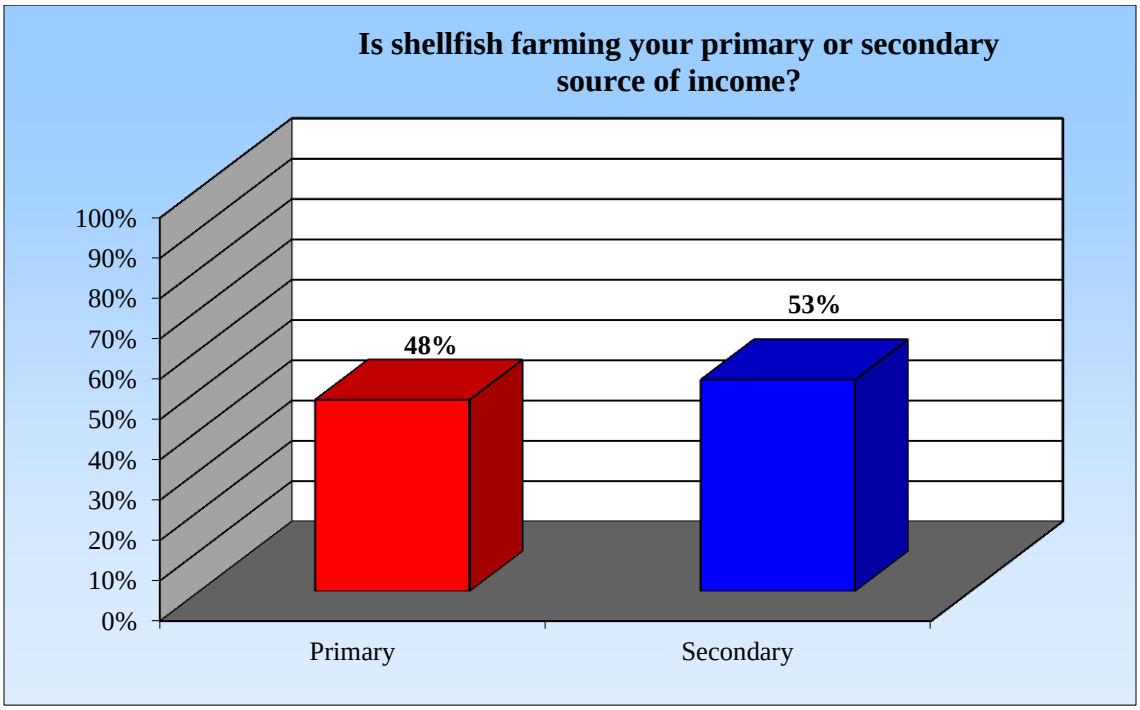


Two percent of respondents had growing areas located in North Shore towns, 18% in South Shore towns, 64% in Cape Cod towns, 10% on the Islands and 6% on the South Coast.

Question 3: Is shellfish farming your primary or secondary source of income?

Is shellfish farming your primary or secondary source of income?

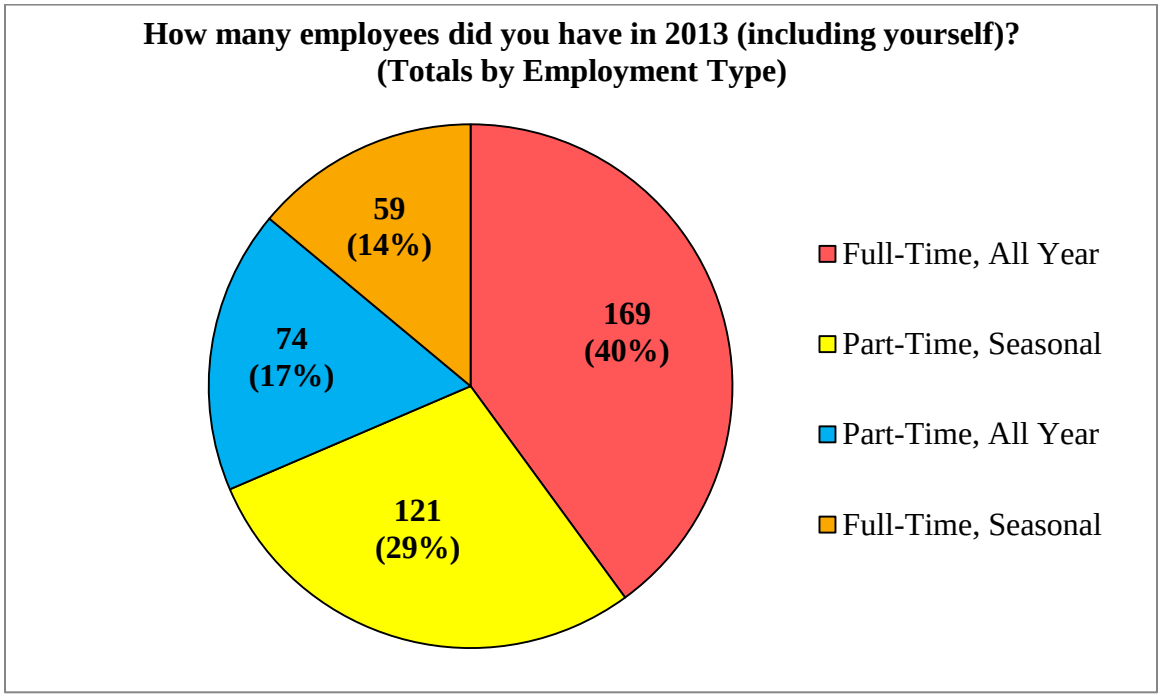
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary	56	47.5	47.5	47.5
	Secondary	62	52.5	52.5	100.0
	Total	118	100.0	100.0	



Shellfish farming is the primary source of income for 48% of respondents and the secondary source for 53%.

Question 4: How many employees did you have in 2013 (including yourself)?

The surveyed leaseholders reported 423 jobs in 2013. Of those employed, 169 worked full-time throughout the year (40% of all reported jobs), 121 worked part-time on a seasonal basis (29%), 74 worked part-time throughout the year (17%) and 59 worked full-time on a seasonal basis (14%).



Employment Totals by Region

North & South Shore Towns: Within these two regions, respondents employed 121 individuals. Of those employees, 48 worked full-time throughout the year, 24 worked part-time throughout the year, 10 worked full-time on a seasonal basis and 39 worked part-time on a seasonal basis.

Cape Cod Towns: Respondents with acreage in production in Cape Cod towns had 220 employees in 2013. Of those, 103 worked full-time throughout the year, 34 worked part-time throughout the year, 36 worked full-time on a seasonal basis and 47 worked part-time on a seasonal basis.

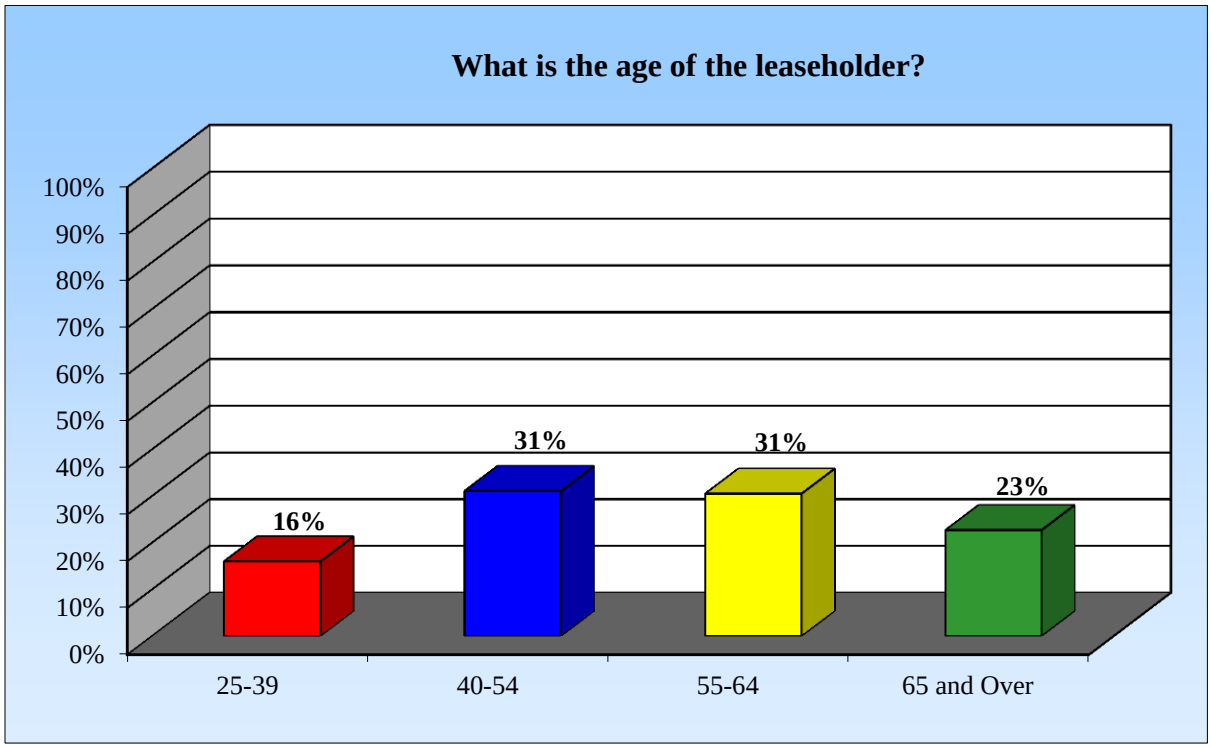
Islands: Leaseholders with acreage on the Islands employed 37 individuals. Of those employees, 8 worked full-time throughout the year, 9 worked part-time throughout the year, 5 worked full-time on a seasonal basis and 15 worked part-time on a seasonal basis.

South Coast: Respondents within the South Coast region had a total of 45 employees. Of those, 10 worked full-time throughout the year, 7 worked part-time throughout the year, 8 worked full-time on a seasonal basis and 20 worked part-time on a seasonal basis.

Question 5: What is the age of the leaseholder?

What is the age of the leaseholder?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-39	19	16.1	16.1	16.1
	40-54	36	30.5	30.5	46.6
	55-64	36	30.5	30.5	77.1
	65 And Over	27	22.9	22.9	100.0
	Total	118	100.0	100.0	



Sixteen percent of leaseholders are 25-39, 31% are 40-59, 31% are 55-64 and 23% are 65 and over.

Questions 6-8: Which species of shellfish did you farm in 2013? (Check all that Apply)

Did you farm oysters in 2013?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	113	95.8	95.8	95.8
	No	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

Did you farm hard-shell clams in 2013?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	21	17.8	17.8	17.8
	No	97	82.2	82.2	100.0
	Total	118	100.0	100.0	

Did you farm soft-shell clams in 2013?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	7	5.9	5.9	5.9
	No	111	94.1	94.1	100.0
	Total	118	100.0	100.0	

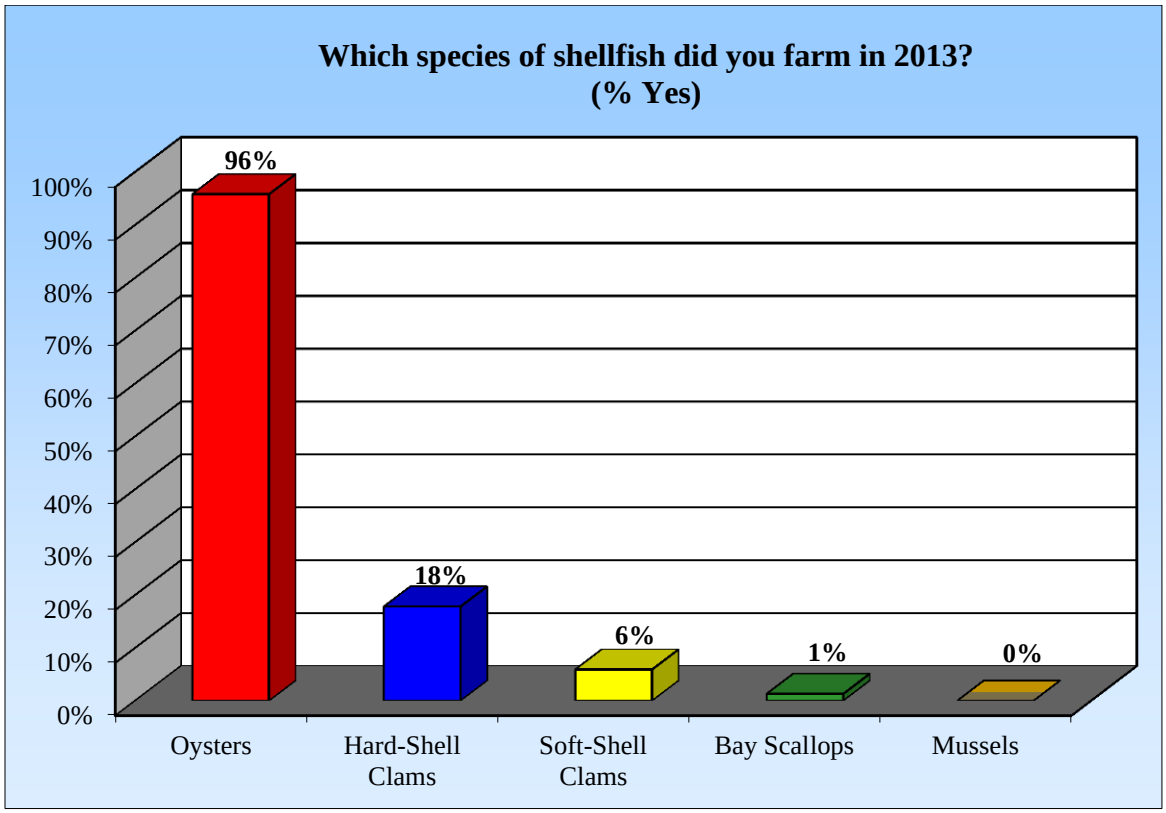
Did you farm bay scallops in 2013?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1	.8	.8	.8
	No	117	99.2	99.2	100.0
	Total	118	100.0	100.0	

Did you farm mussels in 2013?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	118	100.0	100.0	100.0

Questions 6-8: Which species of shellfish did you farm in 2013? (Continued)



Ninety-six percent of respondents farmed oysters in 2013, 18% farmed hard-shell clams, 6% farmed soft-shell clams, 1% farmed bay scallops and no one farmed mussels.

Question 6a: If you farmed oysters in 2013, which classes did you raise/sell? (Check all that Apply)

Did you raise/sell oysters in 2013? (Seed)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	51	43.2	45.1	45.1
	No	62	52.5	54.9	100.0
	Total	113	95.8	100.0	
	N/A	5	4.2		
Total		118	100.0		

Did you raise/sell oysters in 2013? (Petites)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	52	44.1	46.0	46.0
	No	61	51.7	54.0	100.0
	Total	113	95.8	100.0	
	N/A	5	4.2		
Total		118	100.0		

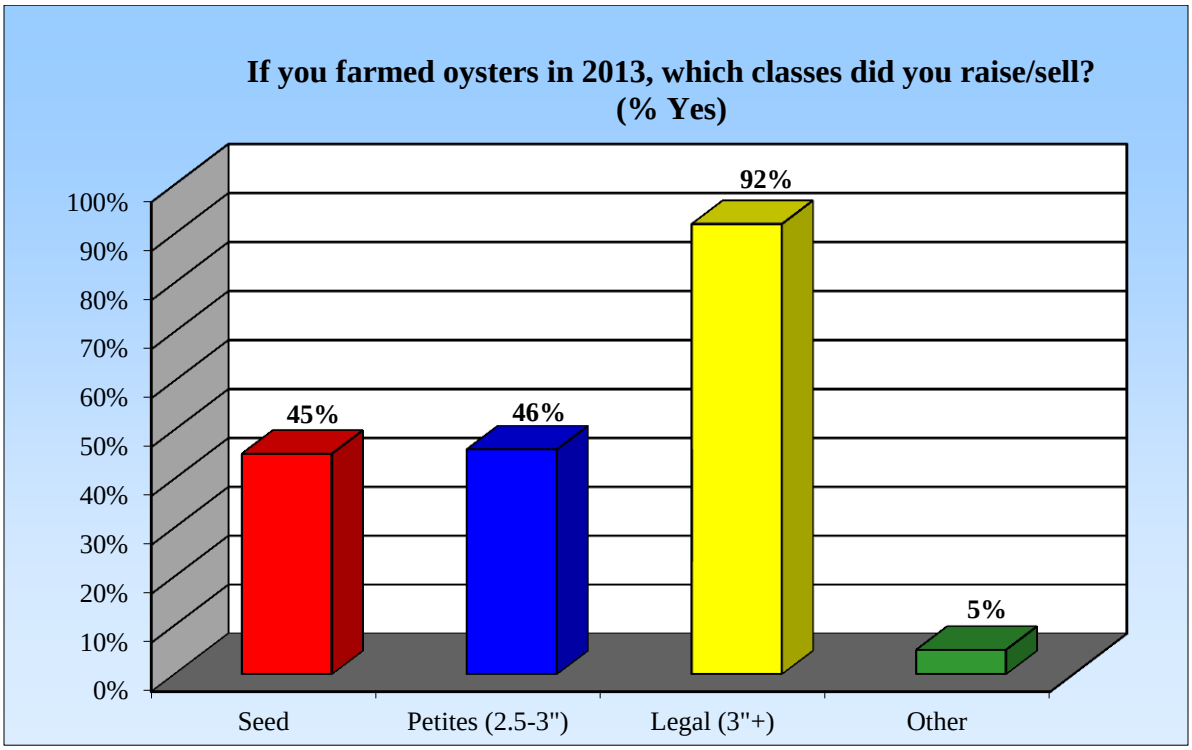
Did you raise/sell oysters in 2013?(Legal)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	104	88.1	92.0	92.0
	No	9	7.6	8.0	100.0
	Total	113	95.8	100.0	
	N/A	5	4.2		
Total		118	100.0		

Did you raise/sell oysters in 2013? (Other)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	6	5.1	5.3	5.3
	No	107	90.7	94.7	100.0
	Total	113	95.8	100.0	
	N/A	5	4.2		
Total		118	100.0		

Question 6a: If you farmed oysters in 2013, which classes did you raise/sell? (Continued)



Forty-five percent of respondents who farmed oysters in 2013 raised seed, 46% raised petites, 92% raised legal and 5% raised some other class of oysters.

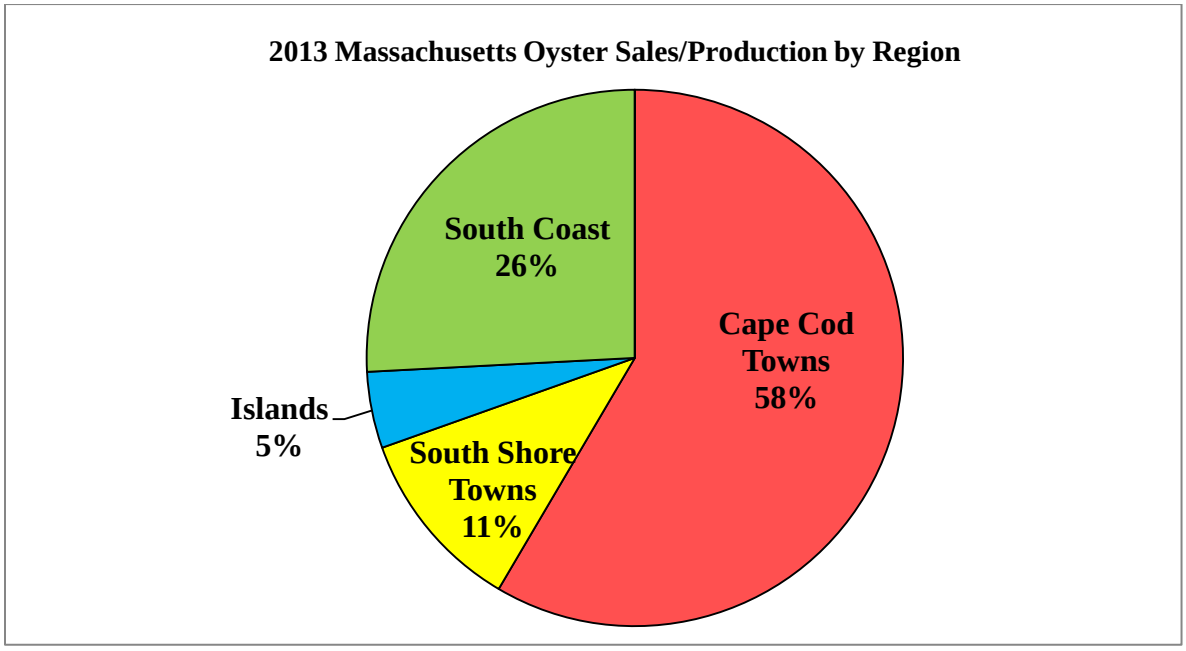
** Those who selected "Other" classes specified large/jumbo, misshapen and XL (4"+).*

Question 6b-c: If you farmed oysters in 2013, how many of each class did you sell and what was the selling price per oyster?

Of the 19,135,928 oysters sold by respondents, 58% were farmed in Cape Cod towns, 26% were farmed on the South Coast, 11% were farmed in South Shore towns, 5% were farmed on the Islands and none were farmed in North Shore towns.

Total Number of Oysters Sold (By Class)

Class of Oysters	Number of Oysters Sold
Petites	3,855,783
Legal	15,175,345
Other (Large/Jumbo/XL)	90,000
Other (Misshapen)	14,800
Total	**19,135,928**



**Since the majority of respondents who raised oyster seed did not sell any, we have excluded this class from the proceeding sales data.*

The value of oysters sold by the 92 respondents that provided both sales volumes and average selling prices for each class offered is approximately $10.53m.

Average Selling Price of Oysters Sold (By Class)

Class of Oysters	Average Selling Price (By the Piece)
Petites	$0.52
Legal	$0.60
Other	$0.51

Question 7a: If you farmed hard-shell clams in 2013, which classes did you raise/sell? (Check all that Apply)

Did you raise/sell hard-shell clams in 2013? (Seed)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	9	7.6	42.9	42.9
	No	12	10.2	57.1	100.0
	Total	21	17.8	100.0	
	N/A	97	82.2		
Total		118	100.0		

Did you raise/sell hard-shell clams in 2013? (Littlenecks)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	18	15.3	85.7	85.7
	No	3	2.5	14.3	100.0
	Total	21	17.8	100.0	
	N/A	97	82.2		
Total		118	100.0		

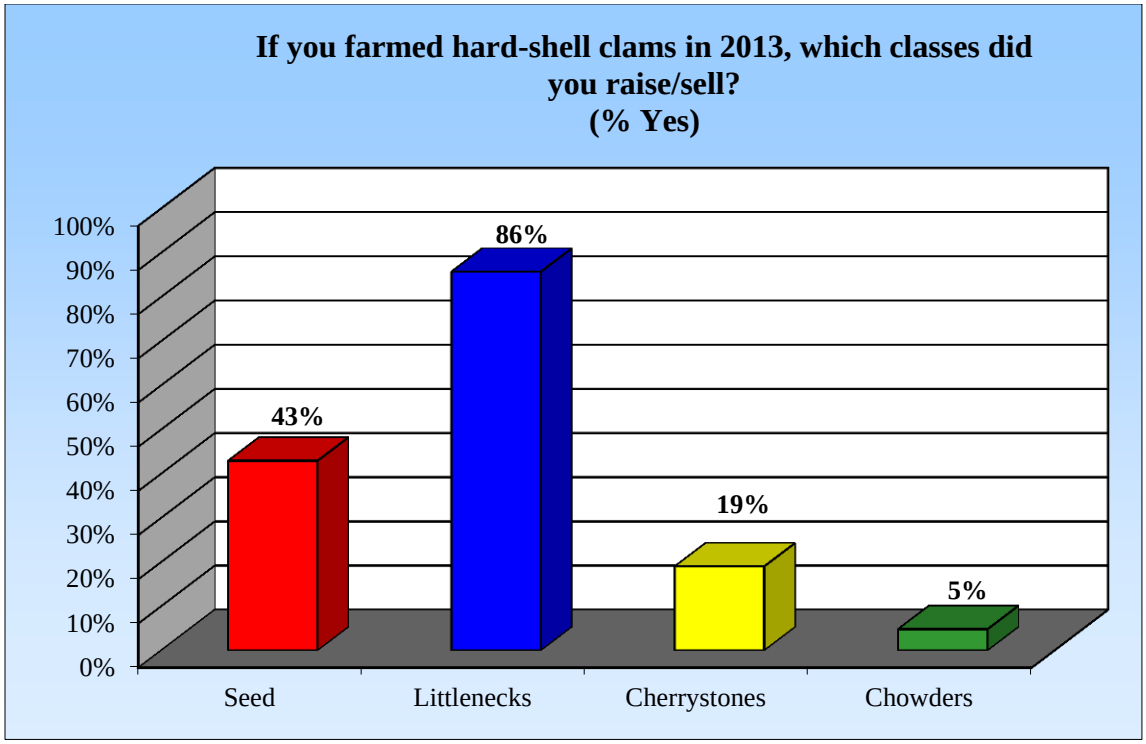
Did you raise/sell hard-shell clams in 2013? (Cherrystones)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	3.4	19.0	19.0
	No	17	14.4	81.0	100.0
	Total	21	17.8	100.0	
	N/A	97	82.2		
Total		118	100.0		

Did you raise/sell hard-shell clams in 2013? (Chowders)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1	.8	4.8	4.8
	No	20	16.9	95.2	100.0
	Total	21	17.8	100.0	
	N/A	97	82.2		
Total		118	100.0		

Question 7a: If you farmed hard-shell clams in 2013, which classes did you raise/sell? (Continued)



Forty-three percent of respondents who farmed hard-shell clams in 2013 raised seed, 86% raised littlenecks, 19% raised cherrystones and 5% raised chowders.

Question 7b-c: If you farmed hard-shell clams in 2013, how much of each class did you sell and what was the selling price per piece?

Almost all of the reported hard-shell clam sales originated in Cape Cod towns.

Total Number of Hard-Shell Clams Sold (By Class)

Class of Hard-Shell Clams	Number of Hard-Shell Clams Sold
Littlenecks	4,341,603
Cherry Stones	15,000
Chowders	1,000
Total	**4,357,603**

**Note: Since the majority of respondents who raised hard-shell clam seed did not sell any, we have excluded this class from the proceeding sales data.*

The value of hard-shell clams sold by the 14 respondents that provided both sales volumes and average selling prices for each class offered is approximately $984,000.

Average Selling Price of Hard-Shell Clams Sold (By Class)

Class of Hard-Shell Clams	Average Selling Price (By the Piece)
Littlenecks	$0.22
Cherrystones	$0.19
Chowders	N/A

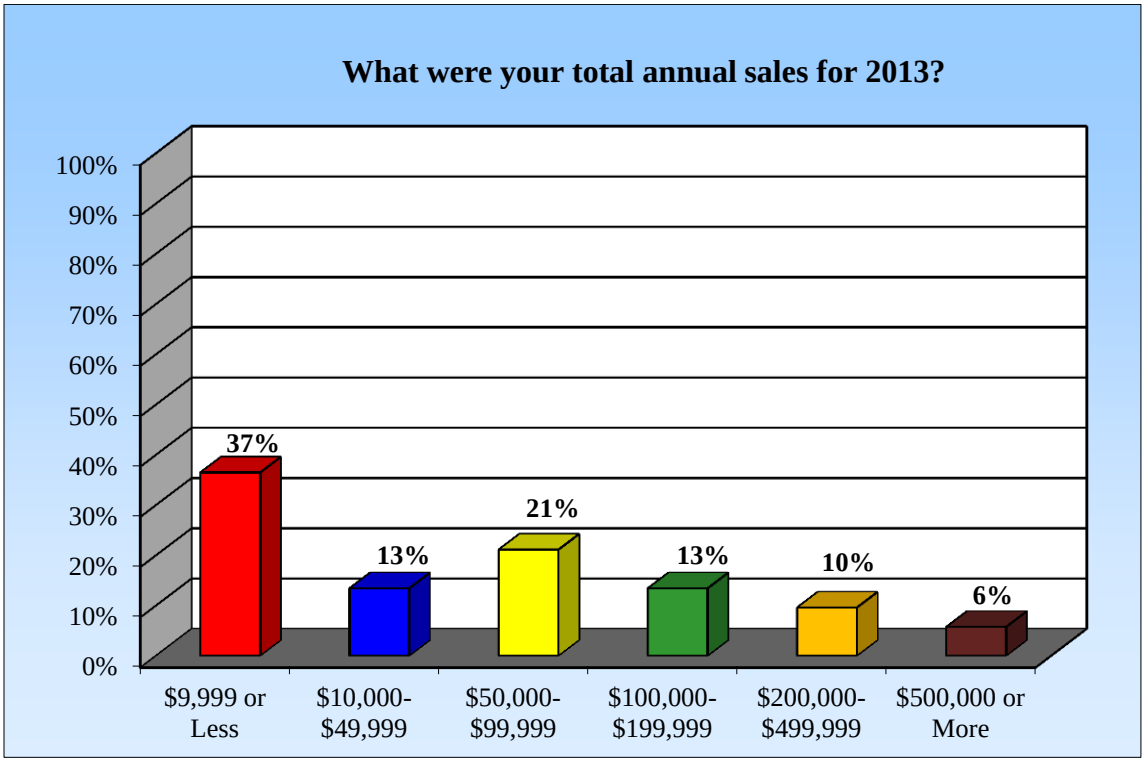
**Note: Only one respondent provided sales data for chowders, so an average selling price for this class is not available.*

Question 8a-c: If you farmed soft-shell clams, mussels or bay scallops, how many pounds of each class did you sell and what was the selling price per pound?

The six respondents that provided sales data for soft-shell clams reported 68,300 pounds valued at approximately $156,000. The average selling price was $2.20 per pound.

Since no one reported having raised or sold mussels and only one individual provided data for bay scallops, average sales data for these species is unavailable.

Question 9: What were your total annual sales for 2013?



Thirty-seven percent of respondents reported sales of $9,999 or less, 13% reported sales between $10,000 and $49,999, 21% reported sales between $50,000 and $99,999, 13% reported sales between $100,000 and $199,999, 10% reported sales between $200,000 and $499,999 and 6% reported sales of $500,000 or more.

Question 10: Which of the following do you sell your shellfish to? *(Check all that Apply)*

Which of the following do you sell your shellfish to? (Small, local wholesales/retailers)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	69	58.5	58.5	58.5
	No	45	38.1	38.1	96.6
	No Response	4	3.4	3.4	100.0
	Total	118	100.0	100.0	

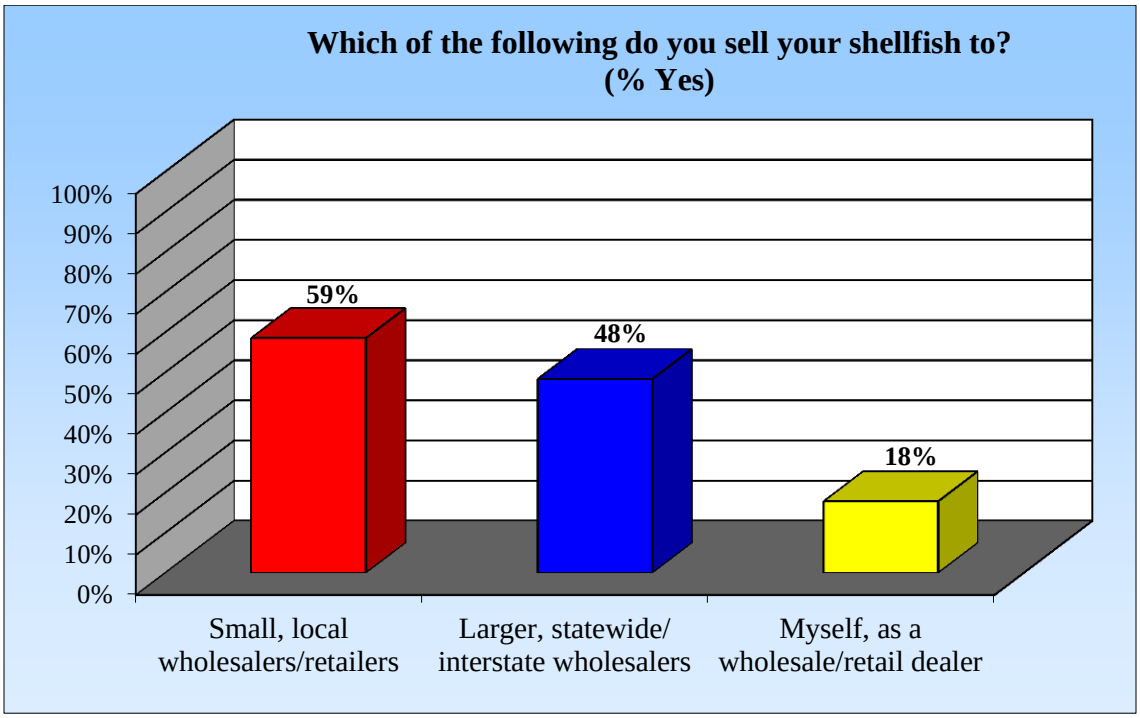
Which of the following do you sell your shellfish to? (Larger, statewide/interstate wholesalers)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	57	48.3	48.3	48.3
	No	57	48.3	48.3	96.6
	No Response	4	3.4	3.4	100.0
	Total	118	100.0	100.0	

Which of the following do you sell your shellfish to? (Myself, as a wholesale and/or retail dealer)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	21	17.8	17.8	17.8
	No	93	78.8	78.8	96.6
	No Response	4	3.4	3.4	100.0
	Total	118	100.0	100.0	

Question 10: Which of the following do you sell your shellfish to? (Continued)

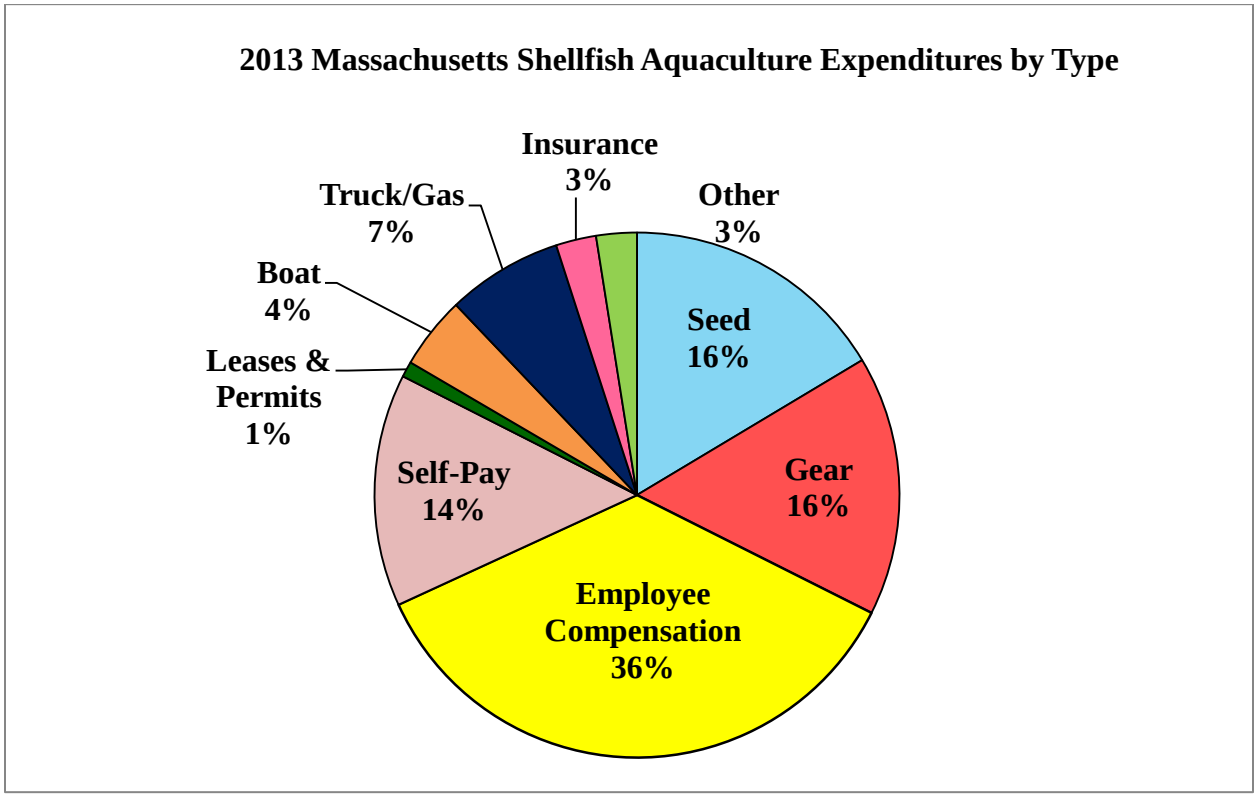


Fifty-nine percent of respondents sell their shellfish to small, local wholesalers/retailers, 48% sell their shellfish to larger, statewide/interstate wholesalers and 18% sell their shellfish themselves as wholesale/retail dealers.

**** Of those who act as wholesale/retail dealer 62% sold their shellfish within the state of Massachusetts in 2013.***

Question 11: Approximately, how much did you spend on each of the following in 2013?

One hundred seven respondents provided detailed expenditure totals. Between these respondents, approximately $8.6m was invested in aquaculture production in 2013. The majority of expenditures are from employee compensation (36%), followed by seed (16%) and gear purchases (16%). The following figure provides a general overview of the spending pattern of Massachusetts shellfish farmers.



Thirty-six percent of expenditures are for employee compensation, 16% are for purchases of gear, 16% are for purchases of shellfish seed, 14% are for self-pay, 7% are for truck/gas expenses, 4% are for boat expenses, 3% are for insurance, 1% is for leases and permits and 3% are for other expenses not mentioned.

Economic Impact of Shellfish Aquaculture in Massachusetts

In order to assess the economic impact of the shellfish aquaculture industry in Massachusetts, we estimated the industry's total expenditures and sales, including those of growers that did not respond to the survey.

Using IMPLAN® software and 2013 data for the state of Massachusetts, economic input-output models were used to estimate output, employment and labor income. Since IMPLAN does not have an industry sector dedicated to shellfish aquaculture, the economic impact of Massachusetts aquaculture was estimated using a modified production function for IMPLAN Sector 17 (Commercial Fishing) based on grower cost and earnings data collected through the survey.

The spending impacts generated by survey respondents who provided both sales and expenditure data are shown in the table below. These respondents accounted for 350 acres.

Economic Impact of Survey Respondents

Total Impacts	Output	Employment	Labor Income
Direct	$11,209,526	244	$4,019,520
Indirect	$2,818,950	18	$1,250,379
Induced	$5,390,690	39	$2,099,676
Total	**$19,419,166**	**301**	**$7,369,575**

Based on survey data, we extrapolated an approximation of the Massachusetts shellfish aquaculture sales per farmed acre ($18,845) to the 753 acres not accounted for by the survey responses. To assure as much accuracy as possible, we excluded outliers when determining this average, resulting in conservative projections. Applying IMPLAN data on the Commercial Fishing industry in Massachusetts, we determined the following output, employment and labor income for non-survey respondents.

Economic Impact of Non-Survey Respondents

Total Impacts	Output	Employment	Labor Income
Direct	$14,190,285	525	$7,875,000
Indirect	$3,568,545	23	$1,582,871
Induced	$8,319,786	60	$3,239,603
Total	**$26,078,616**	**608**	**$12,697,474**

By combining the estimated impacts of survey and non-survey respondents, the total economic impact of shellfish aquaculture in Massachusetts has also been estimated.

Economic Impact of Shellfish Aquaculture in Massachusetts, 2013

Total Impacts	Output	Employment	Labor Income
Direct	$25,399,811	769	$11,894,520
Indirect	$6,387,495	41	$2,833,250
Induced	$13,710,476	99	$5,339,279
Total	**$45,497,783**	**909**	**$20,067,049**

The economic multipliers generated through industry activity are summarized in the table below.

	Output (Per $)	Employment (Per $ Million)	Labor Income (Per $)
Multiplier (From IMPLAN®)	1.79	35.78	0.93

For every dollar of output generated by the industry, an estimated total of $1.79 worth of economic activity is generated in Massachusetts, every $1 spent by the industry generated $0.93 in wages in Massachusetts and approximately 36 jobs are generated for every $1m worth of spending by the industry.

Summary of Findings

Based on this data, we estimate that the output of the shellfish aquaculture industry in Massachusetts was valued at approximately $25.4m in 2013, which in turn generated approximately $45.5m in the Massachusetts economy, or 1.79 times the activity.

Shellfish farmers were responsible for approximately 769 direct jobs in 2013. They also generated an additional 140 jobs through indirect and induced activity, resulting in a total of 909 jobs in Massachusetts.

Shellfish farmers paid approximately $11.9m in wages in 2013. Their economic activity generated additional labor income of $8.2m, for a total of approximately $20.1m in labor income in Massachusetts.

Conclusion

The purpose of this study was to investigate and quantify the economic impact that the shellfish farming industry had in Massachusetts in 2013. The following conclusions, key takeaways and recommendations are based on data collected from the survey with focus on specific variables.

1. **Estimation of the economic impact of the shellfish aquaculture industry in Massachusetts in 2013:**

    - The output of the shellfish aquaculture industry in Massachusetts was valued at approximately $25.4m in 2013, which in turn generated approximately $45.5m in the Massachusetts economy, or 1.79 times the activity.

    - Shellfish farmers were responsible for approximately 909 jobs in Massachusetts.

    - Shellfish farmers paid approximately $11.9m in employee compensation in 2013. Their economic activity generated additional labor income of $8.2m, for a total of approximately $20.1m in labor income in Massachusetts.

2. **Highlights of leaseholder and farm demographics:**

    - Sixteen percent of the leaseholders surveyed are 25-39, 31% are 40-59, 31% are 55-64 and 23% are 65 and over.

    - In 2013, these leaseholders held a total of 256.11 acres in production located in Cape Cod towns, 161.25 acres located on the South Coast, 70.74 acres located in South Shore towns, 37.75 acres located on the Islands and 2 acres located in North Shore towns.

    - Shellfish farming is the primary source of income for 48% of respondents and the secondary source for 53%.

3. **Insight on shellfish sales driven in-state versus out-of-state by farmers in MA:**

    - Approximately fifty-nine percent of respondents sell to small, local wholesalers/retailers; thus keeping their revenues and economic impact confined to their local, more immediate, area.

    - About forty-eight percent of respondents sell to larger, statewide/interstate wholesalers. These growers' products are sold throughout Massachusetts and across state and national lines. Out-of-state impacts are not taken into consideration in this report.

    - Eighteen percent of respondents sell their harvests themselves as a wholesale/retail dealer.

4. **Identification of leaseholders who are also wholesale/retail dealers and insight on the percentage of their sales in-state versus out-of-state:**

    - Twenty-one survey respondents acted as wholesale/retail dealers in 2013. These individuals sold an average of 62% of their shellfish within Massachusetts.

    - Six of the wholesale/retail dealers sold all of their shellfish within the state while six sold less than half in-state. The remaining sold between 50% and 75% in Massachusetts.

5. **Regional differences in farming behaviors and output:**

    - Farmers reported the most acreage and sales in Cape Cod towns, with 49% of all surveyed acreage located within this region. Sixty-four percent of all respondents held acreage in Cape Cod. These respondents farmed nearly 11.2m oysters and more than 4.3m hard-shell clams, which is almost all of the surveyed hard-shell clam catch. Survey respondents in this area employed 220 individuals in 2013. Respondents in this region generated average sales of $29,000 per farmed acre.

    - Acreage on the South Coast accounted for 31% of the total surveyed acreage. However, only 6% of all respondents held acreage in this region, indicating that some individual leaseholders in this area possess larger sums of acreage. These respondents farmed almost 5m oysters in 2013. South Coast farms were responsible for 45 employees. Respondents in this region generated average sales of $13,000 per farmed acre.

    - Approximately 13% of all surveyed acreage was located within North and South Shore towns. Twenty percent of all respondents held acreage in these two regions. In the North and South Shore towns, 121 individuals were employed in 2013. Respondents in these two regions generated average sales of $30,000 per farmed acre.

    - Acreage on the Islands accounted for the remaining 7% of surveyed acreage in production in 2013. Ten percent of all respondents held acreage on the Islands. Leaseholders with acreage on the Islands employed 37 individuals. Respondents in this region generated average sales of $13,500 per farmed acre.

Recommendations

Oysters are by far the most popular shellfish farmed in Massachusetts, with 96% of surveyed farmers growing this species. Hard-shell clams were grown by 18%, soft-shell clams by 6% and bay scallops by 1%. No one grew mussels. To help to ensure continued industry profitability, which in turn causes a substantial impact on the local economy, SEMAC should focus its resources on guaranteeing successful oyster harvest. Any possible slowing of or collapse of the species due to disease or disaster would not only effect the farmers but those buyers downstream, most notably their wholesalers and area retailers and restaurants.

SEMAC may also want to consider advocating for increasing the production of the other species, while simultaneously developing and nurturing a local market and working with other state and national organizations to do so nationwide and internationally.

As growers who sell within Massachusetts have a larger impact to the state's economy and those who sell locally have an even more substantial one on their immediate surroundings, we recommend that SEMAC encourages growers to partner more with local wholesalers/retailers and businesses. SEMAC may even consider creating a program that connects growers to local wholesalers/retailers and encourages their business partnerships.