



Virginia Shellfish Aquaculture Situation and Outlook Report

**Results of the 2012 Virginia Shellfish
Aquaculture Crop Reporting Survey**

March 2013

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Virginia Shellfish Aquaculture Situation and Outlook Report

Results of 2012 Virginia Shellfish Aquaculture Crop Reporting Survey

The shellfish aquaculture industry in Virginia continues to grow, adding significant value to the State's seafood marketplace. Today, watermen harvest both hard clams and oysters from the State's public resources, albeit at rates diminished from historic levels. At the same time, Virginia's watermen-farmers are providing additional quantities of quality shellfish to consumers. In recent years, following the lead of the hard clam industry, a significant transition to intensive aquaculture of native oysters is underway. The once-extensive oyster planting utilizing wild seed has contracted primarily as a result of endemic oyster diseases and increasing wildlife predation

of seed oysters. In its place is an emerging aquaculture sector based on improved culture techniques and disease-resistant oyster seed.

While these trends are widely acknowledged, until this annual survey was initiated in 2006 there had been no consistent reporting of production and economic trends in Virginia's shellfish aquaculture industry. Periodic assessments are necessary to inform growers and related interests about the actual status and trends in the industry. The intent of this survey is to continue annual assessments in order to gauge growth and inputs in Virginia's shellfish aquaculture industry. This report is based upon an industry survey completed during the first quarter of 2013.

Methodology

A mail- and internet-based survey was developed to collect information from Virginia clam and oyster growers known to be active in the industry. Each year, the survey instrument is evaluated and revised based upon field testing (Appendices 1 & 2). Seventy-eight complete, useable surveys were returned by internet, mail, and fax, including twenty-six clam growers, sixty-six oyster growers, five shellfish hatcheries and fourteen growers who cultured both molluscs. It is believed that the survey is representative of overall trends in 2012 and based on the majority of active commercial growers.

For confidentiality reasons, the information collected is aggregated and the total represents both the eastern and western shores of Virginia.

Summary of Findings

Virginia Oyster (*Crassostrea virginica*) Aquaculture 2005-2012

The oyster industry continues to evolve from the traditional extensive planting of “shell on bottom”, utilizing wild oyster seed, to the use of hatchery produced seed.¹ Methods of aquaculture have progressed into a more intensive or containerized form utilizing cages, racks, floats, and the like. In addition, there is increasing interest in extensive planting on bottom using shell struck with oyster eyed larvae produced from a hatchery.

Intensive Culture (using cultchless, or single, seed)

Figure 1 shows a reported 66.7 million single oysters planted; close to a 2 percent increase from plantings in 2011. This number is slightly less than the estimated plantings for 2012 and could be attributed to the expansion into extensive (spat-on-shell) culture.

Oyster Sales and Prices

The numbers of market oysters sold by Virginia growers increased in 2012 by 21 per-

Figure 1. Number of Single Oysters Planted by Virginia Aquaculturists

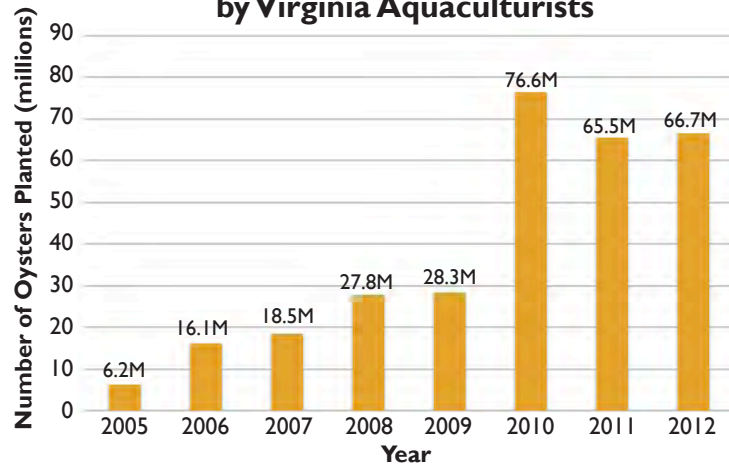
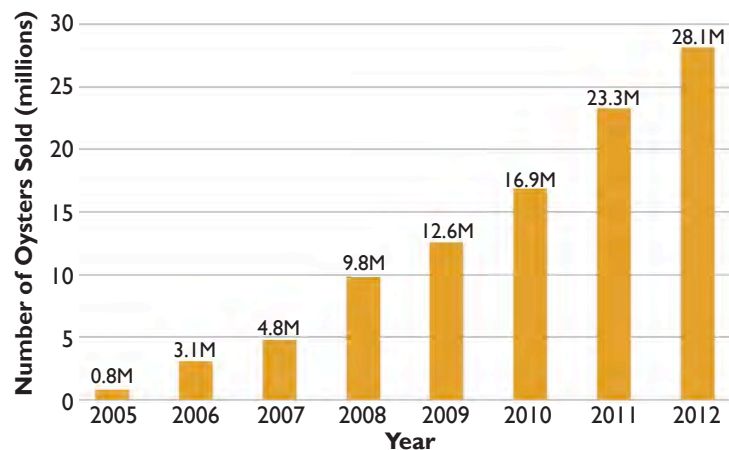


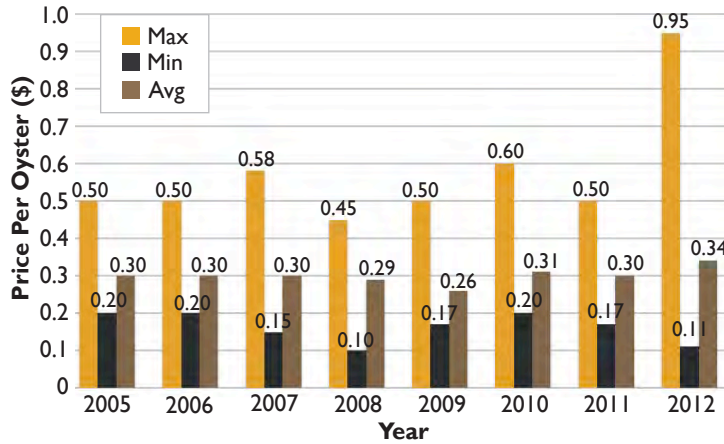
Figure 2. Number of Aquacultured Market Oysters Sold by Virginia Growers



cent to roughly 28 million (Figure 2.). This follows the steady increases reported for the last few years. This increase is slightly less than the 33 million cultured market oysters growers expected from the previous survey year. Combining the overall sales of single, market oysters with the weighted average price per oyster, it is estimated that the total

¹ Historically the most common oyster “culture” technique in Virginia was the transplanting of wild harvested seed to leased growing grounds. Prior to the onslaught of diseases, the grower paid little attention to the grounds between the time seed was planted and the time mature oysters were harvested, some 2 or 3 years later. Today this culture method is still practiced, however the results here do not include information on such oyster planting. The results in this report reflect the use of aquaculture practices that use hatchery-produced seed only, and which were adopted as a result of increased oyster disease and predation.

Figure 3. Oyster Prices Reported by Virginia Growers



revenue for oyster aquaculturists (not including spat on shell production) was \$9.5 million, an increase in almost \$3 million from 2011.

For the purposes of this report, oyster prices are not broken down as to market segment (i.e. primary wholesale, secondary wholesale, retail, etc.). The data in Figure 3 show a continued stability in the average prices received for cultured oysters over the seven-year period while volume of sales have continued to expand.² Trends in the percentage of single oysters sold into wholesale markets remain fairly consistent at greater than 95 percent for the last four years. Also, the percentage of single oysters sold out of state has remained greater than 50 percent (55-77 percent) for the last five years.

Extensive Culture (Spat-on-Shell)

With the expansion of large-scale “remote setting” or “spat-on-shell” oyster planting in Virginia beginning in 2008 and continuing today, the entire picture of hatchery volume changed as existing firms became active in purchasing not just cultchless seed, but large quantities of eyed larvae for spat-on-shell development.³ Remote setting is a method of oyster cultivation in which oyster larvae and old oyster shells are mixed in a controlled environment in large tanks on land rather than in open Bay waters. After the larvae attach (or set) on the old oyster shells and

metamorphose into seed (or spat) oysters, the resulting spat-on-shell is ready for almost immediate planting and the spat will grow naturally until ready for harvest.

The primary advantage of spat-on-shell cultivation is that it requires less labor and fewer materials than single-oyster cultivation, thereby making it a more economically feasible option for producing oysters. Because spat-on-shell cultivation produces oysters grown in clusters (similar to wild-caught oysters), the primary product is oysters for shucking rather than single oysters for half-shell consumption. For this reason, remote setting is not meant to take the place of single-oyster culture (which produces consistent, high-quality, half-shell oysters) but to complement it with a means of producing, on large scale, a local oyster for use by Virginia’s oyster processors.

The industry forecast for expansion in the use of eyed larvae for spat-on-shell continues to be clear but depends on a consistent production of eyed larvae, which was problematic in 2011 due to poor water quality. This report has not yet expanded to include the industry trends in spat-on-shell culture, because a large portion of this development so far has been subsidized by federal monies. Trends will be reported in the future when the investment is coming solely from private dollars and may be considered more sustainable for forecasting purposes. While trends are not yet part of this report, a summary of the reported spat-on-shell production from recent years is included.

2 Small growers with sales less than 4,000 oysters reported average prices as high as \$0.95 and one grower reported receiving a maximum price of \$2.00. This represents high-end retail, or niche market sales. During 2012 the median price was \$0.31 per market oyster; an increase of \$0.01 from 2011. The weighted average price across all growers was \$0.337 per market oyster in 2012.

3 For a complete description of the spat on shell remote setting industry development see: <http://web.vims.edu/library/GreyLit/VIMS/mrr09-01.pdf>

The spat-on-shell production reported over the last few years from survey data shows bushels planted expanding from over 6 thousand in 2008 to almost 19 thousand in 2012. The percentage of triploids used has been at or near 100 percent. Numbers of bushels harvested have expanded from roughly 2 thousand in 2009 to almost 13 thousand in 2012. These numbers reflect only what is reported in the survey, which is assumed to be a mix of private investment and subsidized support.

Oyster Hatcheries

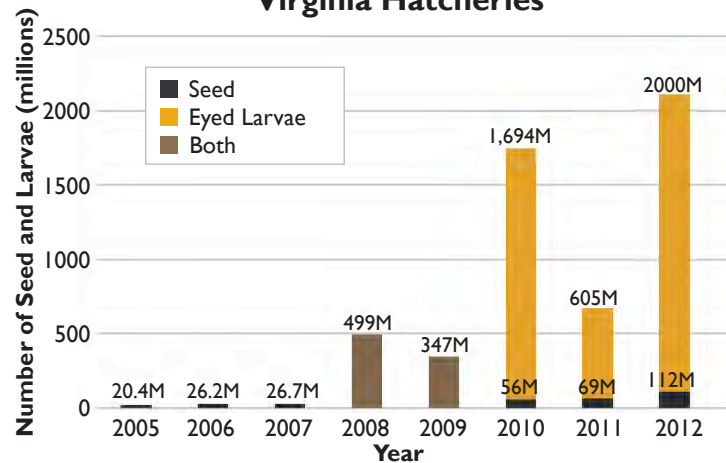
The expansion of hatchery infrastructure in recent years prompted the addition of hatchery-specific questions in the 2010 survey. Hatchery questions were then moved to a stand-alone survey sent directly to the Virginia shellfish hatcheries for the 2011 and 2012 surveys.

Sales of oyster seed and eyed larvae by Virginia hatcheries realized an almost four-fold increase from 2008 to 2010 with the majority of the sales being eyed larvae (1.7 billion). This reflects the growth of the oyster industry as seen in Figure 1 as well as the expansion of extensive culture which is not yet represented graphically in this report.

Oyster growers have adopted improved strains of oyster seed and larvae over the years to optimize growth rates, disease resistance, and meat quality during warmer months. Triploid eyed larvae and seed were the source of the overwhelming majority of the oyster sales reported by hatcheries. In 2012 the percent triploids planted on Virginia farms was reported by growers to be 87%, a decrease from the past several years. Industry members report that the sterile triploid seed is more viable from a commercial standpoint, as the oysters grow faster and do not diminish in quality with seasonal spawning.

The continued potential for expansion lies in the production of oyster eyed larvae for spat-on-shell aquaculture. Difficulties at-

Figure 4. Oyster Seed and Larvae Sold by Virginia Hatcheries



tributed to poor water quality were reported in the summer of 2011 and resulted in the dramatic decline of eyed larvae production seen in Figure 4.⁴ Efforts are ongoing to research and monitor water quality; determining the cause of decline and developing mitigation strategies to maintain consistent production. The 2012 hatchery season regained productivity, with a total of 2 billion eyed larvae sold and 112 million single seed sold. This represents a 20.7 percent increase in sales from 2010 and an 18 percent increase in eyed larvae sales alone. Hatcheries predicted another increase in eyed larvae sales for 2013 (25 percent), which would bring total sales to roughly 2.5 billion eyed larvae.

The continued growth in aquaculture of oysters in Virginia directly drives the hatchery forecast. Virtually all of the seed and eyed larvae produced is either planted by the hatchery owners themselves in their

⁴ Data in Figure 4 from 2005-2007 represents oyster seed sales in millions. In 2008 and 2009, the numbers represent a combination of seed and eyed larvae sales with the majority being eyed larvae due to the initiation of large-scale spat-on-shell culture. The 2010 survey was the first to collect sales data directly from the hatcheries and is separated into seed and eyed larvae sales. Note that most hatcheries report sales which include internal use and external sales. The drop in production in 2009 and 2011 was due to poor water quality.

Figure 5. Virginia Oyster Farm Employment

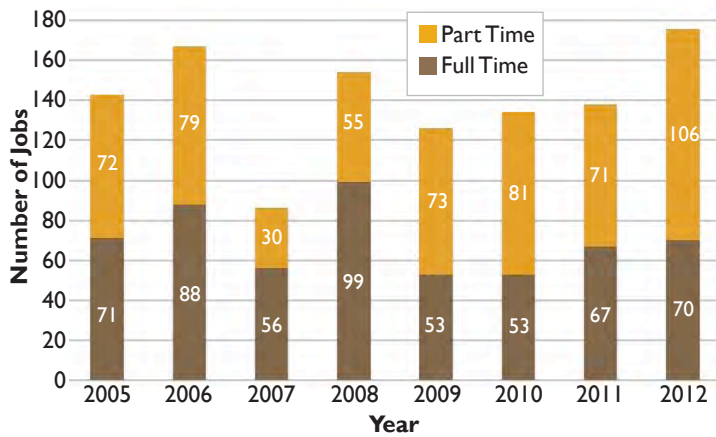


Figure 6. Number of Hard Clams Planted in Virginia

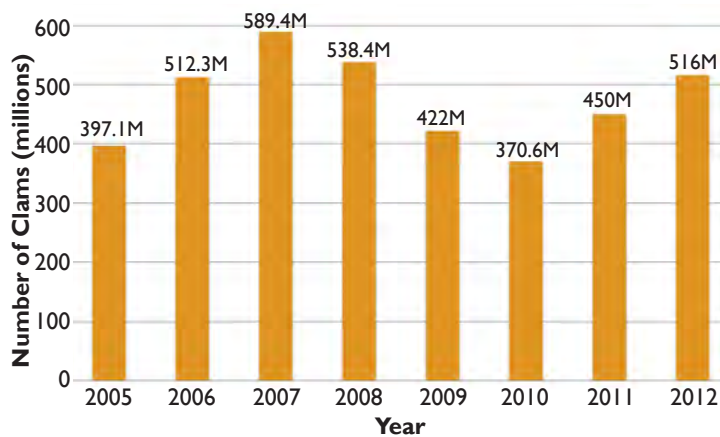
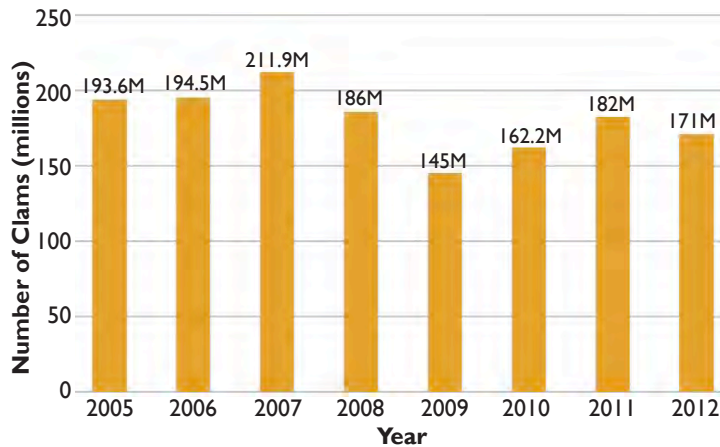


Figure 7. Number of Hard Clams Sold in Virginia



aquaculture operations or sold to other Virginia growers. This vertically integrated system with eventual sales to many out-of-state consumers adds important economic development to local coastal communities.

Employment

Finally, as shown in Figure 5, employment associated with oyster aquaculture has remained variable over recent years. The difficulty of estimating the time and labor associated with relatively small-scale aquaculture conducted in conjunction with other business lines makes estimates of oyster culture labor problematic at this point in industry development. In view of this fact, the trends in these employment figures should be not overly interpreted. There is a consistent expectation that with successful development of both spat-on-shell and cultchless oyster aquaculture, additional employment will be required to meet the greatly expanded planting and production needs.

Virginia Clam (*Mercenaria mercenaria*) Aquaculture 2005-2012

Based upon previous economic assessments compiled by the authors, Virginia continues to lead the nation in the culture of hard clams. The aquaculture of hard clams in Virginia, while expanding from 2005 to 2007, began contracting somewhat in 2008 and showed a further decline for the following two years. Reports for 2011 and 2012 show a slight increase in seed plantings but remain slightly lower than plantings reported in 2008.

As depicted in Figure 6, clam growers reported an increase in seed plantings during the most recent year. The firms reporting indicated that during 2012 they increased plantings by roughly 66 million clams (14.7 percent) compared to 2011, for a total of 516 million clams. The outlook for 2013 predicts a comparable number of clams planted as in 2012.

Clam Sales and Prices

The 2012 crop reporting survey reflects a slight decrease (6 percent) in the total number of Virginia market clams sold between 2011 and the end of 2012. During 2012, it is estimated that Virginia's total farm output reached 171 million "market" clams, as shown in Figure 7. Combining the overall sales with the weighted average price per market clam, it is estimated that total revenue for hard clam aquaculturists in 2012 was \$26.8 million—a slight increase of just under \$1 million from the prior year.⁵

Figure 8 displays the survey findings regarding relative prices received for market clams. The average price reported per market clam at the farm gate was \$0.16 during 2012, the same as the previous two years. Trends in the percentage of market clams sold into wholesale markets remain fairly consistent at greater than 97 percent for the last four years. Also, the percentage of market clams sold out of state has remained between 73 and 89 percent for the last five years.

Clam Hatcheries

Clam seed production and sales have remained stable and the reported average price of clam seed has remained the same for the last several years.⁶ Industry sources indicate that much of hatchery capacity is dedicated to producing seed for each hatchery owner's own planting. Essentially, all of the seed produced is planted in Virginia. This

5 Smaller niche growers with production and sales of less than 10,000 clams reported average prices as high as \$0.23. One small grower reported receiving a maximum price of \$0.30 per clam. Fifteen cents per market clam was the modal price to the grower. It should be pointed out that market level for most growers is equivalent to farm gate prices. Some smaller growers market product directly at the retail level. The weighted average across all growers was \$0.157 per market clam in 2012.

6 The price of seed depends upon size but the modal price reported was \$0.02 per seed in 2012, essentially the same since 2007.

Figure 8. Clam Prices Reported by Virginia Growers

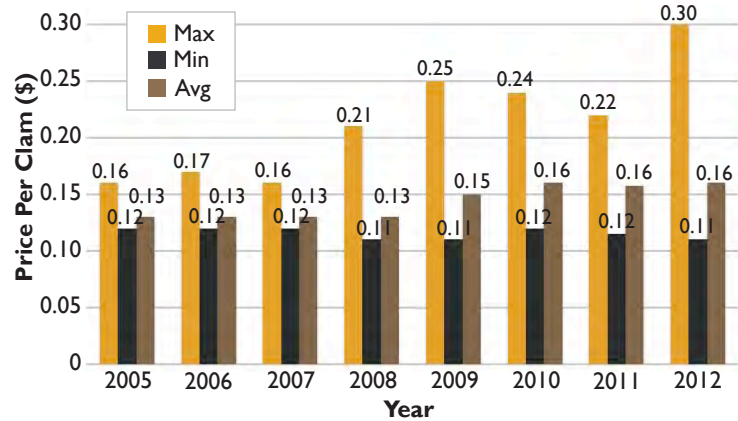
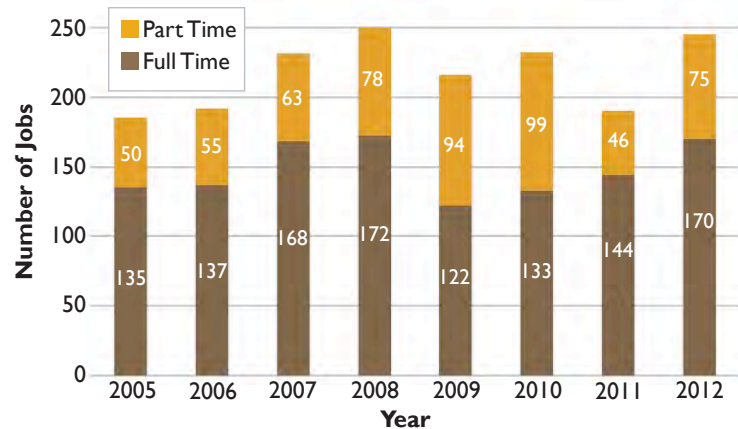


Figure 9. Virginia Clam Farm Employment



vertically integrated system with eventual sales to many out-of-state consumers adds important economic development to local coastal communities.

Employment

Figure 9 demonstrates a slight increase in the full and part time level of employment. However, as noted above, the employment situation with all shellfish aquaculture is complicated by the diversity of the firms involved. The vast majority of the clam production is conducted by relatively large vertically integrated companies, however they often contract with self-employed grower cooperatives which, as with oysters, also complicates the estimates of labor involved in this industry.

Virginia Shellfish Grower Situation & Outlook Survey 2013

Welcome

Thank you for taking a few minutes to complete the following commercial aquaculture survey. With your help, Virginia's past annual surveys have shown how useful timely information is for the shellfish aquaculture industry. Such information is vital to understanding the importance of Virginia's growing aquaculture business to the economy, and in turn the importance of clean water, reasonable land use and tax policies, access to financial capital and the like to shellfish growers.

All information provided will be held in the strictest of confidence and used only when combined with all of those providing information on their individual operations.

Not all questions may apply to your situation. Please answer all that do. The more accurate the information provided, the better the characterization of the Virginia aquaculture industry.

Please complete the survey by February 18, 2013.

If you have any questions or would like to discuss, please contact us at:

Thomas J. Murray
Marine Business Specialist
Phone 804-684-7190
Fax: 804-684-7161

Karen Hudson
Aquaculture Specialist
Phone: 804-684-7742
Fax: 804-684-7161

You can also file online by accessing <http://www.surveymonkey.com/s/shellfishsurvey2013>
If filing online, please note your answers can be saved if you exit the survey before completion.
You can then return at a later time to finish the survey.

Virginia Shellfish Grower Situation & Outlook Survey 2013

Commercial Clam Aquaculture

1. Do you aquaculture clams?

- Yes No

2. Do you have a clam hatchery?

- Yes No

3. Do you "re-sell" seed

- Yes No

4. Do you have a "cooperative" agreement with another clam producer?

- Yes No

5. Do you purchase hard clam crop insurance?

- Yes No

6. 2012 Commercial Clam Aquaculture

a) # Clams planted

b) % Seed purchased

c) Avg. price of seed purchased

d) # Seed sold

e) % seed sold out-of-state

f) # Market (non-seed) sold

i. % wholesale

ii. % retail

g) % Market sold out-of-state

h) Ave. price per market clam

i. Avg. price wholesale

ii. Ave. price retail

i) # Full-time help

j) # Part-time help

Virginia Shellfish Grower Situation & Outlook Survey 2013

Commercial Clam Aquaculture

7. 2013 ESTIMATED Commercial Clam Aquaculture

- a) # Clams planted
- b) % Seed purchased
- c) Avg. price of seed purchased
- d) # Seed sold
- e) % seed sold out-of-state
- f) # Market (non-seed) sold
 - i. % wholesale
 - ii. % retail
- g) % Market sold out-of-state
- h) Ave. price per market clam
 - i. Avg. price wholesale
 - ii. Ave. price retail
- i) # Full-time help
- j) # Part-time help

8. Comments or Explanatory Notes on 2012 and 2013 Clam Aquaculture:

Virginia Shellfish Grower Situation & Outlook Survey 2013

Commercial Oyster Aquaculture

This section covers two methods of oyster culture: spat-on-shell (remote setting, extensive) culture and cultchless or the culture of single oysters (containerized, intensive). Please only report product originating from an onshore hatchery.

9. Do you aquaculture oysters?

- Yes No

10. Do you aquaculture spat-on-shell oysters?

- Yes No

Commercial Spat-on Shell Oyster Aquaculture

Please report only oyster production which originated from an onshore hatchery.
This does NOT include "natural strike" product moved to private ground.

11. 2012 Commercial Spat-on-Shell Oyster Aquaculture

- | | |
|--|----------------------|
| a) # Eyed-larvae purchased | <input type="text"/> |
| i. % Diploid | <input type="text"/> |
| ii. % Triploid | <input type="text"/> |
| b) % Eyed-larvae purchased from out-of-state | <input type="text"/> |
| c) Ave. price per million eyed-larvae purchased | <input type="text"/> |
| d) # Bushels spat-on-shell planted | <input type="text"/> |
| e) # Bushels "market-size" spat-on-shell harvested/sold | <input type="text"/> |
| f) Ave. price received per bushel of "market-size" spat-on-shell | <input type="text"/> |

Virginia Shellfish Grower Situation & Outlook Survey 2013

Commercial Spat-on Shell Oyster Aquaculture

Please report only oyster production which originated from an onshore hatchery.
This does NOT include "natural strike" product moved to private ground.

12. 2013 *ESTIMATED* Commercial Spat-on-Shell Oyster Aquaculture

- a) # Eyed-larvae purchased
- i. % Diploid
- ii. % Triploid
- b) % Eyed-larvae purchased from out-of-state
- c) Ave. price per million eyed-larvae purchased
- d) # Bushels spat-on-shell planted
- e) # Bushels "market-size" spat-on-shell harvested/sold
- f) Ave. price received per bushel of "market-size" spat-on-shell

13. Comments or Explanatory Notes on 2012 & 2013 Commercial Spat-on-Shell Oyster Aquaculture:

Commercial Oyster Aquaculture

14. Do you aquaculture cultchless (single) oysters?

- Yes No

Virginia Shellfish Grower Situation & Outlook Survey 2013

Commercial Cultchless (single) Oyster Aquaculture

Please report only oyster production which originated from an onshore hatchery.

15. 2012 Commercial Single Oyster Aquaculture

- | | |
|---|----------------------|
| a) # Oysters planted | <input type="text"/> |
| i. % diploid | <input type="text"/> |
| ii. % triploid | <input type="text"/> |
| b) # Seed purchased | <input type="text"/> |
| i. % diploid | <input type="text"/> |
| ii. % triploid | <input type="text"/> |
| c) % Seed purchased from out-of-state | <input type="text"/> |
| d) Avg. price of DIPLOID seed purchased (\$ per 1,000) | <input type="text"/> |
| e) Avg. price of TRIPLOID seed purchased (\$ per 1,000) | <input type="text"/> |
| f) # Seed sold | <input type="text"/> |
| g) % Seed sold out-of-state | <input type="text"/> |
| h) Avg. price of seed sold (\$ per 1,000) | <input type="text"/> |
| i) # Market (non- seed) oysters sold | <input type="text"/> |
| i. % wholesale | <input type="text"/> |
| ii. % retail | <input type="text"/> |
| j) % Market oysters sold out-of-state | <input type="text"/> |
| k) Avg. price per market oyster (\$ per piece) | <input type="text"/> |
| i. Avg. price wholesale | <input type="text"/> |
| ii. Avg. price retail | <input type="text"/> |
| l) # Full-time help | <input type="text"/> |
| m) # Part-time help | <input type="text"/> |

Virginia Shellfish Grower Situation & Outlook Survey 2013

Commercial Cultchless (single) Oyster Aquaculture

16. 2013 ESTIMATED Commercial Single Oyster Aquaculture

- a) # Oysters planted
- i. % diploid
- ii. % triploid
- b) # Seed purchased
- i. % diploid
- ii. % triploid
- c) % Seed purchased from out-of-state
- d) Avg. price of DIPLOID seed purchased (\$ per 1,000)
- e) Avg. price of TRIPLOID seed purchased (\$ per 1,000)
- f) # Seed sold
- g) % Seed sold out-of-state
- h) Avg. price of seed sold (\$ per 1,000)
- i) # Market (non- seed) oysters sold
- i. % wholesale
- ii. % retail
- j) % Market oysters sold out-of-state
- k) Avg. price per market oyster (\$ per piece)
- i. Avg. price wholesale
- ii. Avg. price retail
- l) # Full-time help
- m) # Part-time help

Virginia Shellfish Grower Situation & Outlook Survey 2013

Thank You

17. Comments or Explanatory Notes on 2012 & 2013 Commercial Single Oyster Aquaculture:

18. Please provide any comments on the shellfish aquaculture industry situation.

19. Would you like to receive a copy of the overall report when completed?

Yes No

If yes, please fill out the contact information below:

20. Contact Information (Optional)

Name

Company

Address

City, State, Zip

Telephone

Email

Thank you for completing the Virginia Shellfish Grower Situation and Outlook Survey.

Virginia Shellfish Hatchery Situation & Outlook Survey 2013

Welcome

Thank you for taking a few minutes to complete the following commercial shellfish hatchery survey. With your help, Virginia's past annual surveys have shown how useful timely information is for the shellfish aquaculture industry. Such information is vital to understanding the importance of Virginia's growing aquaculture business to the economy, and in turn the importance of clean water, reasonable land use and tax policies, access to financial capital and the like to shellfish hatcheries and growers.

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Please complete the survey by February 18, 2013.

If you have any questions or would like to discuss, please contact us at:

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Marine Business Specialist
Phone 804-684-7190
Fax: 804-684-7161

Karen Hudson
Aquaculture Specialist
Phone: 804-684-7742
Fax: 804-684-7161

You can also file online by accessing <http://www.surveymonkey.com/s/hatcherysurvey2013>
If filing online, please note your answers can be saved if you exit the survey before completion.
You can then return at a later time to finish the survey.

Virginia Shellfish Hatchery Situation & Outlook Survey 2013

1. 2012 Clam and Oyster Hatchery Production

a) # Clam seed produced

b) # Clam seed sold

i. % external sales

c) % Clam seed sold out-of-state

d) # Oyster eyed larvae produced

e) # Oyster eyed larvae sold

i. % external sales

ii. % diploid

iii. % triploid

f) % Oyster eyed larvae sold out-of-state

i. % diploid

ii. % triploid

g) Ave price per million oyster eyed larvae sold

i. diploid

ii. triploid

h) # Single oyster seed produced

i) # Single oyster seed sold

i. % external sales

ii. % diploid

iii. % triploid

j) # Single oyster seed sold out-of-state

k) # Full-time help

l) # Part-time help

Virginia Shellfish Hatchery Situation & Outlook Survey 2013

2. 2013 *ESTIMATED* Clam and Oyster Hatchery Production

- a) # Clam seed produced
- b) # Clam seed sold
 - i. % external sales
- c) % Clam seed sold out-of-state
- d) # Oyster eyed larvae produced
- e) # Oyster eyed larvae sold
 - i. % external sales
 - ii. % diploid
 - iii. % triploid
- f) % Oyster eyed larvae sold out-of-state
 - i. % diploid
 - ii. % triploid
- g) Ave price per million oyster eyed larvae sold
 - i. diploid
 - ii. triploid
- h) #Single oyster seed produced
- i) # Single oyster seed sold
 - i. % external sales
 - ii. % diploid
 - iii. % triploid
- j) # Single oyster seed sold out-of-state
- k) # Full-time help
- l) # Part-time help

Virginia Shellfish Hatchery Situation & Outlook Survey 2013

3. Comments or Explanatory Notes on 2012 & 2013 Commercial Shellfish Hatchery:

4. Please provide any comments on the shellfish hatchery situation.

5. Contact Information (Optional)

Name

Address

City, State, Zip

Telephone

Email

Thank you for completing the Virginia Shellfish Hatchery Situation and Outlook Survey.



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