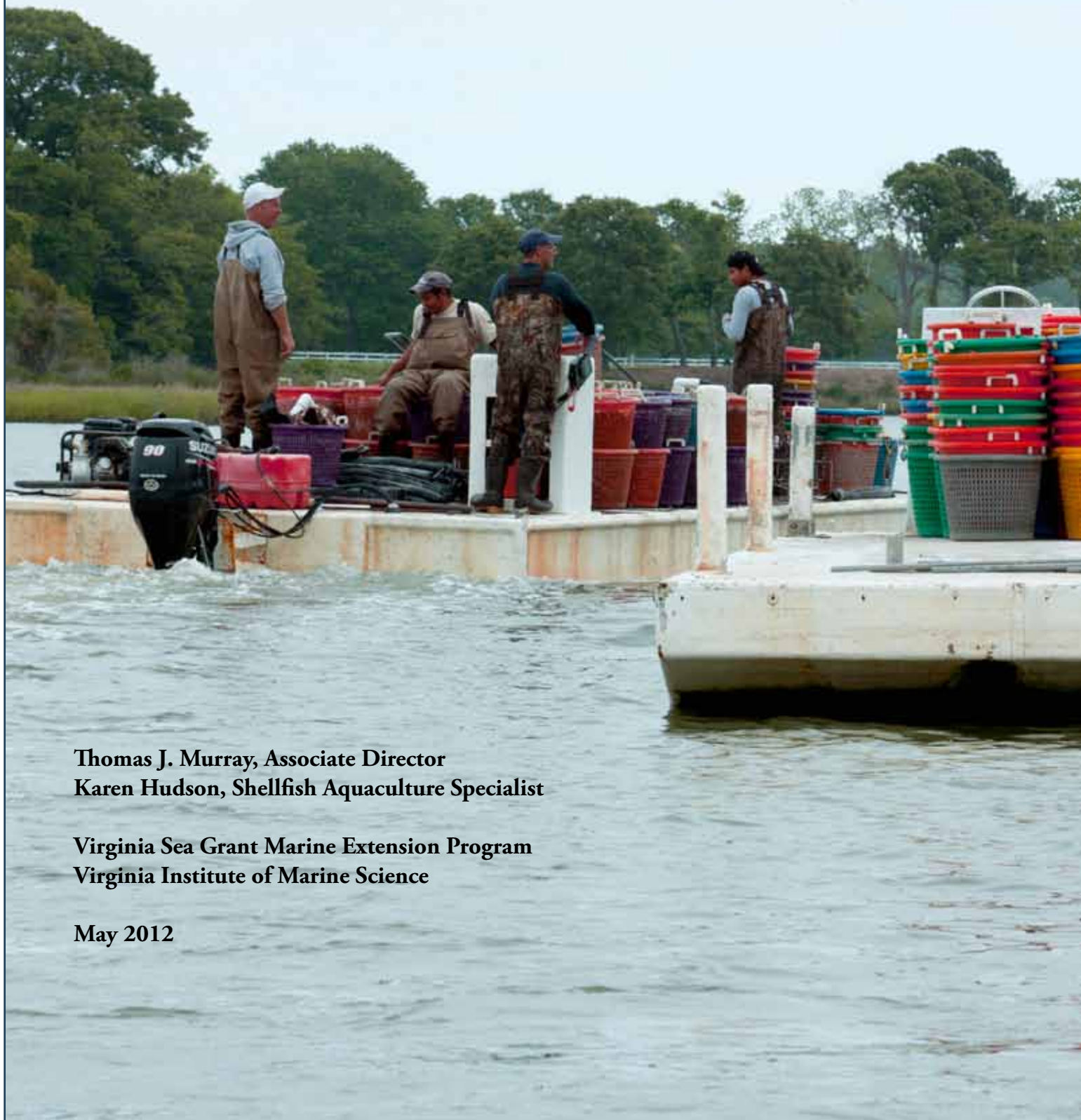


# **Virginia Shellfish Aquaculture Situation and Outlook Report**

## **Results of 2011 Virginia Shellfish Aquaculture Crop Reporting Survey**



**Thomas J. Murray, Associate Director**  
**Karen Hudson, Shellfish Aquaculture Specialist**

**Virginia Sea Grant Marine Extension Program**  
**Virginia Institute of Marine Science**

**May 2012**



# Virginia Shellfish Aquaculture Situation and Outlook Report

## Results of 2011 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 2012.

## 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. A preliminary version of the survey instrument was pilot tested and revised based upon the field testing (Appendices I & II). Fifty-six complete, useable surveys were returned on the internet, by mail, and by fax, including eighteen clam growers, forty-four oyster growers, four shellfish hatcheries and eleven growers who cultured both molluscs. Discussions with industry members suggest that the firms responding represent more than 90% of Virginia aquaculture's total production of market-size oysters and clams during 2011.

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

## Summary of Findings

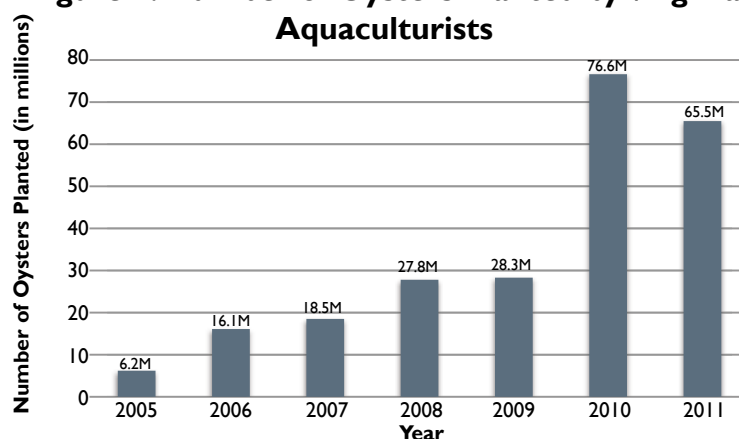
### Virginia Oyster (*Crassostrea virginica*) Aquaculture 2005-2011

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.<sup>1</sup> Methods of aquaculture have progressed into a more intensive or containerized form utilizing cages, racks, floats, and the like. In addition, extensive planting on bottom is resuming but using shell struck with eyed oyster larvae produced from a hatchery.

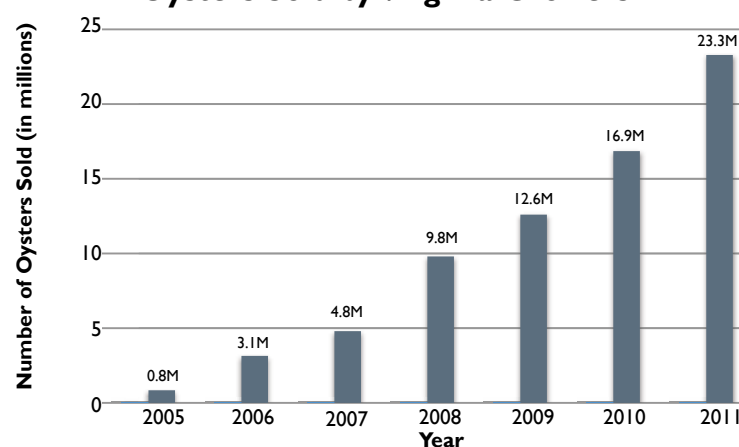
#### *Intensive Culture (using cultchless, or single, seed)*

The growers surveyed reported a 14% decrease in the number of single oysters planted in 2011 as seen in Figure 1. This does not reflect the expectations reported from the previous survey which estimated seventy eight million single oysters planted, which would have been a slight increase from 2010 numbers. This drop in planting could be attributed to the expansion into extensive

**Figure 1. Number of Oysters Planted by Virginia Aquaculturists**



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



(spat-on-shell) culture. Even with the reported reduction this year, the expectations for 2012 plantings predict an estimated increase of ten percent which is just under the numbers planted for 2010.

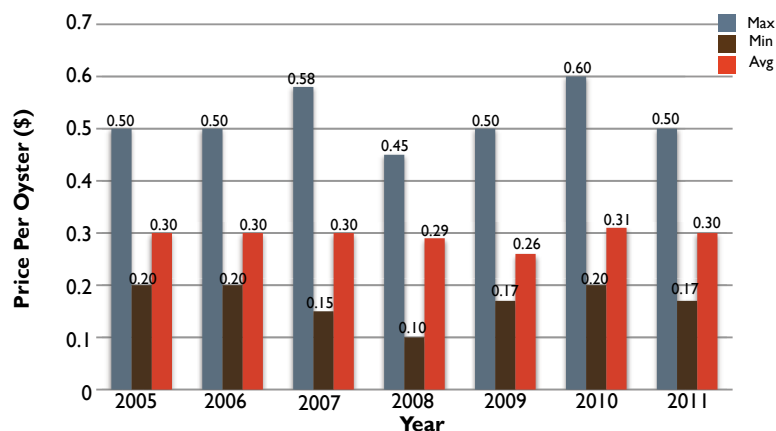
#### *Oyster Sales and Prices*

The numbers of market oysters sold by Virginia growers increased in 2011 by 38% to twenty three million (Figure 2.). This is similar to the increases reported for the

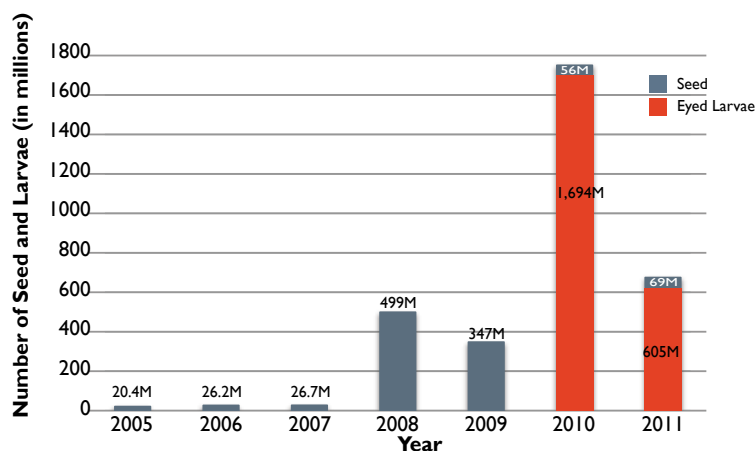
<sup>1</sup> Historically the most common oyster "culture" technique in Virginia was the transplanting of wild harvested seed to leased growing grounds. Prior to the onslaught of diseases, the grower paid little attention to the grounds between the time seed was planted and the time mature oysters were harvested, some 2 or 3 years later. Today there is little such culture practiced and the results here do not include information on such oyster planting. The results here represent the use of aquaculture practices adopted as a result of increased oyster disease and predation using hatchery produced seed.



**Figure 3. Oyster Prices Reported by Virginia Growers**



**Figure 4. Oyster Seed and Larvae Sold by Virginia Hatcheries**



last few years. The growers' expectations indicated in this survey estimate more than thirty three million cultured market oysters will be sold by Virginia growers in 2012 (a 44% increase). Combining the overall sales of single, market oysters with the weighted average price per oyster, it is estimated that the total revenue for oyster aquaculturists (not including spat on shell production) is \$6.7 million.

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 continued general stability in the average prices received for cultured oysters over

the six-year period while volume of sales have continued to expand.<sup>2</sup>

### *Extensive Culture (Spat-on-Shell)*

With the expansion of large-scale "remote setting" or "spat-on-shell" oyster planting in Virginia during 2008 and continuing today, the entire hatchery volume picture changed, as existing firms became active in purchasing not just cultchless seed, but large quantities of eyed larvae for spat-on-shell development.<sup>3</sup> 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 where 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 use of eyed larvae for spat-on-shell continues to be clear but depends on a consistent

2 During 2011 the median price was \$0.30 per market oyster.

3 For a complete description of the spat on shell remote setting industry development see: <http://web.vims.edu/adv/frg/FinalSpatonShell%20Project.pdf?svr=www>

production of eyed larvae, which was problematic in 2011. This report does not outline the industry trends of spat-on-shell culture because a portion of this development over the years has been subsidized by federal monies. Trends will be reported in the future when the investment is coming solely from private dollars and the trends may be considered more sustainable for forecasting purposes.

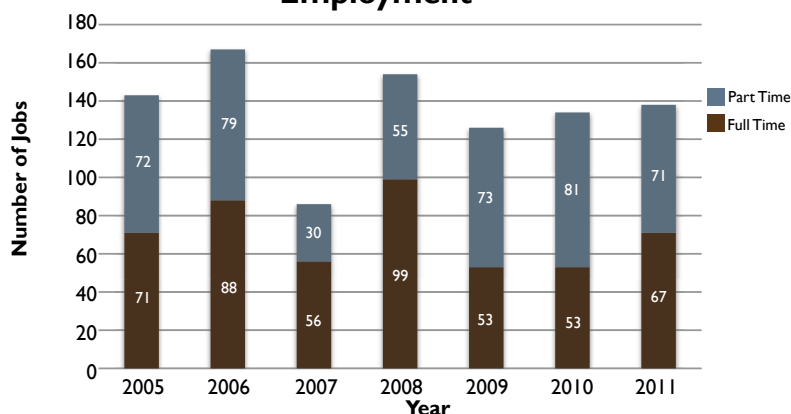
### *Oyster Hatcheries*

The expansion of hatchery infrastructure in recent years prompted the addition of hatchery-specific survey questions beginning in the 2010 survey year. For the 2011 survey, hatchery questions were relocated to a stand-alone survey sent directly to the Virginia shellfish hatcheries.

Sales of oyster seed and eyed larvae by Virginia hatcheries realized an almost four-fold increase from 2008 to 2010 with the majority being eyed larvae (1.7 billion). Oyster growers have adopted the use of improved strains of oyster seed and larvae over the years to optimize growth rates, disease resistance, and meat quality during warmer months. The production and use of triploid eyed larvae and seed is the overwhelming majority reported by growers, and hence produced by hatcheries. In 2011 the percent triploids used in Virginia farms was 95%. Industry reports 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 potential for future expansion lies in the production of oyster eyed larvae for spat-on-shell aquaculture. Difficulties in hatchery production of eyed larvae were reported in the summer of 2011 and attributed to unknown water quality complications. This led to a significant drop in the number of eyed larvae sold from the previous year, as seen in Figure 4. However, this has sparked industry and academic collaborations focused

**Figure 5. Estimated Virginia Oyster Aquaculture Employment\***



\*It has come to the author's attention that oyster employment graphs from the 2009 and 2010 editions of this report contained some errors, which have been corrected here.

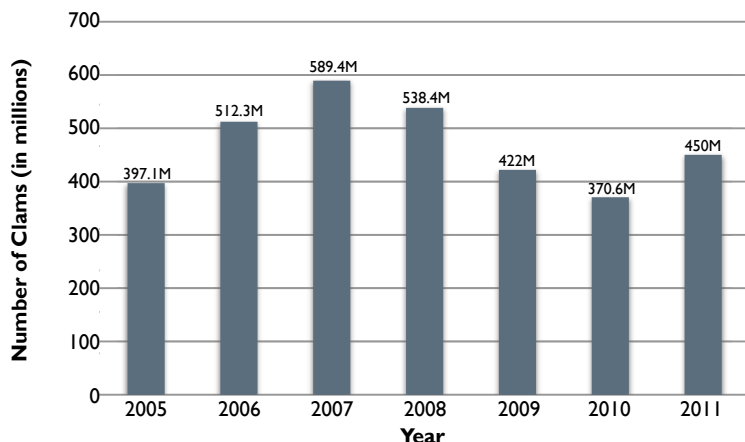
on better understanding water quality as it relates to hatchery production. The forecast for 2012 is that hatcheries will sell close to two billion eyed larvae.

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 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.

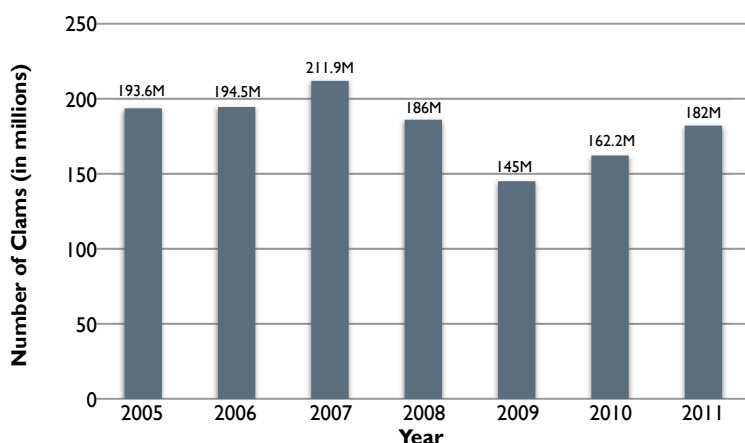
### *Employment*

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 consistent expectation that with successful development of both spat-on-shell and cultch-less oyster aquaculture, additional employment will be required to meet the greatly expanded planting and production needs.

**Figure 6. Number of Hard Clams Planted in Virginia**



**Figure 7. Number of Hard Clams Sold in Virginia**



### **Virginia Clam (*Mercenaria mercenaria*) Aquaculture 2005-2011**

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 subsequent two years. Reports for 2011, however, indicate a 22% increase in the number of clams planted. Despite the variation since 2008, and based upon previous economic assessments compiled by the authors, Virginia continues to lead the nation in the culture of hard clams.

As depicted in Figure 6, clam growers reported an increase in seed plantings during the most recent year. The firms reporting indicated that during 2011 they increased plantings by nearly eighty million clams (22%) compared to 2010. The outlook for 2012 estimates a comparable number of clams planted as in 2011.

#### *Clam Sales and Prices*

The 2011 crop reporting survey reflects a slight increase (12%) in the total number of Virginia market clams sold between 2010 and the end of 2011. During 2011, it is estimated that Virginia's total farm output reached 182 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 2011 was \$26 million—a slight increase of \$1 million from the prior year.

Figure 8 displays the survey findings regarding relative prices received for market clams. The weighted average price reported

per market clam at the farm gate was \$0.16 during 2011, the same as the previous year.<sup>4</sup>

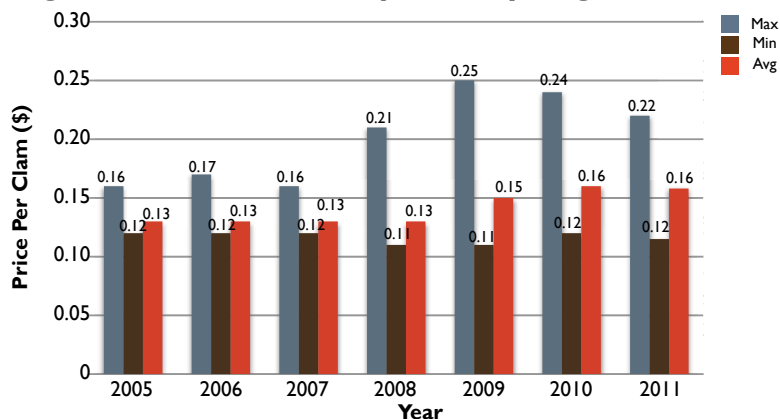
### Clam Hatcheries

Clam seed production and sales have remained stable for the last several years and the reported average price of clam seed has remained the same for the last several years.<sup>5</sup> Industry sources indicate much of the hatchery capacity is dedicated to producing seed for the hatchery owner's own planting. Essentially, all of the seed produced is planted in Virginia. This vertically integrated system with eventual sales to many out-of-state consumers adds important economic development to local coastal communities.

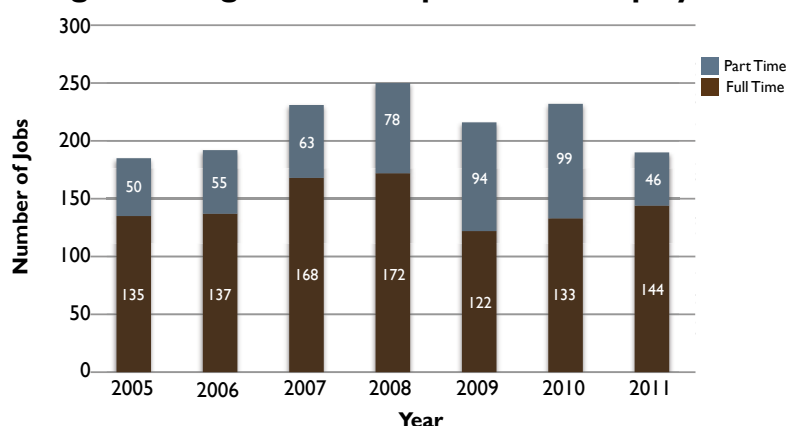
### Employment

Figure 9 demonstrates a slight increase in the full-time level of employment while the part time showed a decrease. 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.

**Figure 8. Clam Prices Reported by Virginia Growers**



**Figure 9. Virginia Clam Aquaculture Employment**



4 Smaller niche growers, with production and sales of less than 50,000 clams reported average prices as high as \$0.22. 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 \$0.151 per market clam in 2011.

5 The price of seed depends upon size but the modal price reported was \$0.02 per seed in 2011; essentially the same since 2007.

## Appendix I: Grower Survey

# Virginia Shellfish Grower Situation & Outlook Survey 2012

## Welcome

Thank you for taking a few minutes to complete the following commercial shellfish 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 March 1, 2012.***

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

**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.**

To begin the survey, click Next.



# Virginia Shellfish Grower Situation & Outlook Survey 2012

## 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

# Virginia Shellfish Grower Situation & Outlook Survey 2012

## Commercial Clam Aquaculture

### 6. 2011 Commercial Clam Aquaculture

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

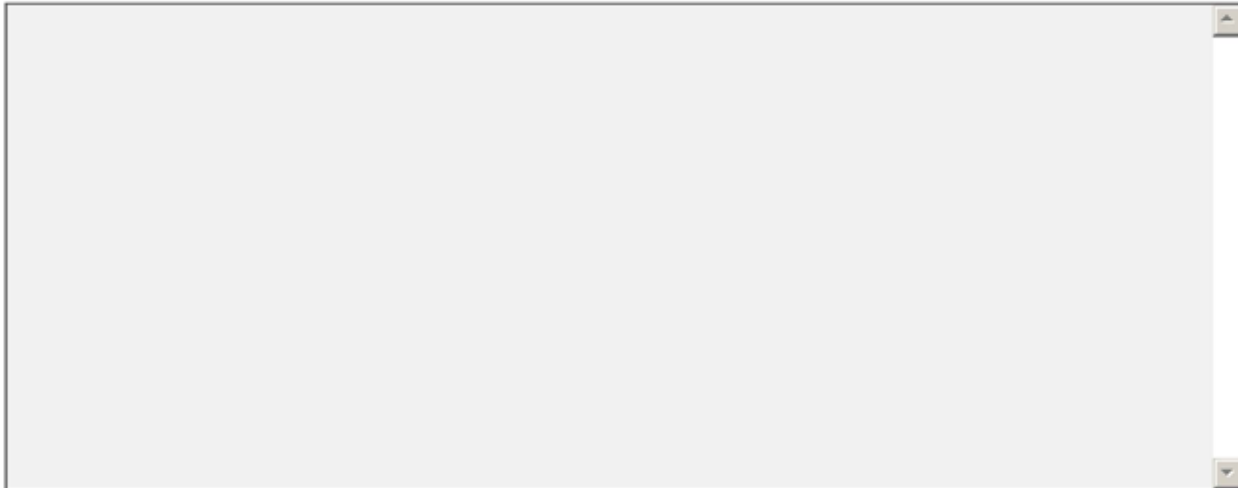
### 7. 2012 *ESTIMATED* Commercial Clam Aquaculture

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

# Virginia Shellfish Grower Situation & Outlook Survey 2012

## Commercial Clam Aquaculture

### 8. Comments or Explanatory Notes on 2011 & 2012 Clam Aquaculture:



## Commercial Oyster Aquaculture

### 9. Do you aquaculture oysters?

- ☐ Yes
- ☐ No

# Virginia Shellfish Grower Situation & Outlook Survey 2012

## Commercial Spat-On-Shell Oyster Production

Please report only oyster production which originated from an onshore hatchery.  
No "natural strike" product moved to growing grounds.

### 10. 2011 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.) Avg. 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.) Avg. price received per bushel of "market-size" spat-on-shell sold	<input type="text"/>

### 11. 2012 *ESTIMATED* 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.) Avg. 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.) Avg. price received per bushel of "market-size" spat-on-shell sold	<input type="text"/>

### 12. Comments or Explanatory Notes on 2011 & 2012 Commercial Spat-On-Shell Oyster Aquaculture:



# Virginia Shellfish Grower Situation & Outlook Survey 2012

## Commercial Cultchless (Single) Oyster Production

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

***No "natural strike" product moved to growing grounds.***

### 13. 2011 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 1000)	<input type="text"/>
e.) Avg. price of TRIPLOID seed purchased (\$ per 1000)	<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 1000)	<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 2012

## 14. 2012 ESTIMATED 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 1000)	<input type="text"/>
e.) Avg. price of TRIPLOID seed purchased (\$ per 1000)	<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 1000)	<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"/>

## 15. Comments or Explanatory Notes on 2011 & 2012 Commercial Cultchless (Single) Oyster Aquaculture:

# Virginia Shellfish Grower Situation & Outlook Survey 2012

## Thank You

**16. Please provide any comments on the shellfish aquaculture industry situation.**

**17. Would you like to receive a copy of the overall report when completed? If so, please fill out the contact information below.**

☐ Yes

☐ No

**18. Contact Information (Optional)**

Name	<input type="text"/>
Address	<input type="text"/>
City, State & Zip	<input type="text"/>
Telephone	<input type="text"/>
Email	<input type="text"/>

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

## Appendix 2: Hatchery Survey

# Virginia Shellfish Hatchery Situation & Outlook Survey 2012

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

**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.**

To begin the survey, click Next.



# Virginia Shellfish Hatchery Situation & Outlook Survey 2012

## Shellfish Hatchery Production

### 1. 2011 Clam & Oyster Hatchery Production

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

# Virginia Shellfish Hatchery Situation & Outlook Survey 2012

## 2. 2012 ESTIMATED Clam & Oyster Hatchery Production

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

## 3. Comments or Explanatory Notes on 2011 & 2012 Commercial Shellfish Hatchery:

# Virginia Shellfish Hatchery Situation & Outlook Survey 2012

## Thank You

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

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

☐ Yes

☐ No

### 6. Contact Information (Optional)

Name

Address

City, State & Zip

Telephone

Email

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



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