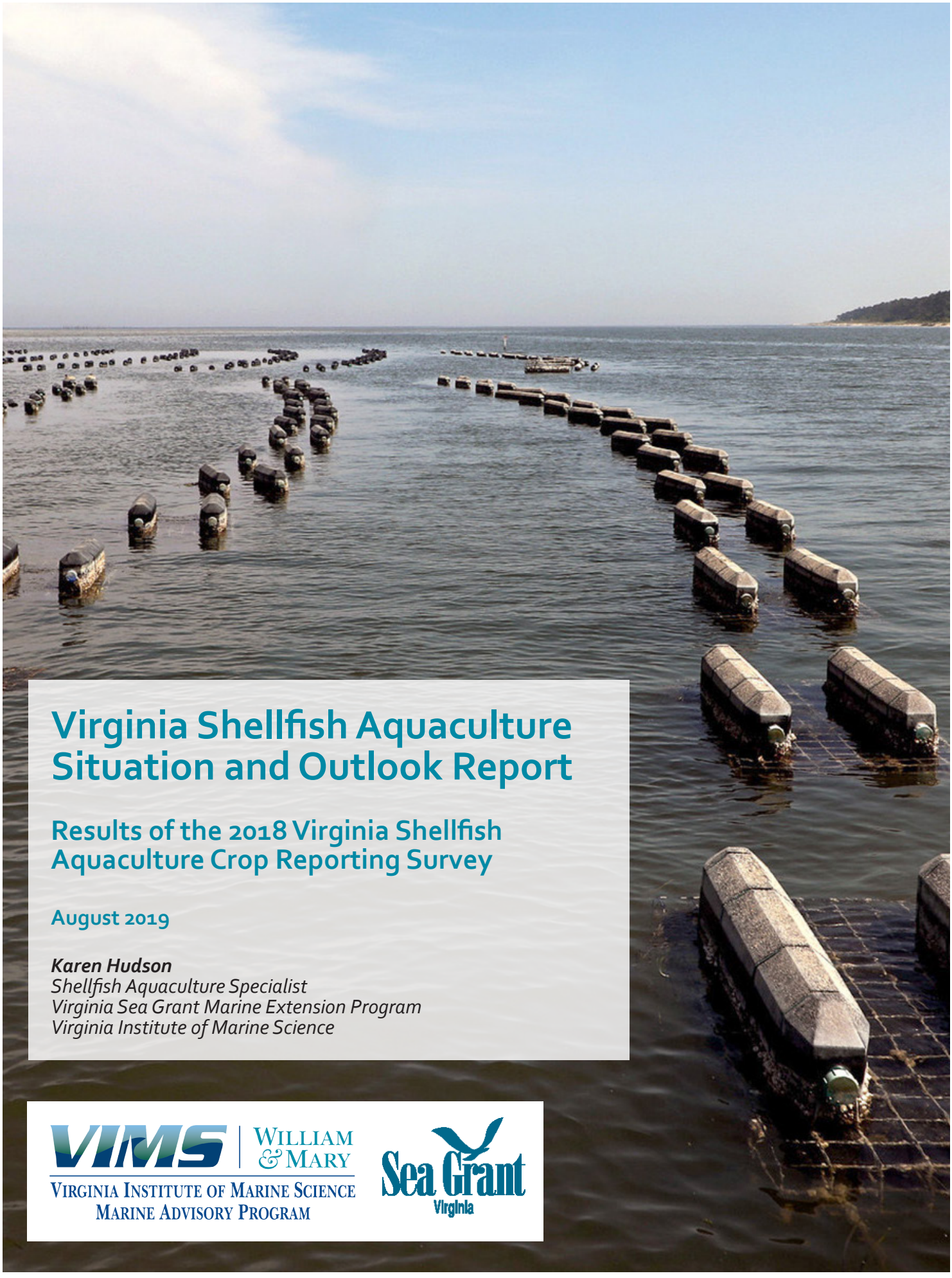

Virginia Shellfish Aquaculture Situation and Outlook Report

Results of the 2018 Virginia Shellfish Aquaculture Crop Reporting Survey

August 2019

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VIMS | William & Mary
Virginia Institute of Marine Science
Marine Advisory Program

Sea Grant Virginia

The complete report can be found online at https://doi.org/10.25773/jc19-y847

VIMS Marine Resource Report No. 2019-8

Virginia Sea Grant VSG-19-3

Executive Summary

The shellfish aquaculture industry in Virginia continues to grow adding significant value to the Commonwealth's seafood marketplace. Today, watermen harvest both hard clams and oysters from the Commonwealth'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[1].

This survey, in its 13th year, is intended to continue annual assessments with which to gauge growth and inputs in Virginia's hatchery-based shellfish aquaculture industry. This report is based upon an industry survey completed during the first quarter of 2019.

While these trends are widely acknowledged, there had been no consistent reporting of production and economic trends in Virginia's shellfish aquaculture industry until this annual survey was initiated in 2006. Periodic assessments are necessary to inform growers and related interests about the actual status and trends in the industry.

Highlights

- 2018 farm gate value for Virginia shellfish aquaculture was $53.3 million
  - $38.8 million Hard Clams
  - $14.5 million Oysters
- Prices and markets remain strong for Virginia shellfish products
- Virginia is 1st in the U.S. for hard clam production
- Virginia is 1st on the East Coast of the U.S. for Eastern oyster production
- Virginia shellfish aquaculture directly employs hundreds of Virginians
- Clams are the biggest contributor to Virginia's shellfish aquaculture economic value
- Oysters are the most rapidly developing sector of Virginia's shellfish aquaculture
- Virginia's shellfish production comes from a system of vertically integrated private hatcheries

[1] Historically, and still practiced today, is the oyster "culture" technique of transplanting wild harvested seed to leased growing grounds; however, the results here do not include information on such oyster planting.

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[2]. Each year, the survey instrument is evaluated and revised based upon field testing (Appendices 1 & 2). A total of 58 complete, useable surveys were returned via the Internet or mail. These included responses from 19 clam growers, 46 intensive oyster growers, 7 extensive oyster growers, 5 shellfish hatcheries, and 12 growers who cultured both molluscs. It is believed that the survey is representative of overall trends in 2018 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

Oyster Aquaculture (Crassostrea virginica)

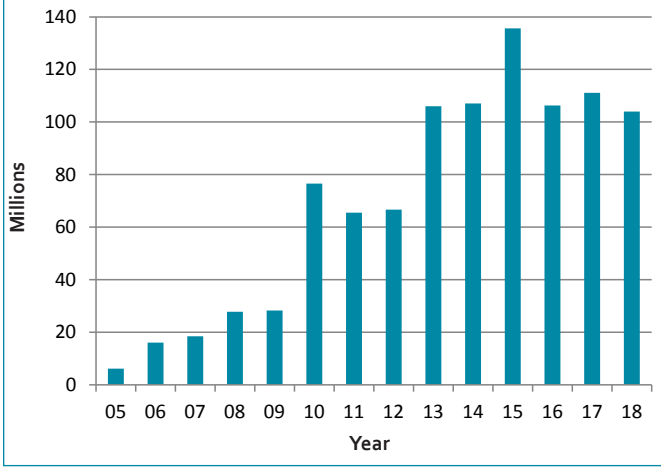
The results in this report reflect the use of aquaculture practices adopted as a result of increased oyster disease and predation which utilize only hatchery-produced seed and larvae. There are two methods of hatchery-based oyster aquaculture production in Virginia, intensive culture (containerized) and extensive culture (spat-on-shell). Both typically use genetically improved stocks and triploid, or "spawnless" oysters. 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.

Intensive Culture (containerized)

Intensive culture methods use cultchless, or single seed, containerized for predator protection. Containerization varies but generally consists of off-bottom cages, racks and in some cases, floats. Intensive oyster culture requires more labor in gear and product maintenance and is generally considered more expensive. However, the end result is a consistent and high quality product that has the ability to obtain a higher price in the boxed and half shell markets.

Figure 1 shows a reported 103.9 million single oysters planted in 2018, a 6% decrease from 2017 and 8% less than projected for 2018. Growers reported that triploids made up 85% of their plantings in 2018 which is similar to reports from the past two years. The outlook for 2019 suggests a 3% decrease in oysters planted by Virginia growers. Growers reported that the above-average rainfall and record low salinities in the Bay in 2018 were problematic. Reports indicated these conditions slowed oyster growth which contributed to lower sales and the reduced outlook for 2019 plantings.

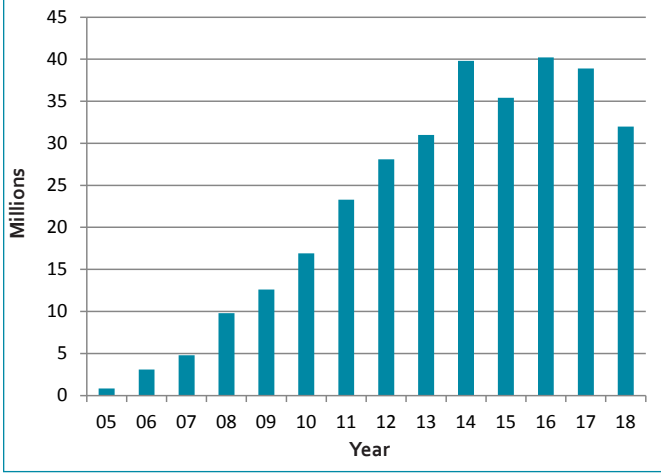
Figure 1. Intensive Culture: Number of Single Oysters Planted by Virginia Growers



Intensive Oyster Sales and Prices

Four of the 46 oyster survey responses indicated some sort of cooperative relationship to market but most arrangements were similar to those with contractors, with no equity exchange such as providing seed[3]. Therefore, individual participation in the survey remains critical to capture the industry trends. The 2018 results indicated the total number of market oysters sold by Virginia growers, subtracting the reported sales from those indicating involvement with a cooperative, was 32.1 million (Figure 2). This was a decrease of 17% from 2017 and 23% less than the outlook from the previous survey. The industry outlook for 2019 is a 13% increase for 2019 sales which,

Figure 2. Intensive Culture: Number of Market Oysters Sold by Virginia Growers



[2] Virginia Marine Resources Commission's Licensed Aquaculture Product Owners List.

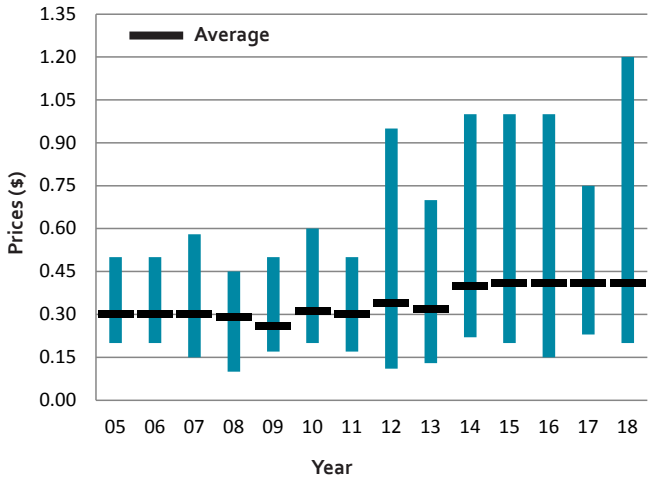
[3] In 2013, the crop reporting survey was expanded to ask whether the grower has a "cooperative" agreement with a larger oyster producer who would likely report the sales numbers. This was due to reports of oyster cooperative arrangements and was an effort to reduce the potential for double counting oyster sales.

if reached, would translate to 36 million market oysters sold. A marketing concern reported from many growers in the past two survey years, but not as problematic in 2018, was heavy wild spat fall on the cultured product which excludes product from entering the higher-value boxed market. As aforementioned, the record low salinities in the Bay in 2018 were reported to be very challenging; contributing to slow growth and the reduced volume to market.

For the purposes of this report, oyster prices are not broken down as to market segment (i.e. primary wholesale, secondary wholesale, retail, etc.). Figure 3 shows an average price of $0.41 per oyster in 2018, no change from the previous three years[4]. Trends in the percentage of single oysters sold into wholesale markets remain fairly consistent at greater than 90% for the last ten years. The percentage of single oysters sold out of state in 2018 was 62% which is the average from the last 4 years of reports.

Combining the overall sales of single, market oysters with the weighted average price of $0.407 per oyster, it is estimated that the total 2018 revenue for containerized oyster aquaculturists (not including spat-on-shell) was $13.1 million, a 10% decrease from 2017.

Figure 3. Oyster Prices Reported by Virginia Growers



Extensive Culture - Spat-on-Shell

Extensive culture is also referred to as remote setting or spat-on-shell. The primary advantage of spat-on-shell cultivation is that it requires less labor and fewer materials than single oyster cultivation. Therefore, this method is a more economically feasible option for producing large quantities of local oysters for use by Virginia's oyster processors. Oyster eyed larvae purchased from the hatchery are transported to setting sites, struck on containerized oyster shells and ultimately planted directly on the bottom. Because spat-on-shell cultivation produces oysters grown in clusters (similar to wild-caught oysters), the primary product is predominantly for shucking rather than for half-shell consumption.

The spat-on-shell process has been enhanced since its start in 2008. Improvements in the quality of eyed larvae coming out of the hatcheries and optimized remote setting methods have cut in half the number of eyed larvae required per bushel of shell. While large-scale spat-on-shell cultivation has been used in Virginia for the last several years, federal monies had subsidized a large portion of this development which impeded relevant forecasting[5]. These subsidies are gone, allowing for inclusion of industry trends. In 2018, growers reported planting 35,000 bushels, a 3% increase from 2017. The industry forecast for 2019 is to increase by 29% to 45,000 bushels. The industry's expansion depends on a consistent production of large quantities of eyed larvae, which can be problematic due to poor water quality such as the record low salinities in the Bay in 2018.

Extensive Culture - Sales and Prices

In 2018, growers reported harvesting 26,000 bushels of spat-on-shell, a 4% decrease from 2017 reports and 65% decrease from reported outlook. Expectations for 2019 are an increase of 54% to 40,000 harvested bushels of spat-on-shell. The average price per bushel reported increased to $55 making the 2018 farm gate value for spat-on-shell $1.4 million; the same as 2017.

[4] During 2018 the median price was $0.40 per market oyster, same as the previous two years. The weighted average price was $0.407 per market oyster in 2018, an increase of $0.033 from 2017.

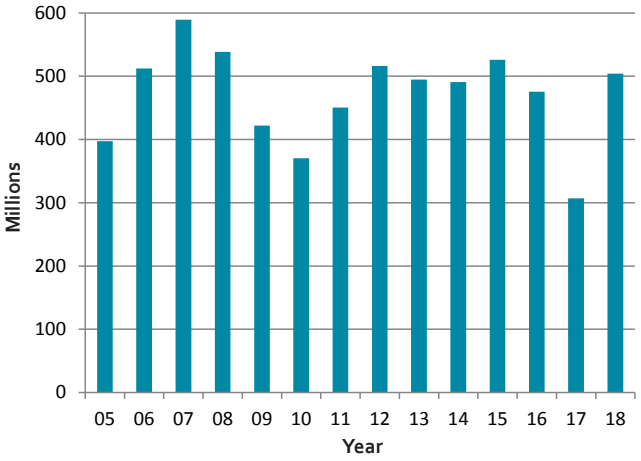
[5] According to prior grower survey reports, the number of harvested bushels of spat-on-shell has continually increased from roughly 2,000 in 2009 to almost 13,000 in 2012 and over 38,000 bushels in 2014. These numbers include a mix of plantings funded by private investment and subsidized support.

Hard Clam (Mercenaria mercenaria) Aquaculture

Clam aquaculture is a relatively mature aquaculture industry that has dominated over wild clam harvest in Virginia for more than a decade. Clams are not as low-salinity tolerant as oysters. Thus the majority of clam production comes from the higher salinity areas on the eastern shore including both bayside and seaside. Clams burrow into the sediment which makes the production methods much different than oyster culture. There is a standard method used for clam aquaculture in Virginia in which beds are planted in plots and covered with mesh net for predator protection. Planting to harvest is a two year process, longer than in oyster aquaculture.

Based on previous economic assessments compiled by the author, Virginia continues to lead the nation in the production of cultured hard clams. As depicted in Figure 4, clam growers reported a 64% increase in seed plantings during 2018 to a total of 503.7 million clams. This was a 41% increase in the outlook from 2017. The industry outlook for 2019 predicts an increase of less than 1%, to 505 million individual clams planted. Growers report winter icing events play a significant role in hard clam survival and sales.

Figure 4. Number of Hard Clams Planted in Virginia (millions)



Clam Sales and Prices

The 2018 crop reporting survey reflects a less than 1% increase in the number of market clams sold over the previous year to 177.7 million (Figure 5). Growers report the 2018 market sales reflect a poor clam seed season in 2016. The industry outlook for 2019 predicts an increase of less than 1%, to 179 million individual clams sold, which is reported to reflect a poor seed season in 2017. Trends in the percentage of market clams sold into wholesale markets have remained in the range of 94% to 99% for the last ten years and were reported at 99% in 2018; the same as the past 3 years. During 2018, 88% of market clams were sold out of state. This export level has ranged from 85% to 93% for the last seven years.

Figure 6 displays the survey findings regarding relative prices received for market clams. The average price reported per market clam at the farm gate was $0.20 during 2018, the same as the previous two years. Based on the overall sales and the weighted average price of $0.218 per market clam, it is estimated that total revenue for hard clam aquaculturists in 2018 was $38.8 million, an increase of 3.5% from the prior year.

Figure 5. Number of Hard Clams Sold by Virginia Growers

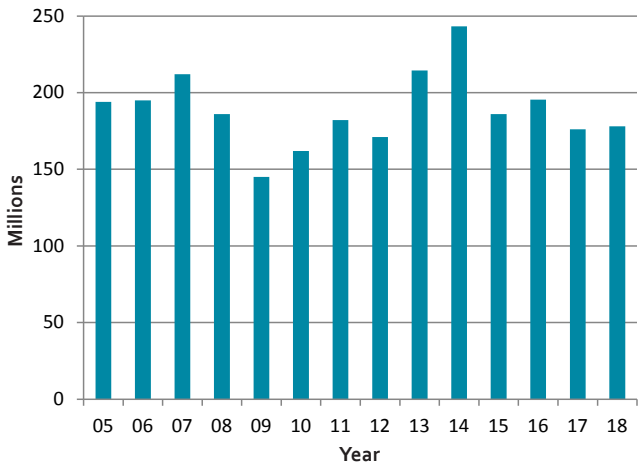
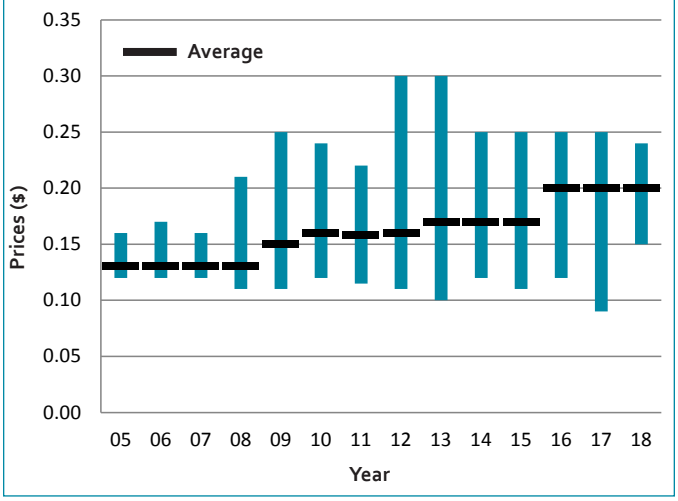


Figure 6. Clam Prices Reported by Virginia Growers



Shellfish Hatcheries[6]

The vast majority of Virginia's production comes from a vertically integrated system with about eight commercial shellfish hatcheries, of various scales, producing clam seed, oyster seed, and oyster eyed larvae. Products are either planted by the hatchery owners themselves in their aquaculture operations, or sold to other growers (Figure 7). The hatcheries are widely distributed throughout coastal Virginia, located on western and eastern shores, both bayside and seaside. Oyster production occurs on both shores; however, hard clam production occurs primarily on the eastern shore due to the higher salinity requirement for this shellfish species. The production seasons are slightly different with hard clam production ending typically two months prior to oysters, which continues into early September.

Since 2008, the expansion of large-scale oyster spat–on-shell in Virginia has changed oyster production volume, as shown in Figure 8. Existing firms became active in purchasing not just cultchless oyster seed, but large quantities of oyster eyed larvae for spat-on-shell development. In 2018, oyster hatcheries reported sales of 258 million single seed and 2.0 billion eyed larvae[7]. These numbers represent a 1% increase in seed sales and 26% decrease in eyed larvae sales from 2017. Hatchery operators reported the high rainfall and low salinity in 2018 negatively impacted oyster larvae production and there is concern it may impact larval production in 2019. Outlook reported for 2019 was similar seed production with a modest increase in eyed larvae. Triploid seed and eyed larvae production are reported to be 97% and 79%, respectively. The percentage of triploid eyed larvae produced decreased by 11% from 2017. The average price of eyed larvae has shown a continual increase over the past four years; increasing 2% to $363 per million in 2018.

Clam seed production increased in 2018 by 19% with seed sales remaining relatively stable as well as the reported average price of clam seed. 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.

Water quality remains a critical, and challenging, aspect for shellfish hatcheries. Water quality issues of unknown origin were reported by oyster hatcheries in 2009 and 2011 and show a clear impact on production as seen in Figures 7 and 8. Research is ongoing to understand the water quality parameters that negatively impact consistent production, with the goal of providing management tools for hatcheries to mitigate the issues. Record low salinities recorded in Chesapeake Bay from May through December 2018 were reported to be problematic for production as well as grow out.

Figure 7. Virginia Shellfish Hatchery Production

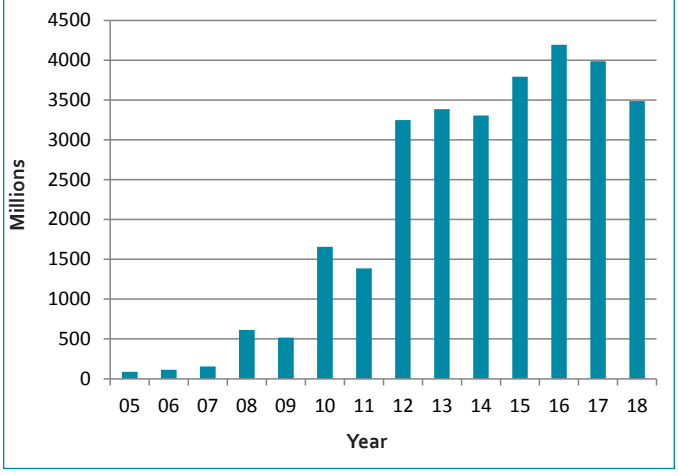
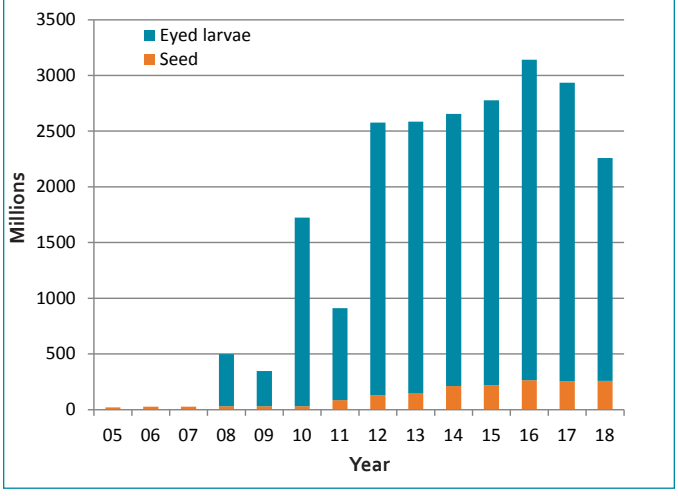


Figure 8. Oyster Hatchery Sales



[6] The expansion of oyster hatchery infrastructure in 2009 prompted the addition of hatchery-specific survey questions in 2010. Hatchery questions were then relocated to a standalone survey sent directly to the shellfish hatcheries beginning in 2011 (Appendix 2).

[7] Over the last six years, Virginia oyster hatcheries have reported selling a percentage of their total seed and eyed larvae production out-of-state. These average 35 percent for oyster seed and 13 percent for oyster eyed larvae. These sales support development of oyster aquaculture in surrounding states with limited, or no private hatchery capability of their own.

Shellfish Aquaculture Employment

The employment situation for all shellfish aquaculture is complicated by the diversity of the firms involved. In view of this fact, the trends in these employment figures should not be overly interpreted (Figures 9 and 10). The difficulty of estimating the time and labor associated with relatively small-scale oyster aquaculture conducted in conjunction with other business lines makes estimates of oyster culture labor problematic at this point in industry development. The vast majority of the clam production is conducted by relatively large vertically integrated companies who often contract with self-employed grower cooperatives which, as with oysters, complicate the estimates of labor involved in this industry.

Given the ambiguity of reporting labor used for both oyster and clam culture noted above, it is useful as a benchmark to review the economic impact model developed for Virginia shellfish aquaculture for the 2012 growing year. The IMPLAN model used for that assessment estimates that just under one (0.9) full time equivalent (FTE) is needed to produce $100,000 of cultured shellfish output. Based upon this model, 480 FTEs would be needed to produce the 2018 estimated output of $53.3 million. These figures do not represent the indirect and induced employment multipliers.

Figure 9. Virginia Oyster Farm Employment

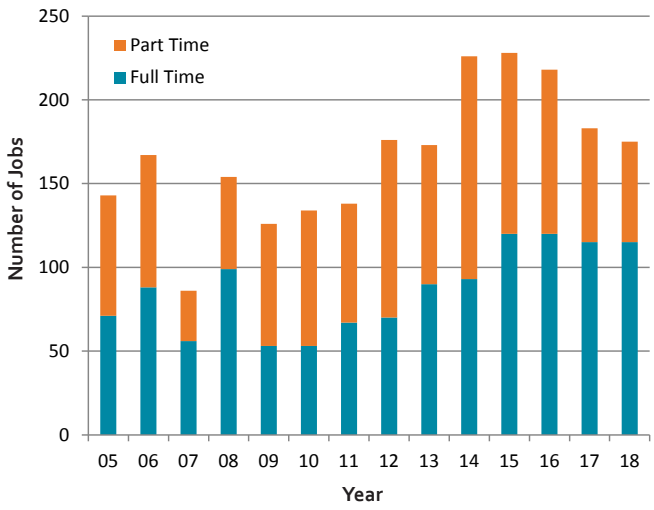
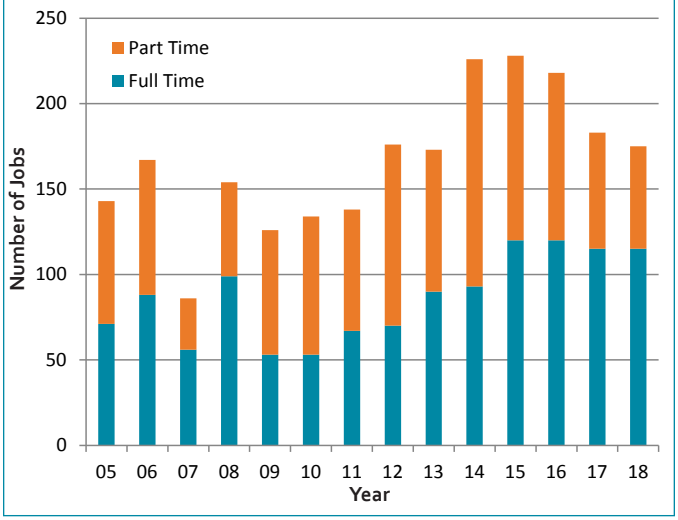


Figure 10. Virginia Clam Farm Employment



Appendix 1: Grower Survey

Virginia Shellfish Grower Situation & Outlook Survey 2019

Welcome

Thank you for taking a few minutes to complete the following commercial aquaculture survey. This survey is meant to capture trends in hatchery-based shellfish aquaculture activity on private ground. If you do not participate in hatchery-based culture, please disregard.

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 and complete the information provided, the better the characterization of the Virginia aquaculture industry.

Please complete the survey by February 28, 2019.

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

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

You can also file online by accessing https://www.surveymonkey.com/r/grower2019

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Virginia Shellfish Grower Situation & Outlook Survey 2019

Commercial Clam Aquaculture

1. **Do you aquaculture clams? (If NO, skip to #9)** Yes ○ No ○

2. **Do you have a clam hatchery?** Yes ○ No ○

3. **Do you "re-sell" seed?** Yes ○ No ○
Do you grow small seed to a larger size for resale to another grower(s)

4. **Do you have a "cooperative" agreement with a larger clam producer who will likely be reporting these numbers?** Yes ○ No ○

5. **Do you purchase hard clam crop insurance?** Yes ○ No ○

6. **2018 Commercial Clam Aquaculture**

a) # Clams planted

b) % Seed purchased

c) Ave. price of seed purchased

d) # Seed sold

i. % seed sold out-of-state

e) # Market (non-seed) sold

i. % wholesale

ii. % retail

iii. % market clams sold out-of-state

f) Ave. price per market clam

i. Avg. price wholesale

ii. Ave. price retail

g) # Full-time help

h) # Part-time help

Virginia Shellfish Grower Situation & Outlook Survey 2019

Commercial Clam Aquaculture

7. 2019 *ESTIMATED* Commercial Clam Aquaculture

a) # Clams planted

b) % Seed purchased

c) Ave. price of seed purchased

d) # Seed sold

i. % seed sold out-of-state

e) # Market (non-seed) sold

i. % wholesale

ii. % retail

iii. % market clams sold out-of-state

f) Ave. price per market clam

i. Avg. price wholesale

ii. Ave. price retail

g) # Full-time help

h) # Part-time help

8. Comments or Explanatory Notes on 2018 or 2019 Clam Aquaculture:

Virginia Shellfish Grower Situation & Outlook Survey 2019

Commercial Oyster Aquaculture

This section covers two methods of commercial oyster culture: spat-on-shell and single oysters. Each method has its own series of questions.

9. Do you aquaculture oysters? Yes ○ No ○
(If NO, skip to #20)

10. Do you aquaculture spat-on-shell oysters Yes ○ No ○
This includes setting, planting, and/or harvesting of spat-on-shell.
(If NO, skip to #14)

Note: Some of you may purchase eyed larvae for setting single seed. Do not include this activity in the spat-on-shell section. It should be included in the cultchless oyster section [provide the resulting seed planted and/or sold from your setting facility. In the comments section mention this was from the purchase of eyed larvae]

Virginia Shellfish Grower Situation & Outlook Survey 2019

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.
This does NOT include larvae purchased for setting single seed.

11. 2018 Commercial Spat-on-Shell Oyster Aquaculture

a) # Eyed-larvae used

   i. % Diploid

   ii. % Triploid

b) % Eyed-larvae purchased from out-of-state

c) # Bushels spat-on-shell planted

d) # Bushels "market-size" spat-on-shell harvested/sold

e) Ave. price received per bushel of "market-size" spat-on-shell

12. 2019 *ESTIMATED* Commercial Spat-on-Shell Oyster Aquaculture

a) # Eyed-larvae used

   i. % Diploid

   ii. % Triploid

b) % Eyed-larvae purchased from out-of-state

c) # Bushels spat-on-shell planted

d) # Bushels "market-size" spat-on-shell harvested/sold

e) Ave. price received per bushel of "market-size" spat-on-shell

13. Comments or Explanatory Notes on 2018 & 2019 Commercial Spat-on-Shell Oyster Aquaculture:

Virginia Shellfish Grower Situation & Outlook Survey 2019

Commercial Oyster Aquaculture

14. Do you aquaculture cultchless (single) oysters? Yes ○ No ○
(If NO, skip to #20)

15. Do you sell/re-sell oyster seed? Yes ○ No ○

Do you purchase larvae and set it for single seed and/or grow small seed to a larger size for resale to another grower(s)?

16. Do you have a "cooperative" agreement with another producer who might report your numbers of planted and/or sold? (For example: selling to market-sized oysters to another grower who markets under their brand. This does NOT include sales to a wholesaler)
If yes, please still report your planted and sales numbers. Yes ○ No ○

Cultchless (single) Oyster Aquaculture

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

If you purchased larvae and set your own seed, leave b) blank and note that in the comments (#19).

17. 2018 Commercial Single Oyster Aquaculture

a) # Oyster seed planted on your farm in 2018
   i. % diploid
   ii. % triploid

b) Avg. price of triploid seed purchased ($ per 1,000)

c) % Planted seed purchased from out-of-state

d) # Seed sold
   i. % seed sold out-of-state
   ii. Avg. price of seed sold ($ per 1,000)

e) # Market (non- seed) oysters sold
   i. % wholesale
   ii. % retail
   iii. % market oysters sold out-of-state

f) Avg. price per market oyster ($ per piece)
   i. Avg. price wholesale
   ii. Avg. price retail

g) # Full-time help

h) # Part-time help

Virginia Shellfish Grower Situation & Outlook Survey 2019

Commercial Cultchless (single) Oyster Aquaculture

18. 2019 *ESTIMATED* Commercial Single Oyster Aquaculture

a) # Oyster seed planted on your farm in 2019
   i. % diploid
   ii. % triploid

b) Avg. price of triploid seed purchased ($ per 1,000)

c) % Planted seed purchased from out-of-state

i) # Seed sold
   i. % seed sold out-of-state
   ii. Avg. price of seed sold ($ per 1,000)

d) # Market (non- seed) oysters sold
   i. % wholesale
   ii. % retail
   iii. % market oysters sold out-of-state

e) Avg. price per market oyster ($ per piece)
   i. Avg. price wholesale
   ii. Avg. price retail

f) # Full-time help

g) # Part-time help

19. Comments or Explanatory Notes on 2018 & 2019 Commercial Single Oyster Aquaculture:

Virginia Shellfish Grower Situation & Outlook Survey 2019

Thank You

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

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

***If yes*, you must fill out the contact information below** Yes ○ No ○

22. Contact Information (Optional but Preferred)

Name	
Company	
Address	
City, State, Zip	
Telephone	
Email	

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

Appendix 2: Hatchery Survey

Virginia Shellfish Hatchery Situation & Outlook Survey 2019

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.

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.

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You can also file online by accessing https://www.surveymonkey.com/r/hatchery2018

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Virginia Shellfish Hatchery Situation & Outlook Survey 2019

Shellfish Hatchery Production

1. 2018 Clam and Oyster Hatchery Production

a) # Clam seed produced

b) # Clam seed sold

i. % Clam seed sold out-of-state

c) # Oyster eyed larvae produced

d) # Oyster eyed larvae sold

i. % diploid

ii. % triploid

iii. % sold out-of-state

e) Ave price per million oyster eyed larvae sold

i. Ave. price diploid

ii. Ave. price triploid

f) # Single oyster seed produced

g) # Single oyster seed sold

i. % diploid

ii. % triploid

iii. % sold out-of-state

h) # Full-time help

i) # Part-time help

Virginia Shellfish Hatchery Situation & Outlook Survey 2019

2. 2019 *ESTIMATED* Clam and Oyster Hatchery Production

Please indicate any changes in production, sales and employment expected for 2019. If no changes are expected, please write "same".

3. Comments or Explanatory Notes on 2018 & 2019 Shellfish Hatchery Production:

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

Thank You

5. Contact Information (Optional)

Name	
Address	
City, State, Zip	
Telephone	
Email	

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

The complete report can be found online at https://doi.org/10.25773/jc19-y847

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