

Chesapeake Bay Shellfish Aquaculture and Hungars Creek Start-Up Experience



Image 1: Hungars Creek namesake Hungars Episcopal Church (by JMG)



Image 2: Oyster Aquaculture by the Presenter (by Caroline)



Image 3: Harvest Clams in Basket (by JMG)



Image 4: Campbell's Soup Can (by Andy Warhol for CSC Brands, L.P.)

Hungars Creek LLC d/b/a Hungars Creek Bivalve

- 🐚 Founded 2003.
- 🐚 Machipongo, Virginia.
- 🐚 Most profitable periods occurred after economic dislocation events. (New Horizon Oil Spill & Hurricane Sandy)
- 🐚 Weather events since January 2018 have curtailed efforts.

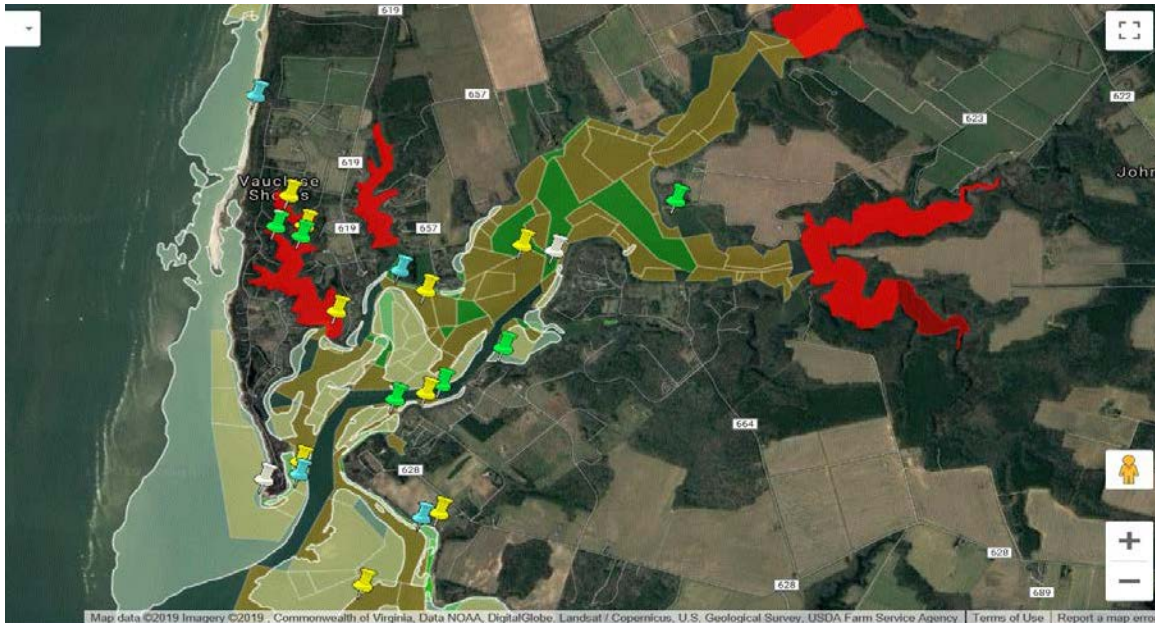


Image 5: Aquaculture on Hungars Creek (by Virginia Marine Resource Commission. (by https://webapps.mrc.virginia.gov/public/maps/chesapeakebay_map.php)



Image 6: Presenter with Aquaculture partner Matthew Parks. (2009 Virginia Tourism Brochure)

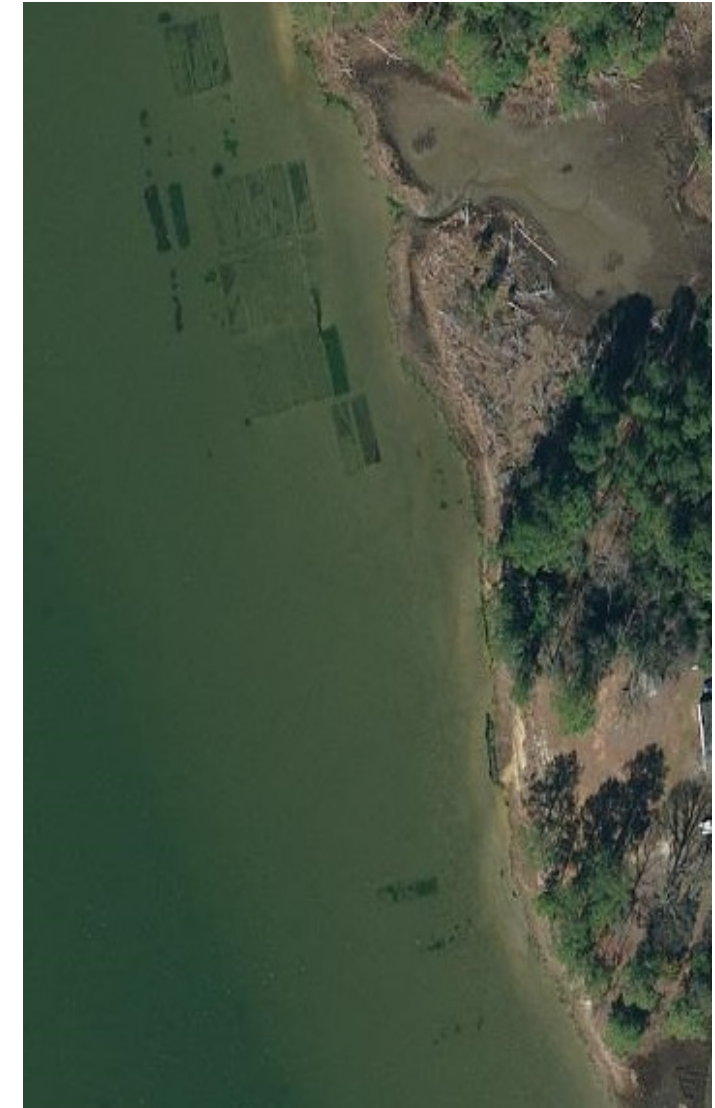


Image 7: Aerial Image of a portion of Hungars Creek LLC shellfish production areas. (by Northampton County GIS)

Shellfish

- ☛ Shellfish is a term for exoskeleton-bearing aquatic invertebrates used as food, including various species of mollusks, crustaceans, and echinoderms.
- ☛ Bivalve is a term for an aquatic mollusk such as Clams, Oysters, Mussels and Scallops which are enclosed in a hinged shell.

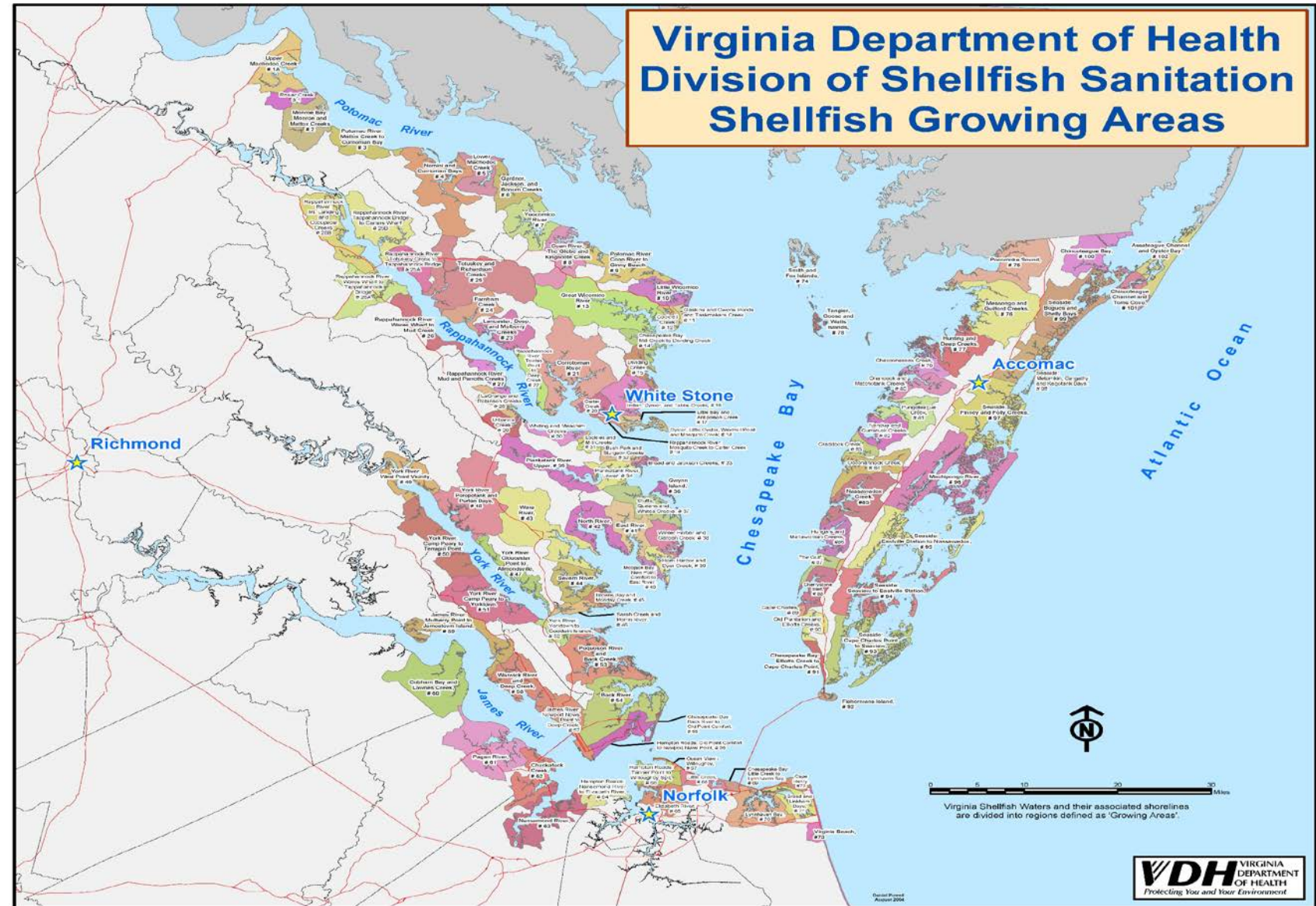


Image 8: Virginia Shellfish Growing Areas (by VDH)

Shellfish Aquaculture Methods

- ☪ Shellfish aquaculture grow out production methods include:
 - Bottom Nets – Clams are planted in plots and covered with mesh net for predator protection. The clams will then burrow a couple inches under the surface for additional protection.
 - Bottom Cages and Bottom Trays – Oysters, Mussels and Scallops are grown in cages placed on the bottom.
 - Off-Bottom Floats – Bags, Cages and Trays are supported in upper water column by a flotation system.
 - Off-Bottom Longline System – Trays, bags or cages are hung from a longline which is anchored between poles and may have floats attached for additional support.



Image 9: Floats (by JMG)



Image 10: Bottom cages (by JMG)



Image 11: Bottom mesh net (by JMG)



Image 12: Longline oyster basket suspension system
(by Hooper's Island Oyster Company)

Hard-shell Clam (*Mercenaria* - *Mercenaria*)

- ☛ Locally known as Quahog, Cherrystone, and Little Necks.
- ☛ Clams are a low fat, high protein seafood choice with an above average amount of minerals such as selenium, zinc, iron and magnesium and B vitamins.
- ☛ A single clam can filter 5 gallons of water per day.
- ☛ Clams will burrow a couple inches under the surface for protection from predators.



Image 13: Littleneck clams (by Ken Hammond for USDA)



Image 14: Clam beds (by JMG)



Image 15: Clam bed (by JMG)

Oyster (*Crassostrea virginica*)

- 🐚 Oysters are filter-feeders, removing algae, organic matter and excess nutrients from the water column as they grow and improving water quality
- 🐚 Oysters are a good source of essential minerals including phosphorus, calcium, potassium and zinc; and may result in increase testosterone levels.
- 🐚 A single oyster can filter around 30 gallons of water per day.



Image 16: Checking planted oyster seed after 3 winter months of growth (by JMG)



Image 17: Planted Intemas Oyster Bags (by JMG)



Image 18: Oysters in Sorter (by JMG)

Chesapeake Bay Shellfish Timeline

- ✦ **2500 B.C.** - The earliest evidence of shellfish harvesting by people living in the Chesapeake region.
- ✦ **1607** - Explorer Captain John Smith writes that oysters “*lay as thick as stones*” in the Chesapeake Bay and describes oyster reefs that had grown to the surface of the water.
- ✦ **1790’s** - New England oyster dredgers sail to the Chesapeake Bay after depletion of their local beds.
- ✦ **1811** - Virginia Bans Oyster Dredging
- ✦ **1820** - Maryland Bans Oyster Dredging and Baltimore begins canning oysters.
- ✦ **1865** - Maryland legalizes Oyster Dredging .
- ✦ **1870s to 1959** - The Oyster Wars begin with thousands of oyster pirates (poachers) known as the Mosquito Fleet, legal watermen and private navies in Maryland and Virginia fighting over harvesting rights in the Chesapeake Bay.
- ✦ **1880s** - Annual local harvest exceed 20 million bushels of oysters, local industry employs 40,000 people and Virginia permits private shellfish ground leases. .
- ✦ **1890s** - The Skipjack, which is the Maryland State Boat, was developed to dredge oysters. The Chesapeake Bay skipjack fleet (about 40 remaining vessels) are the last commercial sailing powered fishing fleet in North America.
- ✦ **1890s to 1910s** - Reedville VA, is the wealthiest town per capita in the U.S. and the number one “port for tonnage” of fish landed for 125 years in the country because of Menhaden (Bunker) and Shellfish.



Image 19: Oyster Cans (by ZEB Barfield Auctions)

Timeline Continued:

- ☛ **1952** the 4.3 mile Chesapeake Bay-Bridge opens and in **1964** the 17.6 mile long Chesapeake Bay-Bridge-Tunnel Opens.
- ☛ **1954** – After Hurricane Hazel, scientists begin tracking the Bay's hypoxic (low-oxygen) and anoxic (oxygen-free) zones caused by excess nutrient pollution.
- ☛ **April 7, 1959** - The final battle of the Oyster Wars occurs when poachers from Colonial Beach exchanged fire with marine police that results in a death and prompts the creation Potomac River Fisheries Commission bill which President Kennedy signs into law in 1962.
- ☛ **1960s** - MSX and Dermo, two diseases that kill oysters appears (from Ship ballast water) in the Chesapeake Bay. These diseases along with pollution wipe out most of the Bay's native oysters by the 1990s, with harvest dropping to below 1 percent of what it was in the 1880's.
- ☛ **1967** - The Chesapeake Bay Foundation is created.
- ☛ **1980's** - Clam Aquaculture begins in Virginia with the collapse of the Oyster Industry.
- ☛ **2009** - Shellfish farming on leased grounds is legalized in Maryland.

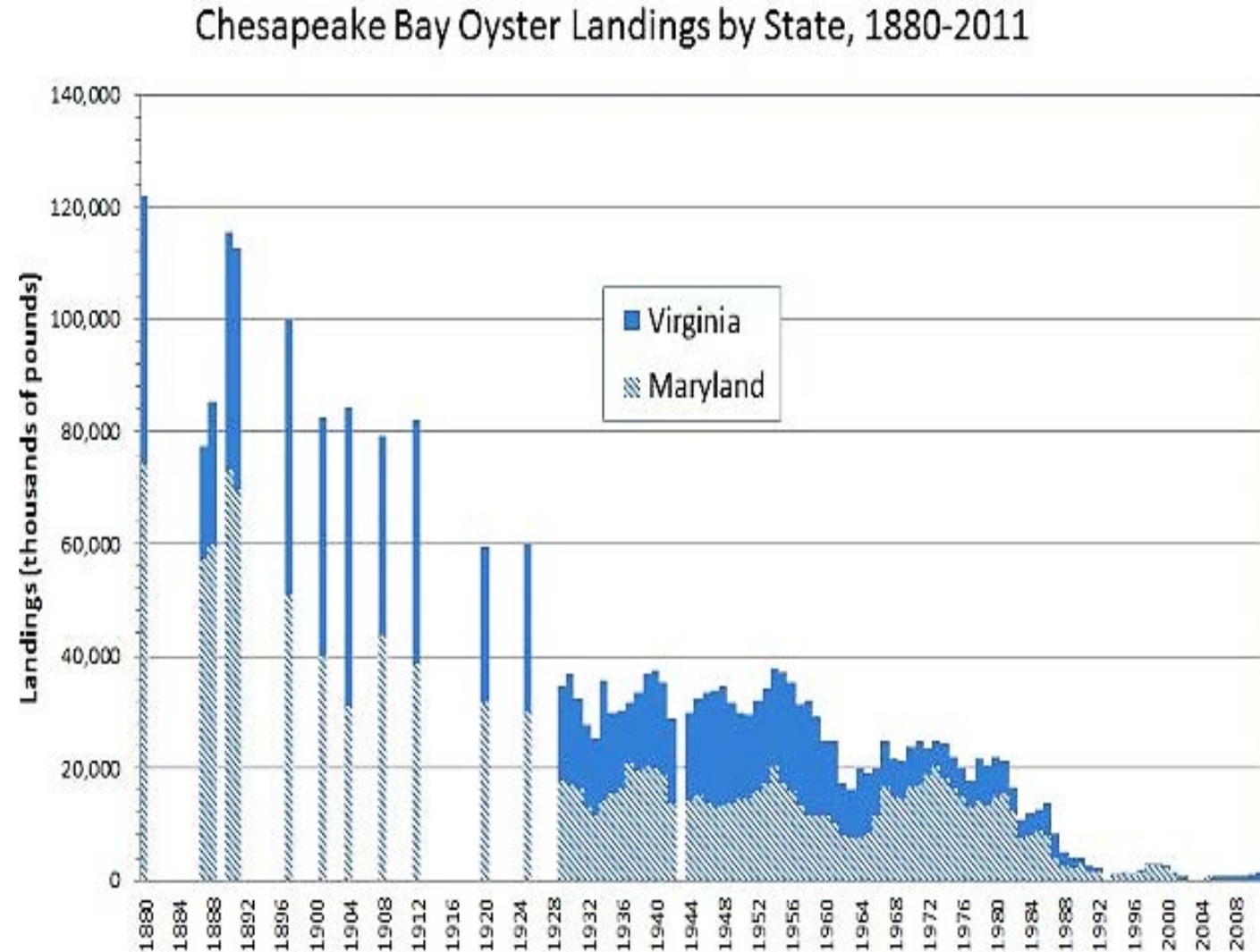


Image 20: NOAA Chart <https://chesapeakebay.noaa.gov/index>

Virginia Shellfish Aquaculture

- ☛ According to the [Virginia Shellfish Aquaculture - Situation and Outlook Report, July 2018](#), “2017 farm gate value for Virginia shellfish aquaculture was \$53.4 million.”
- ☛ Virginia is ranked 1st in the U.S. for hard clam production - \$37.5 million.
- ☛ Virginia is ranked 1st on the East Coast for Eastern oyster production - \$15.9 million.



Images 21: Oyster Cans (by ZEB Barfield Auctions)



Image 22: Shucked clam and oyster shells awaiting to be hauled back out into creek and Chesapeake Bay (by JMG)

Virginia Clams Statistics

Figure 5. Number of Hard Clams Sold in Virginia (millions)

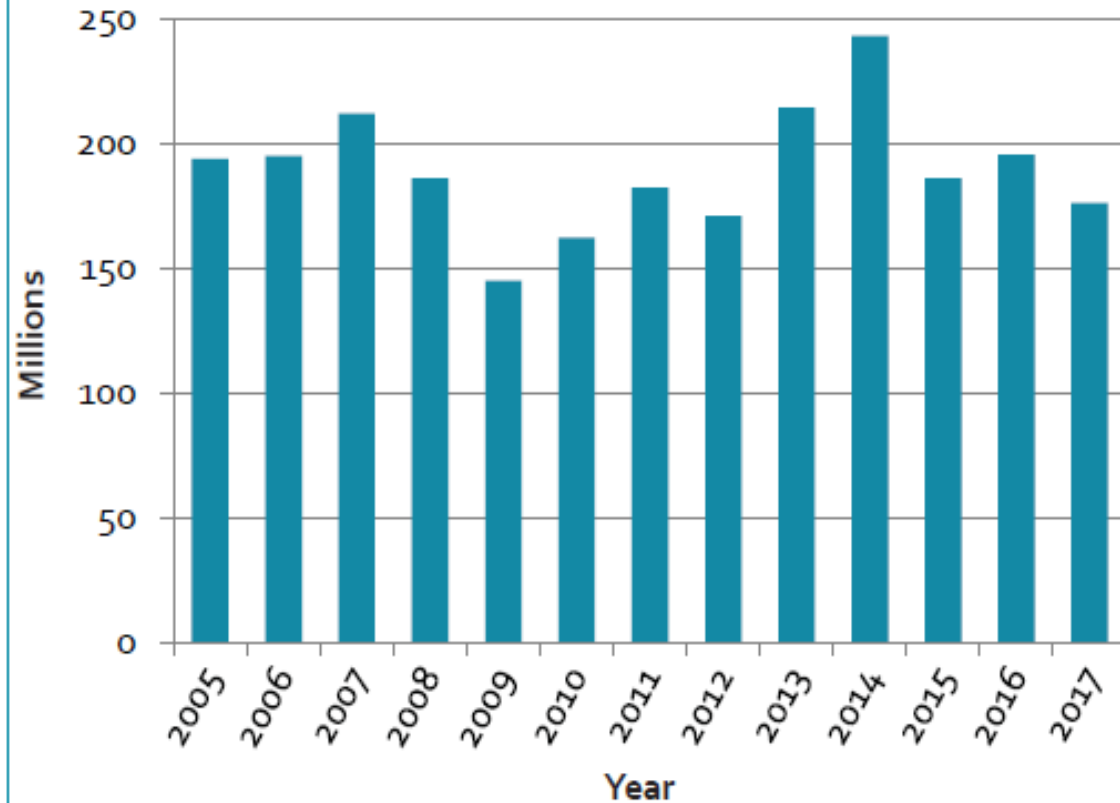


Image 23: Clams Sold (By Virginia Institute of Marine Science, Marine Resource Report No. 2018-9)

Figure 6. Clam Prices Reported by Virginia Growers

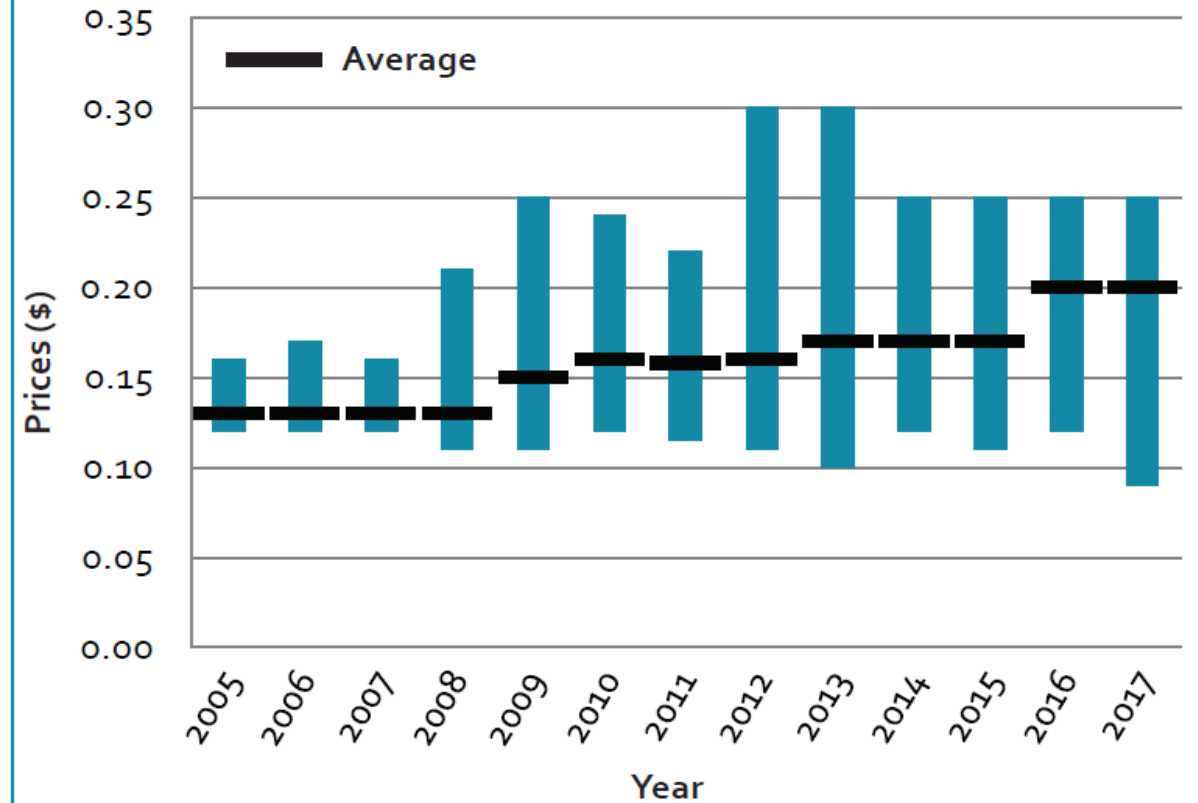


Image 24: Clam Prices (By Virginia Institute of Marine Science, Marine Resource Report No. 2018-9)

Virginia Clam Statistics

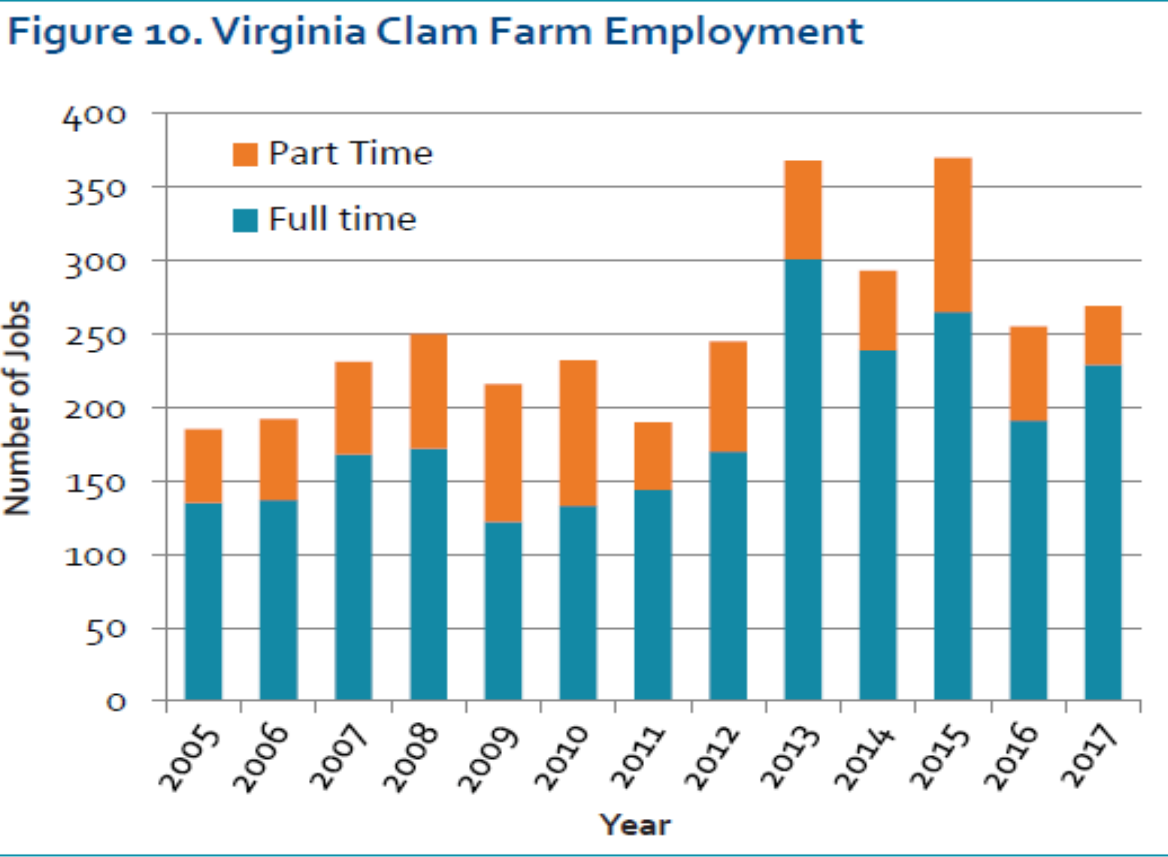


Image 25: Clams Employment (By Virginia Institute of Marine Science, Marine Resource Report No. 2018-9)



Image 26: A Row of Clam Beds (By JMG)

Virginia Oyster Statistics

Figure 2. Number of Market Oysters Sold by Virginia Growers (millions)

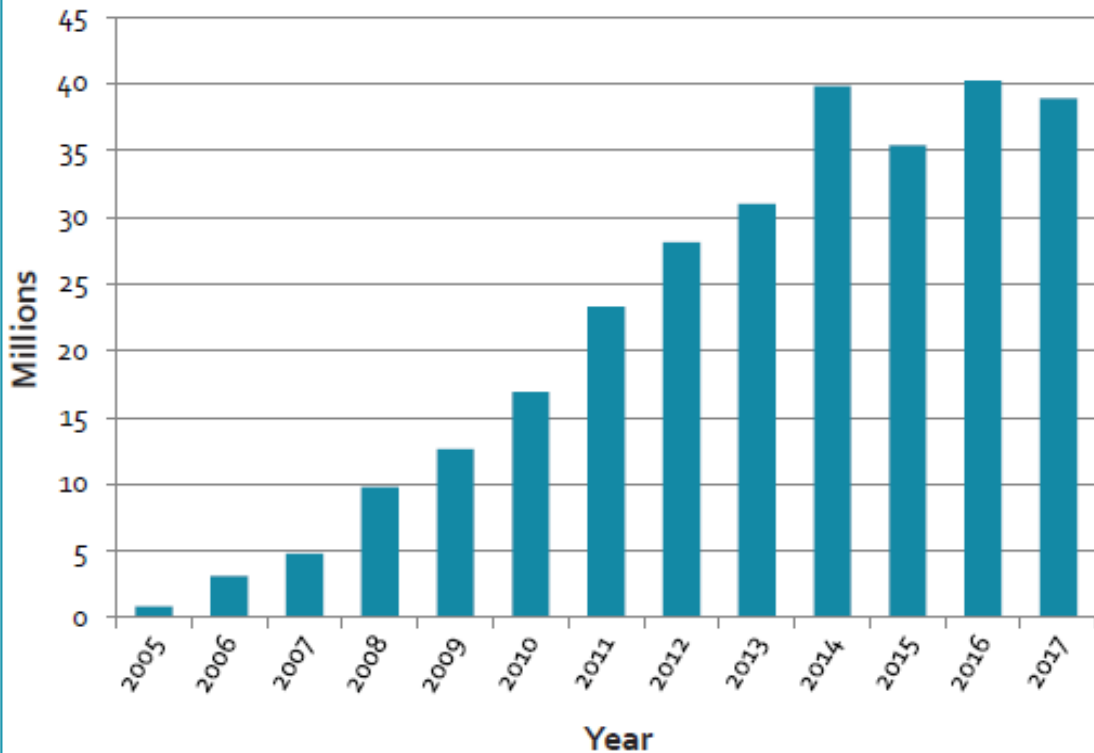


Image 27: Oysters Sold (By Virginia Institute of Marine Science, Marine Resource Report No. 2018-9)

Figure 3. Oyster Prices Reported by Virginia Growers

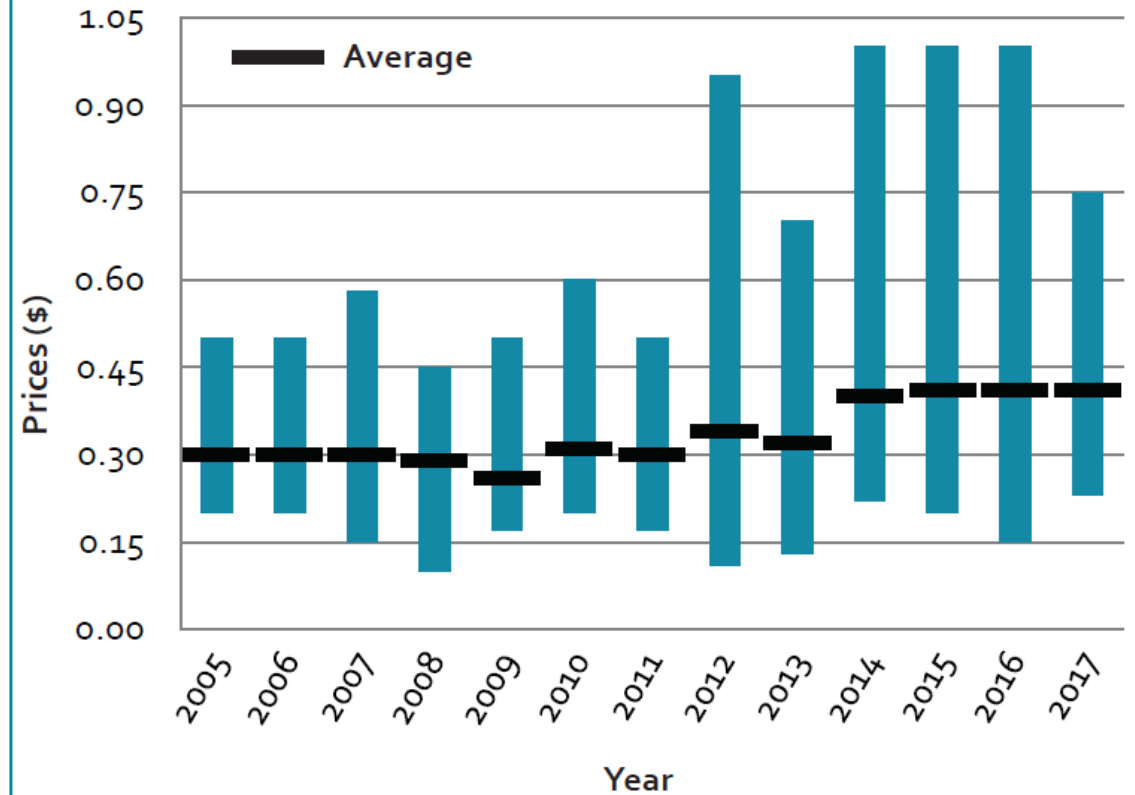


Image 28: Oyster Prices (By Virginia Institute of Marine Science, Marine Resource Report No. 2018-9)

Virginia Oyster Statistics

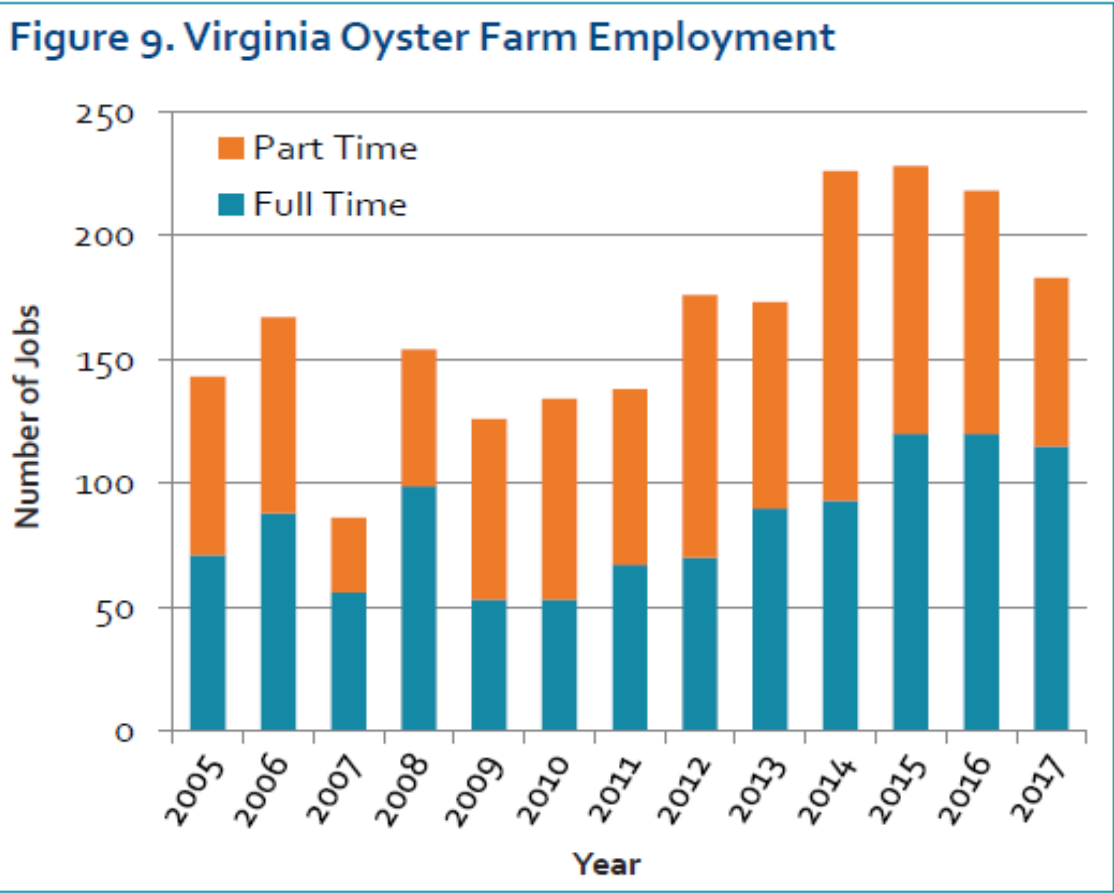


Image 29: Oyster Employment (By Virginia Institute of Marine Science, Marine Resource Report No. 2018-9)



Image 30: "Planted" Baby Oysters (by JMG)

Shellfish Aquaculture Farm Start-UP - 6 Year Mock Budget

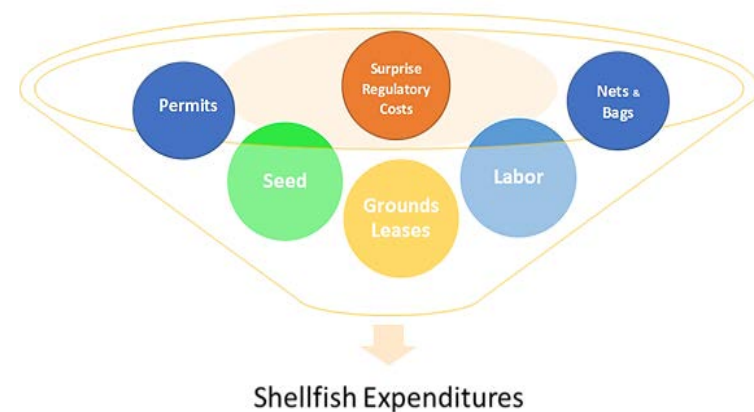
This moderate size aquaculture farm budget characterizes a typical clam and oyster aquaculture farm start up.

Shellfish Ground Leasing	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Application Fee (NONREFUNDABLE):	\$500					
Advertising Cost In the Newspaper:	\$100					
Surveying: VMRC Survey for Lease Assignment:	\$750					
Additional Plat Charge (if needed):	\$100					
Recording Fee for Each Assignment & Plat:	\$12					
Assignment Fee for Each Assignment & Plat:	\$2					
Rental Amount (Per Acre/Per Yr.):	\$11.50	\$11.50	\$11.50	\$11.50	\$11.50	\$11.50
Shellfish Aquaculture Permits						
Commercial Fisherman Registration License:	\$150	\$150	\$150	\$150	\$150	\$150
Oyster Aquaculture Product Owner's Permit:	\$10	\$10	\$10	\$10	\$10	\$10
Oyster Harvest by Hand:		\$10	\$10	\$10	\$10	\$10
Oyster Aquaculture Harvester's Permit:		\$5	\$5	\$5	\$5	\$5
Oyster Single Buyer Permit:		\$50	\$50	\$50	\$50	\$50
Clam Aquaculture Product Owner's Permit:	\$10	\$10	\$10	\$10	\$10	\$10
Clam Harvest by Hand:		\$24	\$24	\$24	\$24	\$24
Clam Aquaculture Harvester's Permit:		\$5	\$5	\$5	\$5	\$5
Shellfish Harvester Tag:		\$10	\$10	\$10	\$10	\$10
HCAAP Training:		\$225			\$225	
Surprise Regulatory Cost:			\$1,000			\$1,000

Budget Continues Next Slide:

Mock Aquaculture Farm Assumptions:

- Lease size is 10 acres,
- Actual area "planted" is 7 acres;
- Shellfish Method used is bottom aquaculture,
- No harvest first year,
- Clam survival rate is at 70%
- Oyster Survival rate is 60%.
- Every 5 years reduce all revenue by 80% for that single year to represent random negative event (Hurricane, Spill, Nutria, Regulatory, Recreational oat damages shellfish beds, etc.).



Shellfish Aquaculture Farm Start-UP - 6 Year Mock Budget

Operating Expenses	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Clam Seed (750,000 per year):	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
Oyster Seed (250,000 per year):	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
Harvest Crew:		\$3,000	\$5,000	\$5,100	\$5,200	\$5,300
Boat Fuel & Maintenance:	\$250	\$250	\$250	\$250	\$250	\$250
Equipment (Hand - non electric Tumbler):		\$150	\$160	\$170	\$180	
Insurance:	\$250	\$250	\$260	\$260	\$260	\$270
Equipment (Tumbler):						\$16,000
Clam Nets:	\$900		\$900		\$1,500	
Intermas Oyster Bags:	\$1,500			\$1,500	\$1,000	
Floats:	\$250	\$250			\$500	
PVC Pipes:	\$125	\$75	\$75	\$75	\$75	\$75
Miscellaneous Supplies:	\$450	\$450	\$460	\$460	\$470	\$470
Total Expenditures	\$25,371	\$24,861	\$27,491	\$26,526	\$28,446	\$43,576
Clam Revenues (17 cents/70% Survival):		\$89,250	\$89,250	\$89,250	\$17,850	\$89,250
Oyster Revenues (35 cents/60% Survival):		\$48,000	\$54,000	\$55,500	\$11,100	\$57,000
Depreciation, Tax & Other Manipulations/Offsets:	\$4,500	\$3,500	\$3,500	\$3,500	\$3,500	\$3,500
Total Revenues	\$4,500	\$140,750	\$146,750	\$148,250	\$32,450	\$149,750
Profit/Loss	-\$20,871	\$115,890	\$119,259	\$121,725	\$4,004	\$106,174



Image 32: Aerial View of Hungars Creek entrance showing other aquaculture farms. (EPA Enviro-Mapper)

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SWOT Analysis – Strengths & Opportunities

- ✿ Significantly improves water quality.
- ✿ Aquaculture structures provides habitat for fish species.
- ✿ Provides shoreline protection.
- ✿ World Bank reports aquaculture now represents more than half (53 percent) of global human seafood consumption.
- ✿ U.S. per capita seafood consumption increased by 1.1 pounds to 16 pounds in 2017.



Images 34: Oyster Cans (by ZEB Barfield Auctions)



Image 33: Staking Oyster Bags – the alligator floats scare skates and rays away. (by Caroline)



Image 35: Shellfish bottom cages. (by JMG)

SWOT Analysis – Strengths & Opportunities

- ❧ Favorable return on investment - expense to sales ratio.
- ❧ Lower capital investment than many other business investments at start.
- ❧ Low labor costs at start - aquaculture materials are easy to handle at pilot scale to allow for informed investment decision.
- ❧ Easy access to vertical and horizontal distribution channels.
- ❧ Brand development not as critical.
- ❧ Tax benefits.



Image 36: Chasing Opportunity . . . or a seagull (by JMG)

SWOT Analysis – Threats & Weaknesses

- ❏ Predators such as drum fish, blue crab, skates and rays.
- ❏ Weather Events.
- ❏ Large industry players manipulating regulations to create hurdles for smaller industry players and new industry entrants.
- ❏ Restrictive regulatory regime in Maryland.
- ❏ Shellfish Diseases.
- ❏ Food Borne Illness.
- ❏ Pollution.
- ❏ Urban Growth.



Image 38: Clam beds covered in muck after March 2018 wind storm event. (by JMG)



Image 37: Muddy Spot (by JMG)

Harvesting

The Virginia Department of Health Division of Shellfish Sanitation (VDH/DSS) classifies and monitors shellfish harvest areas based on levels of pollution.

Approved areas are growing areas where harvest for direct marketing is allowed.

Condemned areas are areas where harvesting is allowed with certain restrictions.

To know whether harvesting areas are approved or condemned go to <http://www.vdh.virginia.gov/division/mentalhealth/shellfish/index.htm>

The Virginia Marine Resources Commission (VMRC) has a mobile map which will allow you to check the shellfish closure status to a specific lease by going to <https://webapps.mrc.virginia.gov/public/maps/condemnation.html>

Tags
Harvested shellfish must be tagged with required information. The 4 W's on Shellstock Tags provides us with **WHO** harvested the product, **WHEN** it was harvested, **WHERE** it was harvested, and **WHAT** type of shellfish was harvested.

The information on this tag follows the shellfish from harvest to the final consumer.

Follow harvest and seasonal time tables for the harvest of oysters and clams. No harvest is allowed before sunrise from June 15 through August 31.

Handling

Harvesting Boat
The boat must be registered with the state;
Be properly constructed;
Have an available sanitation device;
Shading provided to protect the shellfish; and
Have USCG approved equipment.

Discharge of human waste overboard is not allowed since it can lead to contamination of the shellfish in the harvest area resulting in closures.

Proper culling techniques should be used to assure shellfish are available to future harvesters.

Daily harvest time
Restrictions on oysters: (VMRC)

Oysters must be harvested, offloaded and landed by the curfew times listed below in order to limit Vibrio bacteria growth.

	SUNRISE TO	SUNSET
Oct - April	11 am	
May	10 am	
June 1-Aug 31	10 am	
Sept	12 noon	

Harvest times can be extended from May through September as long as the harvester is using an approved method of harvest such as the use of ice or a GPS tracking device and a permit has been granted.

Transportation

Delivering shellfish directly to certified dealers facility using mechanical refrigeration (at 45°F or less) or ice when transport times exceed 1 hour and providing shade ensures a protected product.

No shellfish should be exposed to gasoline, garbage, animals, etc.

For Harvester Activities related to:
Water classification/monitoring
Plant processing inspection
Vessel certification
Call your VDH, Division of Shellfish Sanitation Office

VDH/DSS
Central Office: 804 864 7480
Field Offices:
Accomac: 757 787 5864 x221
Norfolk: 757 683 8461
White Stone: 804 435 1095

For harvesters activities related to:
Boater safety regulations
Bag/size limits
Seasonal time limits
Vessel Sanitation Device
Training
Call Virginia Marine Resources Commission (VMRC)
(757) 247-2200

Image 39: Virginia Shellfish Regulations Brochure. (by Virginia Marine Resources Commission)

SWOT Analysis – Threats & Weaknesses



Image 40: Florida Gulf Coast after 4 months after Hurricane Michael. (by JMG in January 2019)

SWOT Analysis – Threats & Weaknesses

Industry Manipulation of Regulations

- Recent Mid-Atlantic Regulations restrict the shellfish seed sources from Florida and other non Mid-Atlantic sources “to prevent disease introduction”.
- Local seed sources may be arbitrary in quality.
- May act as hurdle for new farmers.

contact Us

4 VAC 20-754-30 APPROVED SPECIES AND CRITERIA FOR IMPORTATION:

A. Pursuant to the provisions of §28.2-825 of the Code of Virginia and under the following conditions, it shall be lawful to import into the Commonwealth, with the intent of placing such animals into the waters of the Commonwealth, any species listed below, except as prohibited in the exception contained in subdivision 1 of this subsection:

- Any hard clam of the species *Mercentaria mercenaria* from the waters of any coastal area or state within the continental United States and which is absent of any known shellfish pathogen, as specified in subsection B of this section, except that any importation of hatchery produced seed of the genus *Mercentaria* from Pacific coastal states within the continental United States shall be prohibited, and any importation of hatchery produced seed of the genus *Mercentaria* from South Carolina or Florida shall meet all requirements established by 4 VAC 20-754-30 A 1., a through d. Importation requirements established by 4 VAC 20-754-30 A 1., a through d, shall be in addition to those importation requirements established by 4 VAC 20-754-30 B.
- The South Carolina or Florida hatchery or facility shall certify that only northern broodstock clams of the genus *Mercentaria*, absent of shellfish pathogens, were used to produce hard clam seed that is to be exported to Virginia. The certification shall be accompanied by evidence that the facility took possession of the northern broodstock hard clams within the previous 12 months.
- The South Carolina or Florida hatchery or facility shall certify that any clam seed scheduled for importation into Virginia was produced from broodstock that satisfies the requirements specified by 4 VAC 20-754-30 A 1. a.
- The South Carolina or Florida hatchery or facility shall certify that only hard clams of northern broodstock were held in the facility used for spawning purposes throughout the time period, within a calendar year, corresponding to all shipments of hard clam seed to Virginia, and all shipments of clam seed shall be accompanied by a tag indicating the name of the hatchery or facility and the quantity, on a per bag or container basis.
- Any certification requirements described in 4 VAC 20-754-30 A 1. a. and b. shall accompany the certified statement from an approved shellfish pathologist as to the complete absence of known shellfish pathogens in a random sample of hard clam seed of the genus *Mercentaria* scheduled for importation into Virginia, as described in 4 VAC 20-754-30 B. All certified statements required for importation of hard clam seed of genus *Mercentaria*, as specified by 4 VAC 20-754-30 A 1. a and b and VAC 20-754-30 B shall be provided to the Virginia Marine Resources Commission, Fisheries Management Division at least 10 days prior to the shipment of any hard clam seed of genus *Mercentaria*.

- Any American oyster shellstock of the species *Crassostrea virginica* greater than 25 mm in shell height from the waters of New England, Mid-Atlantic, or South Atlantic coastal areas or states and which is absent of any known shellfish pathogen, as specified in subsection B of this section.
- Any American oyster hatchery produced seed of the species *Crassostrea virginica* less than 25 mm in shell height from the waters of any coastal area or state within the continental United States and which is absent of any known shellfish pathogen, as specified in subsection B of this section.

Image 41: Shellfish Seed restrictions. (<http://www.mrc.virginia.gov/regulations/fr754.shtm>)



How to Buy Clam Seed... Without Getting Shucked!

Geff Timlin, Ocean County Marine Extension Agent

The hard clam, *Mercentaria mercenaria*, has been an integral part of coastal fisheries and culture for hundreds of years.

Mercentaria has many names. Some are regional, such as quahog in the New England area. Others indicate size classes. Small hard clams below market size are called "button" while marketable clams range from the smallest "little necks, necks, or nicks", then "topnecks", to medium "cherrystones" to the largest size, "chowders". This clam has long served as a food source and even had its shell used as money or "wampum" by native American Indians meaning "pay or wages" (Vaughan, Crestwell & Pardee, 1989). To this day, the hard clam serves as an item of desire not for just the baymen who earn their wages harvesting them but for the millions who spend their wages eating them.

Even though the hard clam generated over 53 million dollars in ex-vessel prices in 2000, statewide, and remains an important fishery resource, natural production in some coastal bays in New Jersey has declined significantly.

Reasons for this decline have been discussed but there has been little success in halting the loss on a large scale. However, enterprising baymen have, for the past 25 years, practiced the culture or husbandry of the hard clam on leased bay bottom. These aquaculture ventures, though often quite risky, have had their successes, and point the way for greater production in the future.

However, everyone who works on the water knows nothing is guaranteed and all precautions must be taken to ensure the best outcome possible.

Since improper site selection or lack of predator control can bring diminished success or even failure, one should try to control as many variables as possible. After procuring a proper site, dedicating appropriate time to learning the grow out process, selecting a feasible predator control system, and establishing an appropriate record keeping system, it is imperative that good healthy seed be procured to get the culture program underway.

This publication is designed to help the first time seed buyer make initial investments, and to alert hatchery operators to methods they can use to help keep baymen as customers after their initial purchases.

"Caveat emptor" or "let the buyer beware" has been a rule since Roman days and is as true now as it was then.

Through controlled-environment spawning of adult hard clams, hatchery technology has reached a level where, through feeding of special algal diets and selection for fast growth, clam seed is available for appropriate bay bottom for grow out to market size. Baymen have the ability to be water farmers and raise clams to market size to help augment catches from the wilds if not rely on clam culture totally.



Image 42: New Jersey Cooperative Extension Publication about issues purchasing clam seed.

(<https://articles.extension.org/sites/default/files/How%20to%20Buy%20Clam%20Seed%20without%20Getting%20Shucked.pdf>)

SWOT Analysis – Threats & Weaknesses

Industry Manipulation of Regulations

- Ballast water is fresh or saltwater held in the ballast tanks and cargo holds of ships.
- It is used to provide stability and maneuverability during a voyage when ships are not carrying cargo, not carrying heavy enough cargo, or when more stability is required due to rough seas.
- Ballast water is one of the major pathways for the introduction of nonindigenous marine species.
- When ships take in water for ballast in port, they also take in whatever organisms are present in the water. These organisms are then transported, and are potentially introduced into the waters of the ports along the vessels' routes as ballast tanks are emptied each time cargo is loaded.
- Dermo, MSX and SSO diseases in the Oyster, and QPX disease in the hard clam were introduced into the Chesapeake Bay by ship ballast discharge.



Image 43: Chesapeake Bay cargo ships in laytime or demurrage. (by JMG)



Image 44: Cargo ships anchored off Cape Charles, Virginia. (by JMG)

Agricultural Marketing Service

Further Reading:

- [Barrier Island Center](#)
- [Chesapeake Bay Commission](#)
- [Chesapeake Bay Foundation](#)
- [National Park Service Captain John Smith Historic Trail](#)
- [Florida Clam Farm Environmental Benefits Calculator](#)
- [The Mariners' Museum](#)
- [Maryland Department of Natural Resources](#)
- [Nature Conservancy – Virginia Coast Reserve Barrier Islands](#)
- [National Oceanic and Atmospheric Administration \(NOAA\) Aquaculture](#)
- [National Park Service – Captain John Smith Trail](#)
- [Notorious Oyster Pirates of Chesapeake Bay](#)
- [Rutgers, The State University of New Jersey Aquaculture](#)
- [Smithsonian: Are Oyster an Aphrodisiac?](#)
- [University of Washington Sea Grant - Shellfish Aquaculture](#)
- [USDA Aquaculture](#)
- [USDA National Agriculture Library Aquaculture](#)
- [Virginia Institute of Marine Science – William and Mary Sea Grant](#)
- [Virginia Marine Resource Commission](#)
- [Virginia Shellfish Aquaculture - Situation and Outlook Report, July 2018](#)
- [YaleEnvironment360, A Remarkable Recovery for the Oysters of Chesapeake Bay](#)
- [Zeb B Barfield Auctions \(Oyster Can Pictures\)](#)



Image 45: The presenter also conducts a variety of other agriculture activities in Central Virginia. (by JMG)



Image 46: Oysters in bags. (by JMG)

Agricultural Marketing Service



Image 47: Ballard Willis Wharf Shellfish Seed Tanks (by JMG)



Image 48: Chesapeake Bay Sunset (by Rainy Parks)

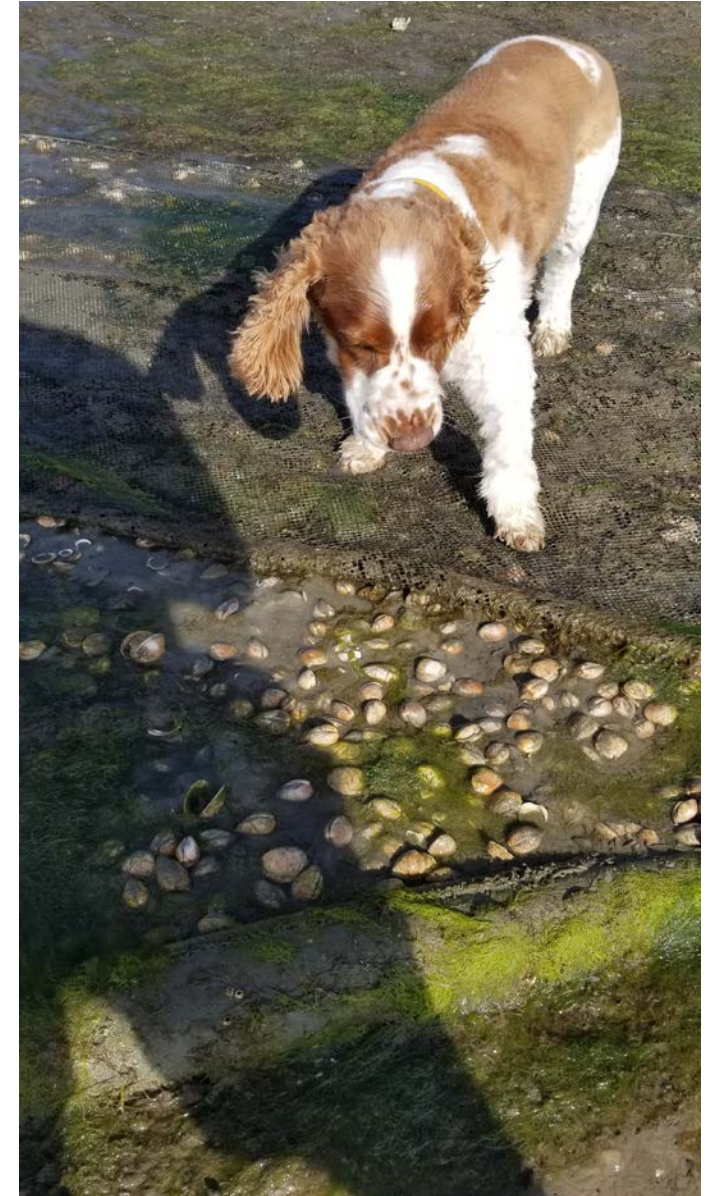


Image 49: Clam Beds (JMG)