
Fostering Shellfish Aquaculture Production in Maryland and Other States

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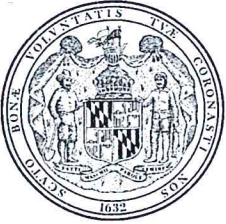
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DEPARTMENT OF LEGISLATIVE SERVICES
OFFICE OF POLICY ANALYSIS
MARYLAND GENERAL ASSEMBLY

Karl S. Aro
Executive Director

Warren G. Deschenaux
Director

January 8, 2013

The Honorable Thomas V. Mike Miller, Jr., President of the Senate
The Honorable Michael E. Busch, Speaker of the House of Delegates
Members of the Maryland General Assembly

Ladies and Gentlemen:

Although aquaculture is more prevalent and culturally ingrained in the rest of the world, aquaculture production in the United States has grown steadily in recent decades. While some states have long, successful histories in shellfish aquaculture production, in Maryland, shellfish aquaculture has been and remains a small part of the shellfish industry. Legislation enacted in recent years made several changes to the State's shellfish aquaculture program in an effort to bolster the industry in Maryland, however.

In an effort to better understand the barriers facing the shellfish aquaculture industry in Maryland and to identify what other states are doing to support shellfish aquaculture, the Natural Resources, Environment, and Transportation Workgroup within the Office of Policy Analysis prepared this report on shellfish aquaculture in Maryland and other states. Specifically, the report (1) provides historical context related to aquaculture production; (2) discusses historical barriers to aquaculture in Maryland and throughout the United States; (3) identifies and describes shellfish aquaculture programs and production statistics in Maryland and selected other states; and (4) presents several policy considerations related to Maryland's recently updated shellfish aquaculture program.

We trust this report will prove useful to the General Assembly in better understanding Maryland's shellfish aquaculture program. If you would like additional information regarding this report, please contact Lesley G. Cook at (410) 946-5510.

Sincerely,

Warren G. Deschenaux
Director

WGD/LGC/km

cc: Ms. Lynne B. Porter
Mr. Karl S. Aro

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Fostering Shellfish Aquaculture Production in Maryland and Other States

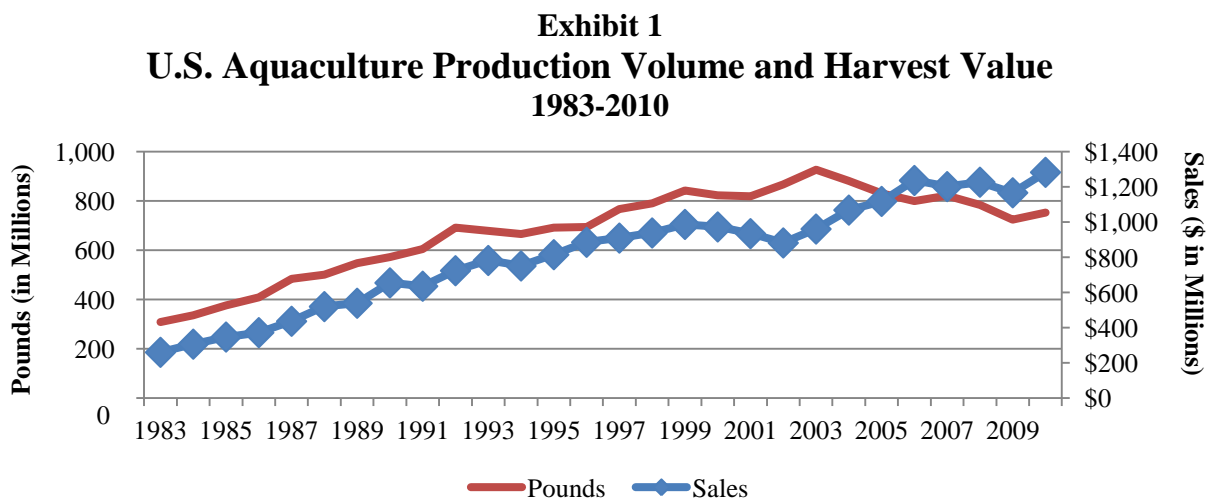
Introduction

Historical Perspective on Aquaculture

Aquaculture, the farming of aquatic organisms, is more prevalent in the rest of the world, particularly in East Asia, than in the United States. Aquaculture began to receive focused attention in the United States during the 1970s when many domestic fisheries reached maximum sustainable yields due to harvest pressure, pollution, disease, and habitat loss. That attention resulted in the passage of the National Aquaculture Act in 1980. The National Aquaculture Act was designed to promote aquaculture in the United States by encouraging aquaculture activities and programs in both the public and private sectors, establishing and implementing a national aquaculture plan, providing for the coordination and dissemination of national aquaculture information among various federal agencies, and to the extent feasible, facilitating financing for aquaculture activities.

U.S. Aquaculture Production Figures

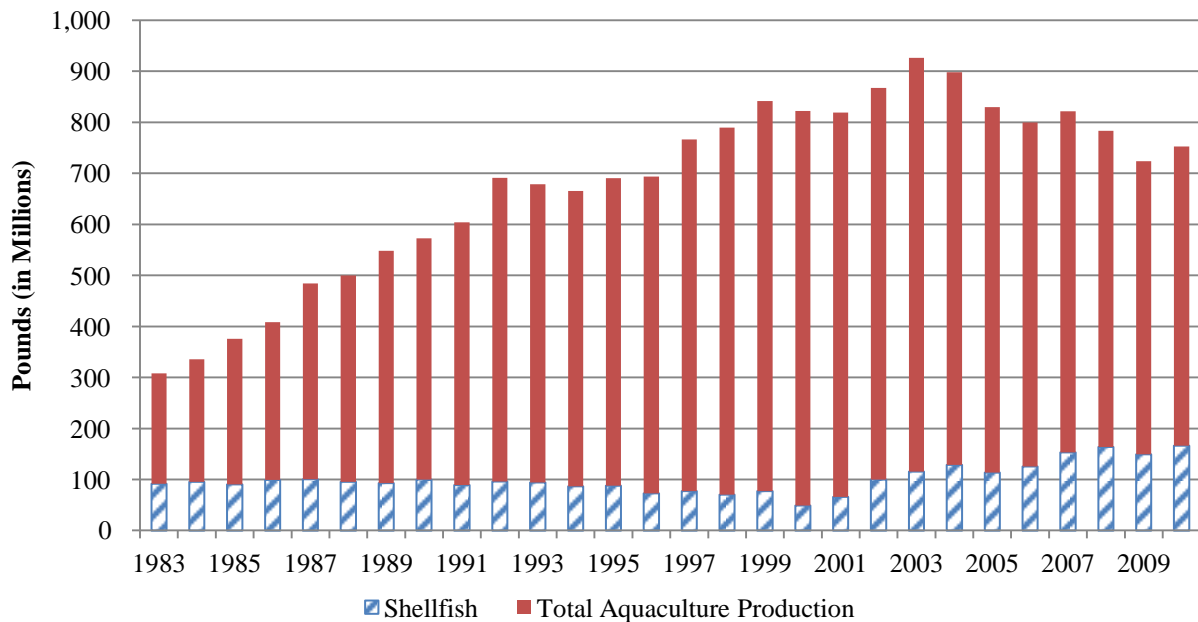
Despite the constraints facing the industry in the early 1980s, U.S. aquaculture production has grown by approximately 3% annually since 1983. Similarly, during the same timeframe, the value of U.S. aquaculture sales has grown by 6% annually. (See **Exhibit 1**.) As of 2010, catfish accounted for nearly 479 million pounds, or 64%, of domestic aquaculture production.



Source: National Oceanic and Atmospheric Association

Maryland's interest in aquaculture production lies largely in the restoration of shellfish (*i.e.*, oyster) resources. As of 2010, the national production of shellfish comprised about 25% of domestic aquaculture production. (See **Exhibit 2**.) Of the 166.6 million pounds of shellfish harvested in 2010, 153.6 million pounds, or 92%, were comprised of crawfish (70%) and oysters (22%).

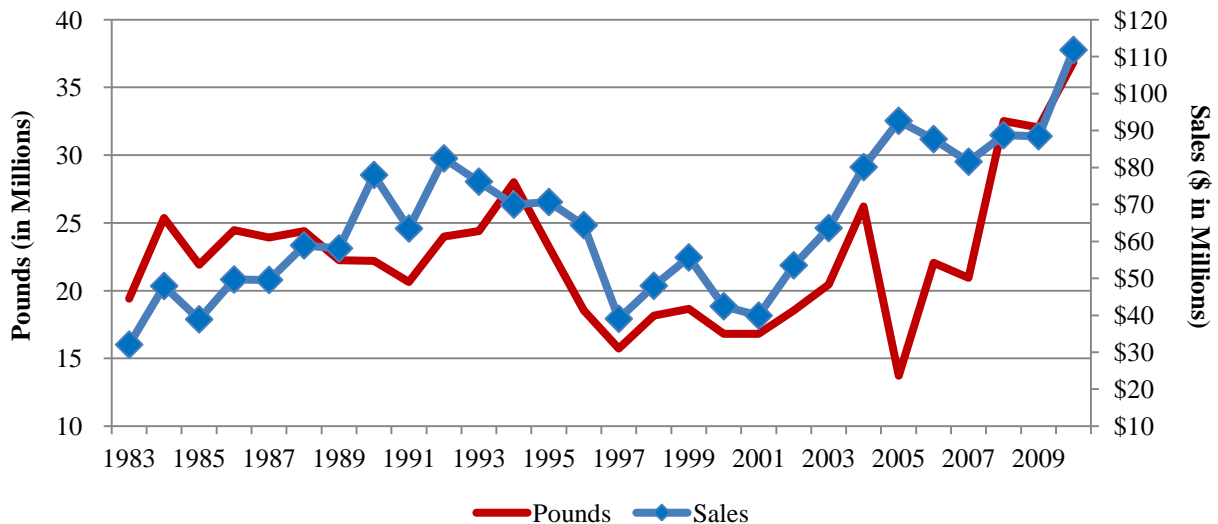
Exhibit 2
U.S. Aquaculture Production Volume
1983-2010



Source: National Oceanic and Atmospheric Association

As shown in **Exhibit 3**, the domestic farming of oysters, a species native to Maryland, has increased by 2% annually since 1983. During the same timeframe, oyster sales increased by 5% annually. In 2010, oyster production and sales reached a 27-year peak with production and sales totaling 36.9 million pounds and \$111.8 million, respectively.

Exhibit 3
U.S. Oyster Aquaculture Production
Volume and Harvest Value
1983-2010



Source: National Oceanic and Atmospheric Association

Historical Barriers to Aquaculture

As a relatively new and growing segment of American agriculture, the aquaculture industry is constrained by increased levels of environmental regulation and state laws unsuited to the development of aquaculture. This analysis examines the current and historical barriers to aquaculture and the steps that many states, including Maryland, have taken to circumvent or eliminate these barriers in an effort to foster growth in shellfish aquaculture.

Wetlands Restrictions

If an aquaculture operation is located in an area that meets the federal wetland classification, as all substantial shellfish aquaculture operations are, the operation must obtain federal and state wetlands approval. This approval comes in the form of a permit issued by the state and the U.S. Army Corps of Engineers (Corps) after determining that the aquaculture operation would not adversely affect priorities such as municipal water supply, water quality, wildlife, safety, or recreation. Included in this process are requirements for public notice and the opportunity for a public hearing before discharge into the wetlands may take place. The U.S. Environmental Protection Agency may veto any Corps decision. Complementary state wetlands protection laws vary greatly.

Waterway Restrictions

If a waterway used for an aquaculture operation is navigable, the Federal Rivers and Harbors Act applies. Under this federal act, the Corps must authorize any structure or project not congressionally authorized that would obstruct navigable waters. The Corps must consider the public or private need for the operation, reasonable alternatives, and the beneficial and detrimental effects of the operation on other activities that may be conducted in the area. In determining whether to issue a permit, the Corps must balance these beneficial and detrimental effects. Under this federal act, the Corps controls the siting of any approved aquaculture structures.

Land Use Restrictions

Aquaculture operations are often required to abide by federal laws governing land use in coastal zones under the federal Coastal Zone Management Act (CZMA). Although each participating state has discretion in determining the boundary of its affected coastal zone, shellfish aquaculture operations almost always take place within the coastal zone and are subject to the CZMA. The CZMA was enacted to address the pressures put on coastal land and water resources by, among other activities, commercial and recreational uses, including aquaculture. Under the CZMA, a participating state develops a federally approved Coastal Management Plan (CMP) in exchange for federal financial assistance for implementing the CMP. A CMP is designed to protect coastal resources and prevent environmental degradation within the coastal zone. Enforcement is usually left to the state, often in the form of a permit requirement that a proposed activity (including an aquaculture operation) avoid or mitigate environmental damage consistent with the CMP.

Pollutant Discharge Restrictions

The federal government, subject to state delegation, regulates the discharge of pollutants into water from point sources through the National Pollutant Discharge Elimination System (NPDES) permit program. Although aquaculture operations are often classified as point source dischargers and required to obtain an NPDES permit, these requirements generally do not apply to shellfish aquaculture.

Inadequate Financing

In the past, adequate financing was not available for aquaculture operations. At the federal level, this problem has been significantly addressed, as aquaculture operations are eligible for federal financial assistance, loans (including federal Small Business Administration loans), and insurance that have traditionally been available only for terrestrial agriculture. Many states have followed suit by including aquaculture as a form of agriculture for financing and marketing purposes. State barriers to aquaculture financing, however, may persist in the form of

ownership restrictions (often in the form of prohibiting corporate ownership or residency requirements), limits on lease size, and the closure of specific waters to aquaculture.

Public Trust Laws

At the state level, aquaculture operations must consider state public trust laws. Public trust doctrines are different in every state, but in the context of aquaculture, the doctrines basically hold that submerged lands are of significant importance to the state, and citizens must have free access to the submerged land to achieve maximum benefits to society. Generally, public trust laws hold that the state holds title to tidal and navigable waters of the state for the benefit of the public. If an aquaculture operation requires the use of waters of the state considered held in public trust, the aquaculture operation is typically required to obtain a permit or lease from the state. The aquaculture operation has to show that the lease is in the public interest.

Disease

One of the primary causes of the decline of the oyster population in the Chesapeake Bay is the outbreak of the oyster parasites MSX and Dermo. When it first appeared in the late 1950s, MSX is believed to have killed up to 60% of the oyster population annually. Currently, Dermo is considered to be the primary threat to Chesapeake Bay oysters. Many people believe that the stress on the oyster population from pollution and harvest hamper the ability of the oyster population to combat the parasites.

Programs in Other States that Favor Shellfish Aquaculture

Over the last decade, aquaculture has gained momentum as a viable method for producing seafood. In an effort to promote aquaculture production, the National Oceanic and Atmospheric Administration, the lead federal agency on aquaculture, has dedicated guidance and financial assistance to states in order to develop aquaculture regulation, policy, and practice. This section provides an in-depth review of the effectiveness of the shellfish aquaculture programs in the states of Virginia, Rhode Island, Washington, Connecticut, and Maine.

Virginia

Program Description

Nineteenth century Virginia watermen feared dominance of the oyster industry by large corporations and the corresponding loss of their independence and financial security. Early on, however, Virginia allowed a few leases that proved very successful, in part assuaging the Virginia watermen's concerns regarding aquaculture. Thus, Virginia's aquaculture program historically has been and currently is significantly more developed than Maryland's aquaculture program.

Over time, Virginia has enacted various pieces of legislation to facilitate its shellfish aquaculture program. The Virginia Aquaculture Advisory Board, established in 1992, is the model for Maryland's Aquaculture Coordinating Council. The board is given the broad mandate to advise the Marine Resources Commission on "policy matters related to aquaculture." Likewise, Virginia's aquaculture program was the model for Maryland's recently revised aquaculture program. Subject to specific exceptions, the Virginia program grants an eligible landowner a riparian right to lease adjacent waters for planting oysters and clams up to one-half acre in size. Any leased riparian waters may not encroach on an existing lease and may not extend out more than the shorter of 210 feet or the middle of the body of water from shore.

Under the Virginia program, any tidal waters that are not under a riparian lease, designated as part of the public shellfish fishery, or prohibited by federal law, may be leased for oyster aquaculture under a general federal permit. The Virginia Marine Resources Commission is also authorized to establish a general permit authorizing a permitted leaseholder to put a temporary protective enclosure around leased grounds. Under Virginia's program, however, an application for an oyster lease may only be made by (1) a resident of the Commonwealth; (2) a political subdivision of the Commonwealth; or (3) an oyster business chartered under Virginia law for which at least 60% of the corporate stock is owned by Virginia residents.

An aquaculture lease may not exceed 250 acres, except in the Chesapeake Bay. A leaseholder of 250 acres of water leased for aquaculture may apply for another 250-acre lease six months after the underlying lease is finally assigned. A person may not lease more than 3,000 total acres of water for aquaculture, except in the Chesapeake Bay, where 5,000 acres of aquaculture leasehold may be assigned to a person in waters 15-feet deep or greater.

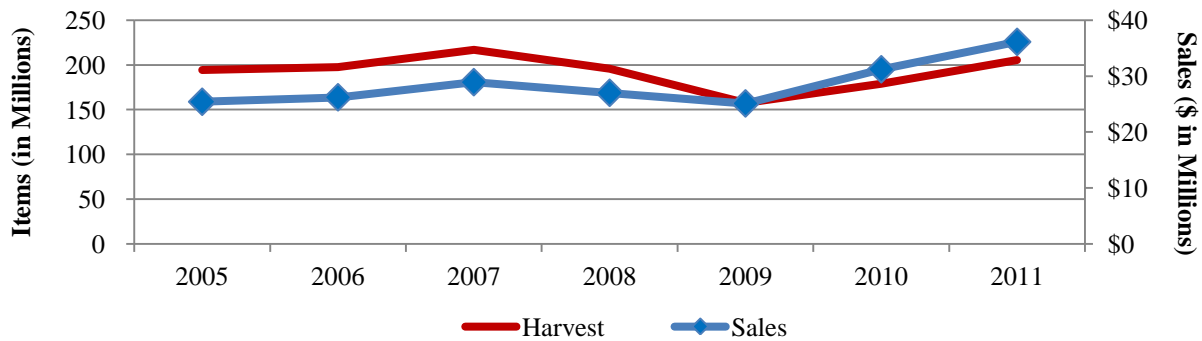
Effectiveness of Aquaculture Program

Economic/Legal Issues: By working with the federal government to establish the general federal permit, Virginia has strengthened its historically strong aquaculture program. The general federal permit establishes areas preapproved for aquaculture, thus eliminating the significant barrier of requiring an applicant for an aquaculture permit to obtain federal wetlands, waterways, and CZMA permits. Virginia, however, does have significant residency requirements for holders of an aquaculture lease, thus foregoing potentially significant private investment in its aquaculture industry. Finally, disease continues to be a significant problem for Virginia's oyster population. Oysters seem to become most susceptible to diseases at close to harvest size, and Virginia does not appear to have a mechanism for adjusting harvest sizes as necessary for oysters harvested through aquaculture.

Production Statistics: The shellfish aquaculture industry in Virginia continues to grow. While Virginia's role in the development of shellfish aquaculture is widely acknowledged by the aquaculture industry, until the *Virginia Shellfish Aquaculture Crop Reporting Survey* was initiated in 2006, there was no consistent reporting of production and economic trends in Virginia's shellfish aquaculture industry.

Exhibit 4 displays Virginia’s shellfish production volume and harvest sales data from 2005 to 2011. During this timeframe, aquaculture production and sales increased by 6 and 1% annually, respectively. As shown in Exhibit 4, shellfish production and sales declined significantly in 2008 and 2009. This decline was solely attributed to a reduction in the production of hard clams which contracted by 32% over the two-year period. (See **Exhibit 5**.)

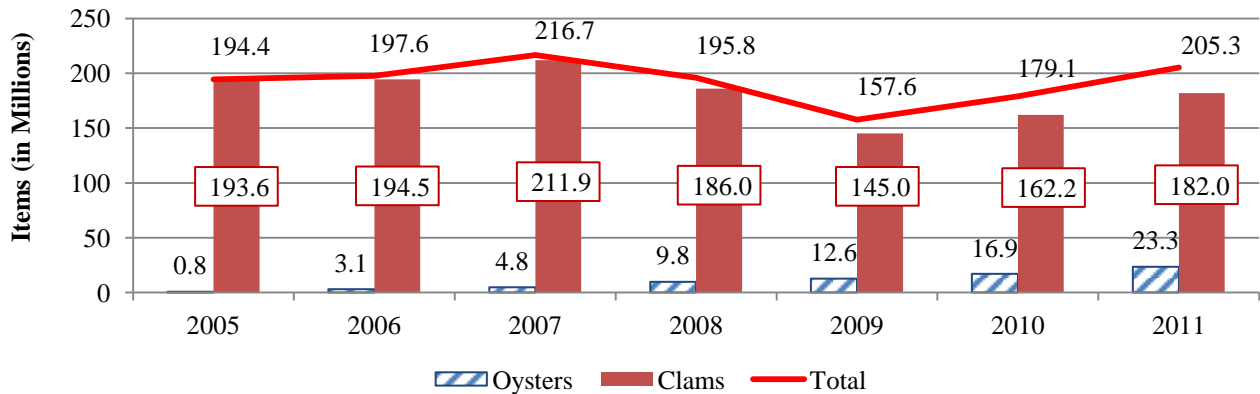
Exhibit 4
Virginia Shellfish Aquaculture Production Volume and Harvest Value
2005-2011



Note: Sales data was calculated by the Department of Legislative Services based on the average market price reported by Virginia growers.

Source: *Virginia Shellfish Aquaculture Situation and Outlook Report (2006-2011)*; Department of Legislative Services

Exhibit 5
Virginia Shellfish Aquaculture Harvest by Species
2005-2011



Source: *Virginia Shellfish Aquaculture Situation and Outlook Report (2006-2011)*

Conversely, the production of oysters has experienced a steady increase since 2005. In calendar 2011, farmers reported harvesting 23.3 million oysters. By contrast, 230,315 bushels of wild oysters (about 80.6 million oysters) were harvested in fiscal 2011.

Rhode Island

Program Description

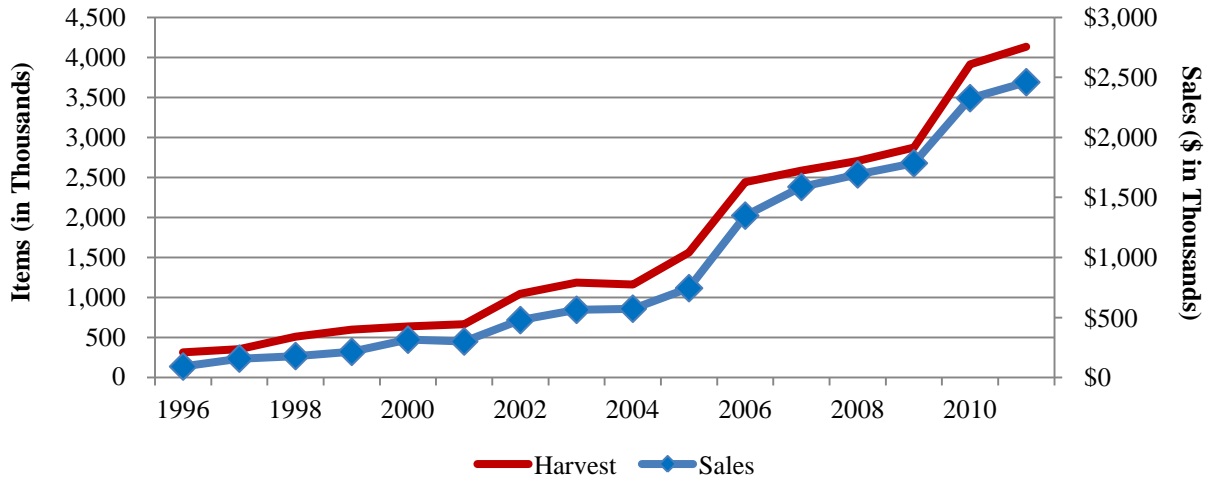
Since 1996, Rhode Island, which by the early 1990s had a virtually dormant aquaculture program, has taken many statutory steps to bolster its shellfish aquaculture program. The state may issue a permit to conduct aquaculture to an individual or another legal entity or to a corporation or business entity chartered in the state. Aquaculture products are also explicitly exempt from the state's sales and use tax, as is equipment used in an aquaculture operation. The only restrictions on the location of a lease, other than federal law, are for the protection of existing marine life. The state may require a permit holder to execute a performance bond to guarantee that the permit holder will abide by the laws governing shellfish aquaculture and that, on failure to perform, all aquaculture equipment will be removed from the waters of the state. Restrictions that apply to the public fishery, including seasons, catch limits, harvest methods, and, except for quahaugs, minimum sizes, do not apply to shellfish harvested through an aquaculture operation.

Effectiveness of Aquaculture Program

Economic/Legal Issues: There is no indication in Rhode Island law of a streamlined process for obtaining federal wetlands, waterways, and CZMA approvals. Exempting aquaculture from the restrictions that apply to the public fishery, however, provides a leaseholder with significant flexibility in dealing with diseased shellfish. Furthermore, Rhode Island's authority to issue a lease to any legal entity in the state potentially attracts significant private investment for shellfish aquaculture. Finally, the sales and use tax exemption for aquaculture likely reduces the amount of capital needed to finance a successful aquaculture operation.

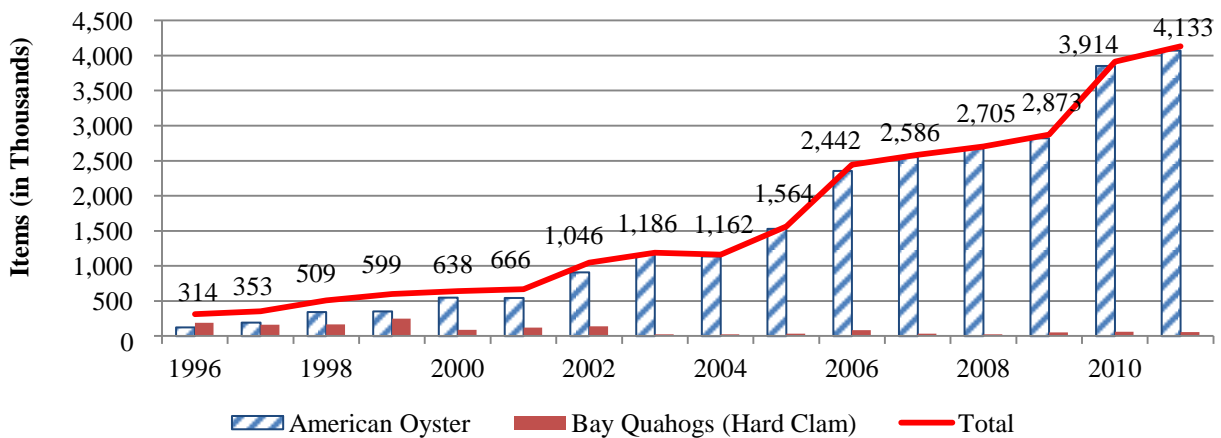
Production Statistics: The reforms to Rhode Island's aquaculture program that began in 1996 seem to have borne fruit. The shellfish aquaculture industry in Rhode Island has experienced steady growth for nearly two decades. **Exhibit 6** displays Rhode Island's shellfish aquaculture production volume and harvest sales data from 1996 to 2011. During this timeframe, aquaculture production and sales increased by 19 and 25% annually, respectively. While Rhode Island has multiple shellfish species, the American oyster is the predominant shellfish species in the state. The Bay Quahog (hard clam) is a distant second, comprising only 1% of Rhode Island's aquaculture production in 2011. (See **Exhibit 7**.) As shown in Exhibit 6, nearly 4.1 million American oysters were harvested in 2011.

Exhibit 6
Rhode Island Shellfish Aquaculture Production Volume and Harvest Value
1996-2011



Source: *Aquaculture in Rhode Island Annual Status Report (1999-2009; 2011)*

Exhibit 7
Rhode Island Shellfish Aquaculture Harvest by Species
1996-2011



Source: *Aquaculture in Rhode Island Annual Status Report (1999-2009; 2011)*

Washington

Program Description

The shellfish aquaculture program in the state of Washington, which has a long successful history in aquaculture, is fairly straightforward and contains few restrictions. For instance, there are no restrictions, such as a ban on corporate leasing or residency requirements as found in other state laws, on who or what entity may obtain a lease. There are also no restrictions on where a lease may apply, other than federal law and a required denial of a lease to protect natural oyster bars, oyster seed production areas, and previously leased areas.

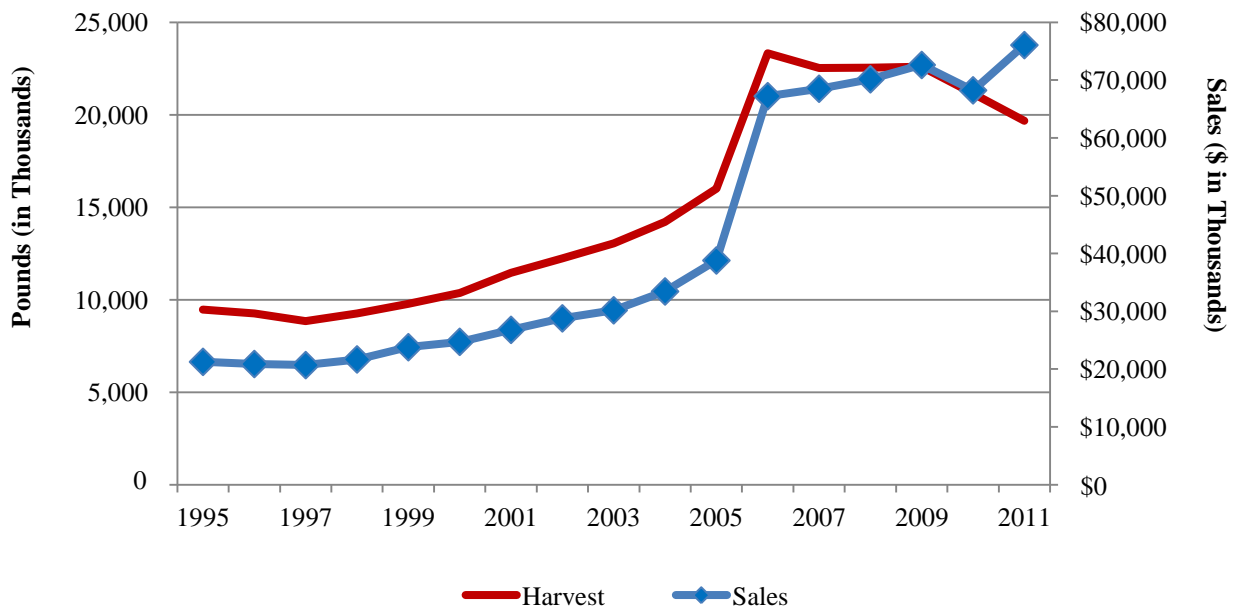
The state of Washington, however, does have an interesting historical twist that continues to impact the shellfish aquaculture program today. In the late nineteenth century, the state of Washington enacted two pieces of legislation, the Bush Act and the Callow Act, to encourage and assist the growth of the oyster industry by authorizing the *sale* of tidelands (land under the waters of the state) to persons for oyster aquaculture. Among other benefits, ownership of tideland allows the owner to use the tideland as collateral to obtain capital for the oyster aquaculture operation. The Bush Act authorized the state to sell up to 100 acres of tidelands per person for use solely for oyster aquaculture, although an owner of tideland that fails to engage in oyster aquaculture may keep title to the tideland. If the tideland is used actively for any other purpose other than oyster aquaculture, however, title to the tideland reverts back to the state. The Callow Act authorized the state to sell up to 40 acres of tideland for oyster aquaculture to a person who had previously entered on the land and engaged in oyster aquaculture. Title to the land reverts to the state if the tideland is used for any other purpose or ceased to be used for oyster aquaculture. Eventually, in 1919, the legislature approved use of the land sold under both acts for all shellfish aquaculture. Almost 47,000 acres of tideland were sold under the Bush and Callow Acts. Although both the Bush Act and the Callow Act were repealed in 1935, language in the repealing legislation established that rights acquired under the acts are unaffected by the repeal. Thus, to this day, shellfish aquaculture continues to operate on privately owned tidelands in Washington state.

Effectiveness of Aquaculture Program

Economic/Legal Issues: Lawmakers and regulators in Washington state recognized over time that the Bush and Callow Acts infringed on the duties of the state under the public trust doctrine. Eventually, title transfers, subdivisions, and the repeal of the Bush and Callow Acts clouded the restrictions that may apply to individual tideland owners. Some of the tideland may have been used to build houses, docks, bulkheads, and even marinas, and for other unintended uses. Furthermore, the 1919 law authorizing all shellfish aquaculture on Bush and Callow Act land was “mysteriously” repealed in the mid-twentieth century, a fact that few if any people knew until recently. As a result, owners of tideland unaware or not notified properly of Bush and Callow Act restrictions, as well as owners harvesting shellfish other than oysters in good faith, may be threatened with reversion of the property to the state.

Production Statistics: Until recently, the shellfish aquaculture industry in the state of Washington experienced consistent growth for over a decade. **Exhibit 8** displays Washington’s shellfish aquaculture production volume and harvest sales data from 1995 to 2011. During this timeframe, aquaculture production and sales increased by 5 and 8% annually, respectively. As shown in Exhibit 8, the production of shellfish reached its peak in 2006 at 23.3 million pounds. However, since that time, the production of shellfish has generally declined notwithstanding growing sales.

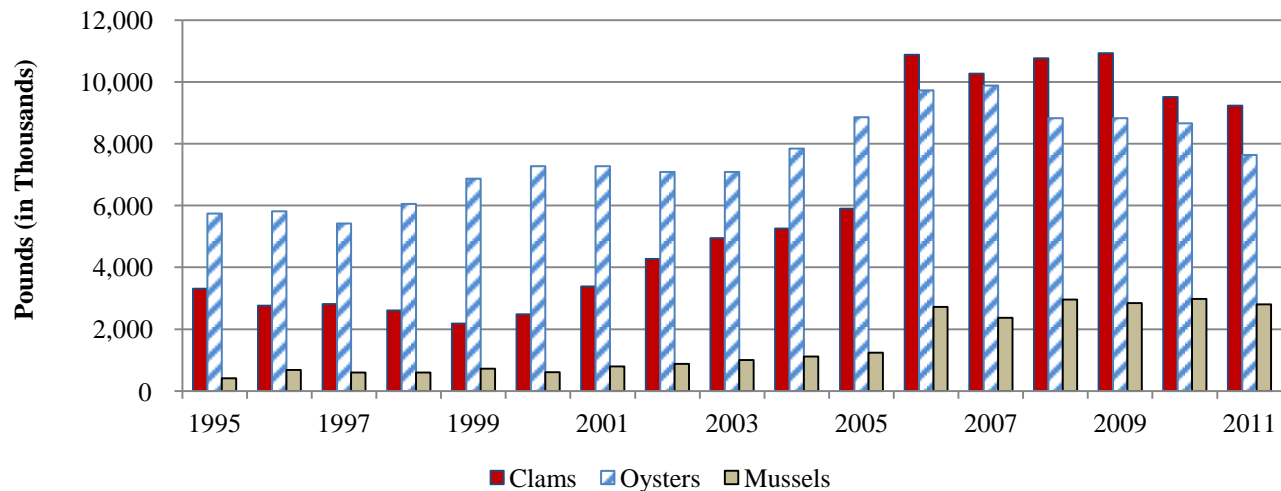
Exhibit 8
Washington Shellfish Aquaculture Production Volume and Harvest Value
Washington Island
1995-2011



Source: Washington Department of Fish and Wildlife

Currently, there are three types of shellfish species farmed in Washington – oysters, clams, and mussels. While once the most harvested shellfish species in Washington, the production of oysters now ranks second to the production of clams. (See **Exhibit 9**.) Although the production of mussels ranks third among the shellfish species produced in the state, trends show that the most significant annual growth has occurred in the production of mussels. The production of mussels increased by 13% annually from 1995 to 2011 compared to clams and oysters, which increased by 7 and 2% annually, respectively.

Exhibit 9
Washington Shellfish Aquaculture Harvest by Species
1995-2011



Note: Mussel production data includes a negligible amount of miscellaneous shellfish such as scallops.

Source: Washington Department of Fish and Wildlife

Connecticut

Program Description

In Connecticut, an applicant for an aquaculture lease is required to obtain federal wetlands, waterways, and CZMA approval, in addition to state and, if applicable, local approval. Connecticut grants aquaculture leases of between 50 and 200 acres to the highest responsible bidder. Aquaculture leases may not be granted to nonresidents of Connecticut unless the applicant's state of residence grants reciprocity. MSX is a problem in Connecticut, as evidenced by a 1997 outbreak that reduced the state's oyster population by nearly 80%.

Effectiveness of Aquaculture Program

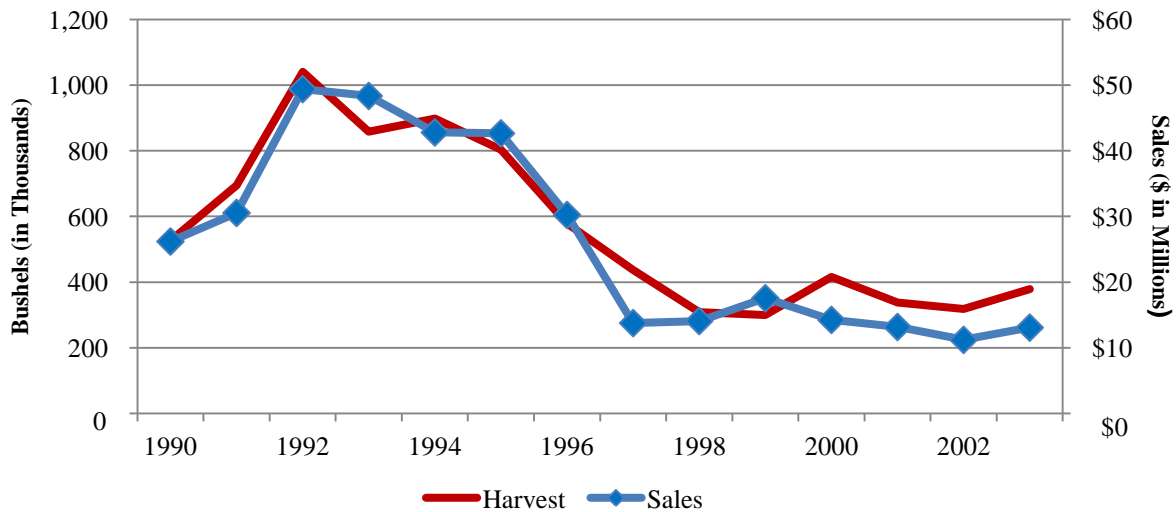
Economic/Legal Issues: Although federal approval is required for an aquaculture lease, the process does not seem to be as cumbersome as in other states. Connecticut has developed a joint permit application with one point of contact, the State Department of Agriculture/Bureau of Aquaculture. In addition, land in the state appropriate for aquaculture leasing appears to be mostly in use. When leasable grounds become available, the state opens the bidding process to re-lease the grounds. This process would seem to indicate that most leasable grounds have

previously received approval, further streamlining the process. The residency limitations, however, likely reduce opportunities to obtain outside private financing for the aquaculture industry in the state. Finally, the growth of naturally and artificially disease resistant (triploid) oysters has helped a “modest to moderate” rebound in oyster aquaculture production in the state in the last decade.

Production Statistics: Connecticut has a rich history in shellfish aquaculture. Exhibits 10 and 11 display Connecticut’s shellfish production volume and harvest sales data over two distinct periods of time. As shown in Exhibit 10, from 1993 to 1999, there was a fairly steady decline in aquaculture production. The most significant decline in aquaculture production took place between 1996 and 1998. During this timeframe, production declined by 27% annually. The decline in production was due, in part, to an outbreak of MSX that reduced the oyster population by 66% from 1996 to 1998.

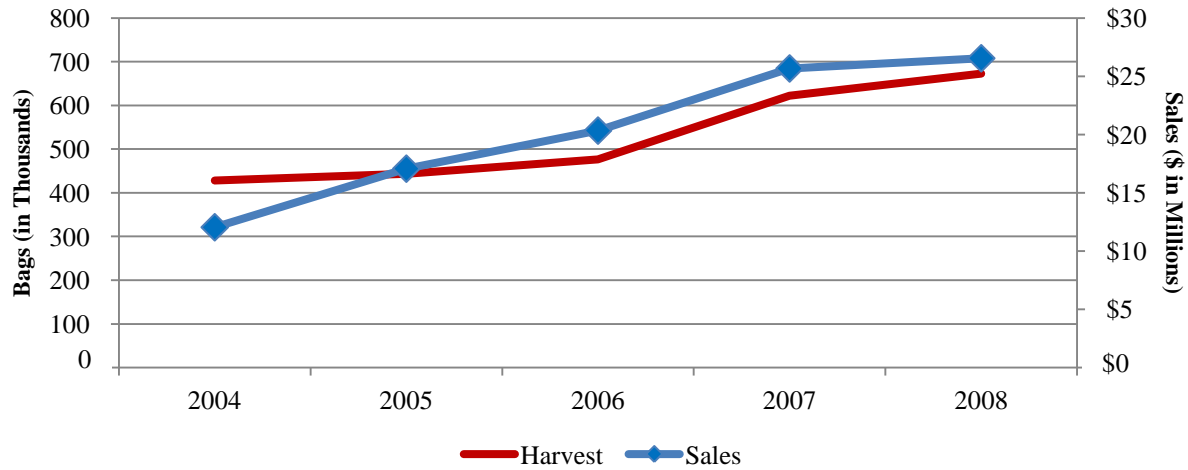
As shown in Exhibit 11, there has been a relatively steady increase in Connecticut’s shellfish aquaculture production and sales since 2004. From 2004 to 2008, aquaculture production and sales increased by 12 and 22% annually, respectively. In 2008, the most recent year in which aquaculture data is available, 511,659 bags of clams were harvested totaling \$20.2 million in sales value. (See Exhibit 12.) Since 2000, at least 76% of Connecticut’s shellfish aquaculture production has been comprised of clams. According to the Connecticut Bureau of Aquaculture & Laboratory Services, unlike most other states, Connecticut’s shellfish harvest is solely derived from aquaculture production.

Exhibit 10
Connecticut Shellfish Aquaculture Production Volume and Harvest Value
1990-2003



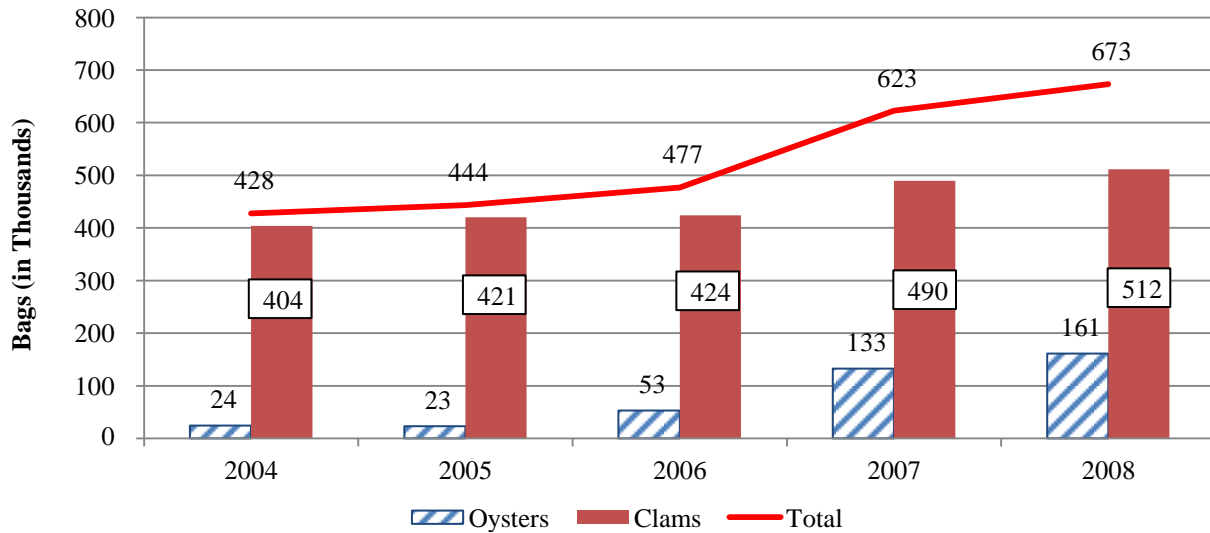
Source: Connecticut Department of Agriculture

Exhibit 11
Connecticut Shellfish Aquaculture Production Volume and Harvest Value
2004-2008



Source: Connecticut Department of Agriculture

Exhibit 12
Connecticut Aquaculture Harvest by Species
2004-2008



Source: Connecticut Department of Agriculture

Maine

Program Description

In Maine, an applicant for an aquaculture lease is required to obtain federal wetlands, waterways, and CZMA approval, in addition to state and, if applicable, local approval. A lease may be issued to any person, subject to varying limits on the aggregate size of leased areas and limited riparian preferences. Shellfish taken from leased areas are not subject to minimum size requirements or time for taking or possessing requirements.

Maine also has three special aquaculture leases. The emergency aquaculture lease authorizes the holder of an aquaculture lease to relocate shellfish from a leased area where the health and safety of the shellfish is threatened. The limited-purpose aquaculture lease, used for nursery sites, relay sites for the recovery of diseased oysters, testing new areas, hobby purposes, or small operations, is limited to 400 square feet and expires on December 31 each year. The experimental lease is used for testing new areas and allowing a leaseholder to determine the leaseholder's aptitude for aquaculture and is limited to four acres and a three-year duration. If the site proves suitable, the leaseholder may apply for a standard aquaculture lease on the site. These special leases also have the benefit of shorter application and approval timeframes than standard aquaculture leases.

In Maine, no tax is collected on the sales, storage, or use of feed, hormones, pesticides, antibiotics, or medicine for use in aquaculture. In addition, any sales tax paid on the purchase of electricity or depreciable machinery or equipment for use in commercial aquaculture production is refundable.

Effectiveness of Aquaculture Program

Economic/Legal Issues: There is no indication in Maine law of a streamlined process for obtaining federal wetlands, waterways, and CZMA approvals. The three special licenses, however, likely assist leaseholders in implementing and maintaining the aquaculture leases and attract new persons into the aquaculture field. Additionally, exempting aquaculture from the minimum size requirements or time for taking or possessing requirements provides a leaseholder with significant flexibility in dealing with diseased shellfish.

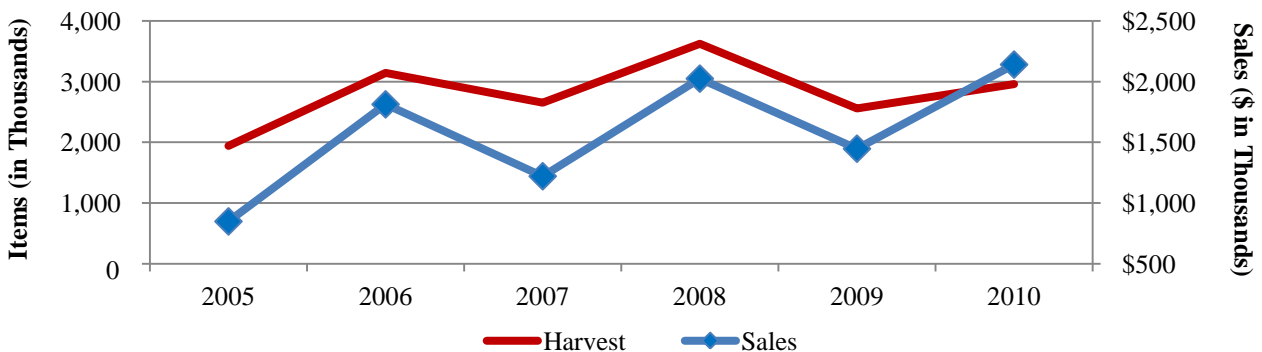
Furthermore, the liberal residency requirements for aquaculture leaseholders likely help in attracting capital to Maine's aquaculture program. Finally, the sales, storage, and use tax exemption for specific products used in aquaculture and the sales tax refund for specific commodities used in commercial aquaculture production likely reduce the amount of capital needed to finance a successful aquaculture operation.

Production Statistics: Laws governing fish and shellfish aquaculture in Maine date back to 1905. The leasing of Maine waters for the private aquaculture of marine fish, shellfish, and plants, however, has a more recent history. Since 2003, the state of Maine has compiled data on the aquaculture production of American oysters and blue mussels. However, due to concern

regarding the reliability of the data collected prior to 2005, the Department of Maine Resources has chosen not to disclose harvest data collected during the first two years of the reporting requirement.

Exhibit 13 displays American oyster harvest data for the state of Maine from 2005 to 2010. During this timeframe, aquaculture production and sales increased by 9 and 20% annually, respectively. In 2010, the most recent year in which aquaculture data is available, nearly three million American oysters were harvested totaling \$2.1 million in sales value. Unlike other states such as Maryland, the majority of Maine's oyster harvest is farmed. In 2010, only about 577,000 wild oysters were harvested totaling about \$80,000 in sales value.

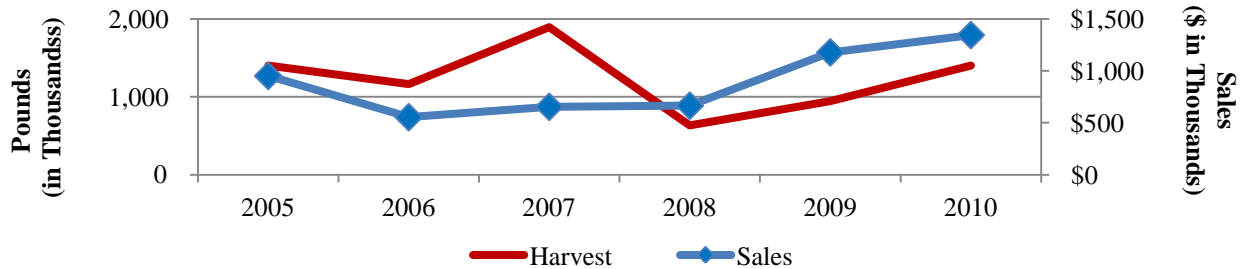
Exhibit 13
Maine American Oyster Production Volume and Harvest Value
2005-2010



Source: Department of Maine Resources

Exhibit 14 displays blue mussel harvest data for the state of Maine from 2005 to 2010. During this timeframe, aquaculture production and sales increased by 0.04 and 7.17%, respectively. Despite fluctuations in both production and sales from 2005 to 2007, there has been a noticeable increase in production and sales since 2008. Unlike oysters, Maine's blue mussel harvest is mostly comprised of wild mussels. In 2010, farmers reported harvesting 1.4 million pounds of blue mussels totaling \$1.3 million in sales. By contrast, about 13.2 million pounds of wild blue mussels were harvested totaling \$1.1 million in sales value.

Exhibit 14
Maine Blue Mussel Production Volume and Harvest Value
2005-2010



Source: Department of Maine Resources

Maryland Shellfish Aquaculture Program

Maryland Introduction and Historical Perspective

As with Virginia, laws authorizing and governing shellfish aquaculture in Maryland date back to the nineteenth century. These laws, passed at a time when the wild shellfish stocks were abundant, were tempered by various political pressures. Specifically, the watermen of the time feared dominance of the oyster industry by large corporations and the corresponding loss of their independence and financial security. Thus, the early laws governing shellfish aquaculture were quite restrictive and ineffective in promoting growth in the industry. Aquaculture began as, and remained for decades, a small part of the shellfish industry in Maryland.

In the late twentieth century, new concepts of shellfish aquaculture provided some promise for expanding aquaculture in Maryland. Unfortunately, at roughly the same time, disease ravaged the oyster population. These diseases nearly ended both the public and private oyster fisheries in the Chesapeake Bay. By the early twenty-first century, the oyster industry in Maryland consisted mostly of a small number of harvesters working on public oyster bars. An effective shellfish aquaculture program would create a significant opportunity in Maryland and the Chesapeake Bay to rejuvenate the shellfish industry, create jobs and economic opportunity, improve water quality, replenish depleted wild shellfish stocks, and provide seafood for the marketplace.

Program Description

In recent years, Maryland has made significant changes to update its outdated shellfish fishery management program, particularly in relation to its aquaculture program. The changes mainly apply to the oyster aquaculture program. Legislation enacted in 2005 established the

Aquaculture Coordinating Council under the Maryland Department of Agriculture (MDA) (now under the Department of Natural Resources (DNR)). Among other things, the council is required to formulate and make proposals for advancing Maryland aquaculture; conduct applied studies of projects and products that will expand Maryland's aquaculture industry; and, on a regular basis, review State regulations impacting aquaculture and make appropriate recommendations. The council has been instrumental in establishing and promoting updated laws governing Maryland aquaculture.

Legislation enacted in 2007 was the next step in this process. Among other changes, the legislation altered the authority to impose license suspensions or revocations on persons who violate oyster restrictions, taking this authority out of the hands of the State courts (which have often been reluctant to impose license suspensions or revocations out of sympathy for the livelihood of the person convicted) and placing it with the appropriate regulatory body, DNR. DNR also was required to adopt by regulation enhanced administrative penalties for egregious violations of time restrictions and closed areas. The legislation further established the Oyster Advisory Commission (OAC) to provide an independent review of scientific and management issues relevant to oysters in the Chesapeake Bay. The legislation required DNR to publish maps and coordinates of areas closed to shellfish harvest and to provide this information to each tidal fish license holder who pays the oyster surcharge (payment of the surcharge in any license year authorizes the license holder to harvest oysters). By providing this information, DNR puts the license holder on constructive notice of the closed areas.

Also in 2007, appropriations bills provided capital funding for the expansion of the oyster spat (juvenile oysters) production facility at Horn Point and the Maryland Artificial Reef Initiative (which uses reef building materials from various sources, including salvaged structures such as the old Woodrow Wilson Bridge, to create new reefs).

In September 2008, MDA (which at the time oversaw the State's aquaculture program), in consultation with other State agencies and the Aquaculture Coordinating Council, published *Maryland Shellfish Aquaculture Plan: Enhancing the Environment through Private Sector Investment*. This report included recommendations about developing a sustainable fishing industry while creating opportunities for prospective shellfish growers to establish aquaculture businesses in Maryland waters. An expanded sanctuary program, including increased aquaculture, was also recommended by OAC and in the Final Programmatic Environmental Impact Statement for Restoring Oysters to the Chesapeake Bay prepared by federal and State officials. Legislation enacted in 2009 implemented several of the recommendations in the report. The legislation and subsequent amendments required DNR to identify and establish (1) a public commercial shellfish fishery area in productive wild areas traditionally harvested by watermen on which leasing is prohibited; (2) Aquaculture Enterprise Zones (AEZs) (under a federal general approval permit similar to that in effect in Virginia) in the Chesapeake Bay for aquaculture leasing, and more traditional submerged land and water column leases in the Chesapeake and Atlantic coastal bays, which have no limits on proximity to natural oyster bars, county locations, corporate or out-of-state leaseholds, or acreage; and (3) aquaculture demonstration leases for educational, conservation, or ecological purposes.

The 2009 legislation implemented numerous policies to incentivize aquaculture operations. Areas approved for AEZs under the federal general permit are also preapproved for water quality by the Maryland Department of the Environment (MDE) and a federal tidal wetlands permit, a federal waterway permit, and as meeting CZMA requirements, thus eliminating significant regulatory hurdles and significantly shortening the timeframe before DNR may approve a lease. Elimination of the location, ownership, and size barriers for aquaculture leasing increased the areas available for leasing and made the aquaculture program more attractive for and available to outside investment (authorization for corporate ownership was somewhat tempered under subsequent 2011 legislation that limited corporate ownership to a corporation chartered in Maryland and for which more than 50% of the stock is owned by Maryland residents, a requirement substantially similar to Virginia's). Additional legislation enacted in 2011 streamlined the aquaculture permitting process by consolidating all of the State's aquaculture activities under DNR. Other legislation enacted in 2011 eliminated the daily harvest limit for aquaculture operations. Subsequent legislation in 2012 authorized DNR to eliminate the size limit for oysters harvested from oyster aquaculture operations, helping to alleviate disease pressure on these oysters as MSX and Dermo tend to infect oysters when they are close to harvest size.

There remains a lingering issue with respect to the federal general permit applicable to Maryland, however. The federal general permit applicable to Virginia requires minimal effort by an applicant for an aquaculture lease, as the areas in question have already been preapproved as suitable for aquaculture and unlikely to result in negative ecological impact. Aquaculture activity under the Virginia general permit must satisfy basic standards such as inclusion of navigational markers, limitations on aquaculture in areas populated by submerged aquatic vegetation, and minimal adverse effects on birds, wild shellfish, and other native species. Under the Maryland federal general permit, however, an application must contain more standards and analysis than in Virginia, including seemingly redundant analyses of the substrate in question, water quality, user conflicts and prospective mitigation, and detailed project plans. These application requirements present an additional barrier to aquaculture in Maryland that does not exist in Virginia, although both general permits apply to essentially the same bodies of water.

In an effort to encourage shellfish aquaculture production, DNR partnered with the Maryland Agricultural and Resource-Based Industry Development Corporation to provide affordable financing to watermen and other parties who want to start or expand commercial shellfish aquaculture operations in Maryland. The University of Maryland Extension and the Oyster Recovery Partnership are also contributing to this effort by providing training and business planning assistance to current and prospective shellfish growers.

Finally, in Maryland, the sales and use tax does not apply to the sale or rental to an aquaculture leaseholder of equipment used for aquaculture.

Effectiveness of Aquaculture Program

Before enactment of the 2009 legislation, DNR did not maintain historical data on shellfish aquaculture in Maryland. Since that time, however, DNR has implemented mandatory

reporting requirements for leaseholders. Calendar 2010 was the first year that DNR began collecting aquaculture production data from leaseholders. According to DNR, 4,200 bushels of shellfish were harvested in 2010 with an estimated value of \$200,000. Likewise, in 2011, 4,500 bushels of shellfish were harvested with an estimated value of \$252,000.¹ DNR anticipates future production increases as the majority of the seeds planted over the last two years are harvested in the upcoming calendar year. Despite the anticipated growth in aquaculture production, if Maryland's aquaculture harvest ever approaches the level of the State's wild harvest, it will undoubtedly take years to accomplish. By way of comparison, 129,787, 105,123, and 127,780 bushels of wild oysters were harvested during the 2009 to 2010, 2010 to 2011, and 2011 to 2012 oyster seasons, respectively.

According to DNR, the State maintained 709 active shellfish aquaculture leases comprising 6,722 acres of land in early 2009 (before the passage of the 2009 legislation). By comparison, in November 2012, the State maintained 356 active shellfish aquaculture leases comprising nearly 4,000 acres of land. DNR reports that the notable decline in the number of leases issued and land harvested is attributed to one of the new policies established under the 2009 legislation requiring a commercial leaseholder to actively use a lease or return it to the State. Consequently, many submerged land leases have been returned by the leaseholder or terminated by the State due to inactivity. According to DNR, as of November 2012, 85 lease applications comprising 1,421 acres of land were under review. DNR expects to approve approximately 50 new leases annually for the next few years.

Conclusion

Because the United States can no longer depend on an unlimited harvest of wild stocks of shellfish, the continued rise of aquaculture is inevitable. Some states, such as Virginia and Washington, have a long successful aquaculture tradition on which they wish to build, while others, such as Rhode Island, have essentially started from scratch. Individual states will implement different policies to foster aquaculture based on experiences in other states and federal research and guidance, and their own unique circumstances.

Maryland has made several changes to its aquaculture program after examining programs in other states, particularly Virginia. Although it is too early for the available data to show improvement, the recent changes to the program should go a long way in fostering aquaculture, especially shellfish aquaculture, in the State. The establishment of the federal general permit in Maryland should streamline the application and start-up processes. The elimination of limits on ownership and investment for aquaculture operations in Maryland should attract needed capital for emerging aquaculture operations. Regulatory flexibility in establishing size and catch limits for harvest should help aquaculture operations address disease issues. It is expected that these

¹ It should be noted that DNR has expressed concern regarding the reliability of the aquaculture data due to the infancy of the reporting requirement.

reforms will show up in future data that will show improving shellfish aquaculture production and harvest value.

Maryland can continue to look to other states for guidance and innovative ideas to facilitate growth in the aquaculture industry. In particular, Maryland may wish to examine four issues addressed earlier by other states.

- Virginia's federal general permit expires in late 2013. Maryland should support Virginia in any feasible manner in this permit renewal application, in the hopes of maintaining precedent for relaxing the seemingly redundant standards of the Maryland federal general permit.
- Triploid oysters focus their energy on growth rather than reproduction and as a result can reach market size quickly. This fact makes this species ideal for aquaculture in high intensity disease areas. Triploid oysters can also be produced out of season, when wild oysters are weakened from spawning. Maryland has begun examining the use of triploid technology in its aquaculture program, as has seemingly proved useful in Connecticut, and should continue to do so.
- Washington's long history of successful aquaculture may well be due in part to its past policy of selling tideland to private entities. This policy, however, has proven problematic and unpopular in many circles based on its infringement on the Public Trust Doctrine, and has resulted in misuse of tidelands and potentially contentious lawsuits. While it is possible that the sale of tideland could provide a short-term benefit for aquaculture through increasing access to capital and pride of ownership, the long-term risks may outweigh the benefits.
- Maryland may also wish to examine implementing features of Maine's three special aquaculture leases, the emergency aquaculture lease, the limited-purpose aquaculture lease, and the experimental aquaculture lease. Maryland aquaculture leaseholders could benefit from provisions of these licenses that authorize the relocation of endangered shellfish, relay sites for the recovery of diseased oysters, nursery sites, and the testing of potential new shellfish aquaculture sites. Prospective leaseholders interested in trying shellfish aquaculture may be attracted to the initial limited obligation to a small leased area, lower initial costs, the opportunity to test the prospective leaseholder's aptitude for aquaculture, and possibly shorter application and approval timeframes.

Domestic wild fisheries undoubtedly will continue to struggle to provide adequate seafood for a growing population. Increased aquaculture production will be vital in making up this shortfall. Although Maryland has significantly updated its aquaculture policies and practices in recent years, the State should continue to monitor other states' programs for future improvements of best aquaculture practices. Considering the upward trajectories of aquaculture production in other states and the potentially promising initial reports in Maryland of a continued increase in aquaculture lease applications and acreage leased for aquaculture, with the proper

attention and promotion, Maryland aquaculture should be poised for significant growth in the near future.