Rhode Island Aquaculture Initiative: A Shared Vision for the Future
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URI doctoral student Rachel Petrik-Finley emptying a pot of fish to be tagged and released for a habitat study. Photo by Jessica Tallman.

Shellfish farmer Robert Krause at work among suspended oyster cages. Photo by Marta Gomez-Chiarri.
Rhode Island Aquaculture Initiative:
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Ross Ricciarelli hauling gear at his father Louis’s oyster culture site. Photo by David Alves.
VISION STATEMENT

Rhode Island becomes a globally recognized center for the development of sustainable, ecological aquaculture by the integration of its innovative farming and aquaculture business sectors with its world-class research, education, and outreach capabilities.

A harvest from Shellfish For You, Quonochontaug Pond. Photo by Marta Gomez-Chiarri.

Starfish, a problem predator for cultured oysters. Photo courtesy of RW U.
RHODE ISLAND AQUACULTURE INITIATIVE: A SHARED VISION FOR THE FUTURE

INTRODUCTION

Aquaculture has a long history in Rhode Island. In the early 1900s, oyster culture generated the equivalent—in today’s dollars—of $50 million to $90 million in revenue. But by mid-century, pollution, political problems, turf conflicts between aquaculture lease holders and capture fisheries, and natural disasters—notably, the hurricane of 1938—had decimated the state’s aquaculture industry. Limited growing space and intensive competition for coastal access have hindered reestablishment of the industry over the years. Conflicts stemming from multiple uses of aquatic resources along an increasingly crowded coastline have thwarted accommodation of still more demands on coastal areas.

Yet despite these restrictions, aquaculture is experiencing resurgent growth in Rhode Island, with shellfish culture dominating marketplace activity. Much of the state’s production is based in Rhode Island’s south shore salt ponds—coastal lagoons whose exceptional productivity promotes fast growth and excellent flavor. Excellent water quality in areas of Narragansett Bay and in Block Island and Rhode Island sounds also contributes to a consistently high-caliber product. The superb quality of Rhode Island’s aquaculture products assures premium prices, boosting the value of the state’s aquaculture harvest despite the industry’s small size.

Legislative interest has acknowledged industry potential through establishment of a Legislative Commission on Aquaculture and the introduction of aquaculture reform legislation. And national support has significantly accelerated industry development through a $1.42-million Rhode Island Aquaculture Initiative provided through the efforts of U.S. Sen. Jack Reed, with strong local backing from R.I. Rep. Eileen Naughton.

Harvest Value

Rhode Island’s aquaculture products are acknowledged for their exceptional quality, commanding premium prices. The Rhode Island Coastal Resources Management Council assesses the gross value of the state’s aquaculture harvest at more than $8,000 per acre for 2003. In comparison, land-based agriculture in Rhode Island earns a little more than $640 per acre.
THE RHODE ISLAND AQUACULTURE INITIATIVE

A thriving aquaculture industry in Rhode Island requires connections and commitments that capitalize on, augment, and strengthen existing resources and relationships while minimizing user conflicts. The industry can encourage a productive aquaculture environment by pioneering positive connections between capture fisheries and aquaculture farmers. By supporting collaborative projects among farmers and educational and technological institutions, the industry can promote invention of technologies suitable for Rhode Island’s environmental and cultural landscape. By strengthening human resources through maintenance of the existing investment and through the addition of aquaculture business-management expertise, the industry can provide the technical know-how and practical assistance to support robust entrepreneurship. And by developing economically viable and educationally appropriate aquaculture demonstration sites, the industry can provide an infrastructure blueprint to encourage and guide new aquaculture endeavors.

The Rhode Island Aquaculture Initiative is working to advance Rhode Island’s standing in world aquaculture by focusing the state’s academic, scientific, industrial, and regulatory resources on development, promotion, and management of a competitive aquaculture industry. In the context of the strategic plan, the Initiative’s executive committee is shaping the future of Rhode Island aquaculture in its considerations for the next round of investment in Initiative projects. These investments work to promote diversification and innovation in the industry in ways that maintain and enhance Rhode Island’s coastal and marine environments and assure compatibility with the state’s vital commercial capture fisheries.

Recent Growth

Aquaculture has been slow to gain a foothold in Rhode Island. Limited to the production of shellfish—primarily oysters and hard clams—the state’s industry is small even in comparison to the industries of neighboring Connecticut and Massachusetts. Nationally, Rhode Island ranks near the bottom of the 50 states in aquaculture production.

But a more competitive industry is in the making. From about $90,000 in sales in 1996 to $550,000 in sales in 2003, aquaculture in the Ocean State has grown steadily. From six farms on about 9 acres in 1996, the industry had expanded to cover 61 acres with 20 working farms by 2003.

A legislative boost

Legislative support for aquaculture has advanced industry growth in Rhode Island through establishment of the Legislative Commission on Aquaculture and the introduction of aquaculture reform legislation.

Significant financial and developmental support energized the industry in 2002 with the $1.42-million Rhode Island Aquaculture Initiative secured through the National Oceanic and Atmospheric Administration by U.S. Sen. Jack Reed.

Left: Collecting clams for a survey of bivalve diseases. Photo by Marta Gomez-Chiarri.

Right: Oyster farmer Rob Krause (left) and extension agent Dale Leavitt assessing samples from Krause’s lease site. Photo by Marta Gomez-Chiarri.
Industry-related research and capacity-building projects funded through the Initiative have expanded Rhode Island’s aquaculture presence into classrooms, public works, and specialty markets as well as traditional food-production enterprises. Through multiyear appropriations and short-term mini-grants, the Initiative encourages bold experiments with potential impacts on the entire industry as well as smaller scale innovations pertinent to a single farm. The Initiative has directed approximately $536,000 ($513,000 in research awards and $23,000 in industry-targeted mini-grants) to widely varied research and development projects. Production projects take advantage of applied, industry-relevant aquaculture science by generating new techniques or new gear, encouraging experimentation with new species, and enhancing the efficiency and output of fish farms.

RHODE ISLAND AQUACULTURE INITIATIVE GOALS

To realize the full potential of Rhode Island’s aquaculture industry, the state is applying its natural, human, and economic resources to two specific goals:

1. Promoting a balance in jobs and growth within traditional and nontraditional industry sectors; growing aquaculture while respecting Rhode Island traditions and culture; building and supporting partnerships; developing techniques that improve aquaculture productivity in harmony with other uses of the resource and the environment

2. Fostering a linked global and local approach to the development of nontraditional futuristic aquaculture businesses by creating an environment that enables innovative aquaculture development

A Mandate for Growth

The mandate of the Rhode Island Aquaculture Initiative is to assist the growth, expansion, and diversification of the aquaculture industry in Rhode Island. The following overarching goals of the Initiative are focal points for revitalization of the aquaculture industry:

- Increasing the number of farmer entrants and related technological and manufacturing companies
- Increasing incomes and job opportunities in aquaculture and aquaculture support industries in Rhode Island
- Building new partnerships, reinforcing existing collaborations, and enhancing cooperation between federal-state-university and industry stakeholders to develop sustainable aquaculture in Rhode Island

Collaborative strength

A major accomplishment of the Initiative has been development of a unique collaboration among federal, state, academic, commercial fisheries, and aquaculture interests in Rhode Island. This collaborative strength has furthered the industry while ensuring that the future of aquaculture will fit into the unique cultural and natural environment of Rhode Island.
• Creating new institutional linkages by enhancing extension and outreach capacities to encourage growth of the state's aquaculture industry
• Accelerating applied, industry-relevant, cooperative research between universities and industry
• Promoting Rhode Island aquaculture by enhancing communications and public outreach
• Assisting in the organization of public aquaculture efforts among state and federal agencies and the industry to restore and invigorate commercial and recreational shellfish harvests in Rhode Island waters
• Clarifying the economic, environmental, and social benefits of aquaculture for consumers

A STRATEGIC PLAN FOR RHODE ISLAND AQUACULTURE

The vision statement of the Rhode Island Aquaculture Initiative encapsulates a broader strategic plan whose specific goals, objectives, and actions are directed toward building the aquaculture industry in Rhode Island to a position of national and international recognition. Inherent in both the vision and the strategy is a determination to rejuvenate aquaculture with enterprises consistent with the state's cultural and social structure.

Opportunities and Needs

The aquaculture industry in Rhode Island recognizes the need for stable investment as a strategy for continued growth in established areas, and for diversification into new ventures to ensure long-term viability. Rhode Island aquaculture has grown slowly but steadily in recent years as traditional fishing and shellfishing families have integrated wild harvest with culture practices. Additionally, interest has expanded to inland areas, which present opportunities for innovative approaches to aquaculture. Rhode Island has the resources in place to cultivate a modern, knowledge-based industry that advances the development of aquaculture worldwide in a sustainable and ecologically and socially responsible manner.

Former Coastal Fellow Meggan Dwyer processing oysters for a shellfish disease survey. Photo by Marta Gomez-Chiarri.

Farmer Louis Ricciarelli instituting new cage methodology using PVC cages. Photo by David Alves.

Right: Former URI fisheries student and Coastal Fellow Josepha Dougal preparing oyster tissue for histological examination. Photo by Marta Gomez-Chiarri.
ACCOMPLISHMENTS AND PROGRESS

Creation of the Aquaculture Initiative’s executive committee established an infrastructure of leadership to reinvigorate the aquaculture industry and nurture its expansion. The committee’s support of diverse projects and the pioneering advances achieved through these projects construct a sturdy framework on which to build the industry.

Initiative Accomplishments

Achievements of the Rhode Island Aquaculture Initiative confirm Rhode Island’s capacity to support an innovative aquaculture industry and establish a solid foundation for future development:

• Extension positions provide expertise in finfish and shellfish culture to advance aquaculture efforts in a production setting
• A finfish aquaculture demonstration center at the University of Rhode Island offers working examples of commercial aquaculture applications
• Aquaculture education familiarizes middle school- through college-age students with the mechanics, impacts, and potential benefits of aquaculture
• Shellfish enhancement augments wild populations to expand the commercial harvest
• Geographic Information System (GIS) maps plot various uses of Rhode Island waters to inform future development decisions
• A marine ornamental aquaculture research center assesses the economic potential of commercial-scale ornamental aquaculture for Rhode Island
• Initial work toward a marine technology and aquaculture center advances prospects for a marine biotechnology industry in Rhode Island
• Inclusion of members of the Initiative’s executive committee on the Rhode Island House of Representatives Commission on Aquaculture ensures a voice for industry interests
• Sponsorship of state and regional aquaculture conferences and expos extends knowledge of aquaculture to multiple constituencies
Rhode Island Aquaculture Initiative Grants Research Awards

2002

• Habitat value of shellfish aquaculture gear, $100,028
  Graham E. Forrester, University of Rhode Island
  Robert Rheault, Moonstone Oysters
• QPX in Rhode Island Quahogs, $49,100
  Marta Gomez-Chiarri, University of Rhode Island
  Roxanna Smolowitz, The Marine Biological Laboratory
  Timothy Scott, Roger Williams University
• Development of a marine ornamental aquaculture research center in Rhode Island, $125,400
  Bradford Bourque, Roger Williams University
  Harold Pomeroy, Roger Williams University
  Kurt Harrington, Something Fishy, Inc.
• Ocean State aquaculture education project: Building a better community through aquaculture education, $104,000
  Perry Raso, Ocean State Aqua Farm
  Alicia Thayer, South Kingstown High School

2004

• An evaluation of currently available disease-resistant oysters for use in Rhode Island oyster farms, $99,100
  Marta Gomez-Chiarri, University of Rhode Island
  Dale Leavitt, Roger Williams University
• Survey of bivalve diseases in Rhode Island farms, $35,164
  Marta Gomez-Chiarri, University of Rhode Island

Rhode Island is seizing aquaculture’s potential.
### Rhode Island Aquaculture Initiative Grants

**Mini-Grant Awards**

#### 2003

- **Scallop and soft-shell clam grow-out in Narragansett Bay, $3,000**
  
  Russell E. Blank and William Blank, Commercial Shellfishermen and Shellfish Farmers

- **Mussel declumper with modifications for oyster hopper and market grading module, $3,000**
  
  Todd Corayer, Salt Water Farms, LLC

- **Starfish predation control in oyster culture cages, $275**
  
  Rob Krause, Aquaculture Products by Krause, Inc.

- **Scallop container grow-out in Narragansett Bay, $3,000**
  
  Louis Ricciarelli, Commercial Shellfisherman and Shellfish Farmer

- **FLUPSY Genset for remote locations, $2,000**
  
  Robert Rheault, Spatco, Ltd.

- **Surf clam grow-out in Narragansett Bay, $2,000**
  
  Kenneth Thompson, Commercial Shellfisherman

- **Integration of wind turbine with photovoltaic-powered upwellers, $1,700**
  
  Christopher Warfel, Shellfish Farmer

#### 2004

- **Development of an electronic fish counting system, $1,750**
  
  Dale Leavitt, Roger Williams University

- **Underwater video camera and recorder to document habitat value of shellfish aquaculture gear, $4,030**
  
  Robert Rheault, Shellfish Farmer

- **Extending the FLUPSY fleet of the Rhode Island Shellfishermen’s Association, $2,500**
  
  Michael McGiveney, Commercial Shellfisherman, and Save The Bay

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*Legislative support for aquaculture has advanced industry growth.*
Extension Positions

The hiring of two extension agents satisfies an essential objective of the Aquaculture Initiative. These agents ensure an integrated statewide approach to outreach to support the aquaculture industry with technical assistance and training, demonstration projects, species diversification, and market development. Knowledgeable in marine sciences and experienced in various aspects of aquaculture, the agents offer guidance and assistance for addressing issues such as disease or water quality as well as general information about species whose hardiness, growth rates, marketability, or pharmaceutical potential might make them attractive subjects for entrepreneurial efforts.

- Randy Mickley, the Initiative’s finfish aquaculture extension agent, has generated projects and programs that advance Rhode Island’s efforts in the expansion of finfish culture in a production setting. Mickley is housed at the University of Rhode Island’s East Farm Fisheries Center.
- Dale Leavitt, the shellfish aquaculture extension agent, has conducted research and outreach that cultivate and promote expansion of the culture of shellfish in a production setting. Leavitt is an assistant professor at Roger Williams University, with a courtesy appointment in the University of Rhode Island fisheries, animal and veterinary science department.

Extension Developments

- Reestablishment of a finfish aquaculture demonstration site at the University of Rhode Island East Farm campus opens indoor grow-out tanks and outdoor/greenhouse finfish aquaculture facilities to students and the interested public as working demonstration projects.
- Construction of a water garden at East Farm emphasizes landscaping as an aquaculture business opportunity.
- Research into the causes and prevalence of oyster disease and evaluation of available disease-resistant oysters for aquaculture use generates practical applications for the Roger Williams University extension effort.
- Cultivation of a vegetable garden at the University of Rhode Island demonstration site makes use of fish waste for fertilizer, with produce from the garden going to the state’s food bank.
- Facility tours and demonstrations at both campuses inform interested individuals about biological considerations, culture techniques, and equipment development important to an aquaculture business.
- Informational materials, presentations, and consultations bring the knowledge, experience, and creativity of the extension agents directly to entrepreneurs, students, and other interested individuals.

Finfish extension agent Randy Mickley at the East Farm water garden. Photo by Tony Corey.

Baby clams growing in a upweller. Photo by Perry Raso.

Shellfish extension agent Dale Leavitt. Photo by Marta Gomez-Chiarri.
Marine Technology and Aquaculture Center

The Marine Technology and Aquaculture Center will have the capacity to incubate biotechnology initiatives both by ensuring the resources necessary for such enterprises and by remedying problems such as waterfront access, complex permitting systems, and potential user conflicts. Along with structural accommodations, including laboratories, offices, greenhouses, and access to flowing seawater, the proposed multi-acre facility will offer support in the way of business, technical, and legal expertise. Especially significant will be the center’s role in providing necessary operating permits to facilitate industry development and expansion. This center will be the first facility in the Northeast dedicated to promotion of emerging marine biotechnology industries.

Instant Information: Maps and Websites

Aquaculture lease sites, oyster disease sampling sites, and anoxia-threatened areas are some sections of Rhode Island waters that can be pinpointed with the click of a mouse on an updated and enhanced Aquaculture and Fisheries Website and Internet Map Server. These electronic tools draw on academic, regulatory, and industry resources to visually document current uses of Narragansett Bay and adjacent waters to help guide future development decisions. Detailed GIS maps and data files, all downloadable, put current, practical information at the fingertips of managers and decision makers. In addition, interactive capability created through the Internet Map Server allows users to manipulate information layers depicting fisheries data, habitat data, environmental sensitivity information, and related facts in order to create their own maps.

...the first facility in the Northeast dedicated to promotion of emerging marine biotechnology industries.
**Marine Ornamental Aquaculture**

The potentially lucrative production of clownfish, lined sea horses, and other ornamental species is the focus of a three-year project designed to assess the economic feasibility of commercial-scale marine ornamental fish culture in Rhode Island. Supporting a marine ornamental aquaculture research center at the Roger Williams University Center for Economic and Environmental Development, the project incorporates student research and education, collaborative studies, and marketing through partnerships with the university, with other research institutions, and with private business. This concentration of resources has advanced production procedures for several ornamental species, generating successful feed-production strategies, water-quality maintenance, spawning protocols, disease-prevention techniques, and market analysis.

The marine ornamentals market is a high-value growth market that fits Rhode Island’s vision of a sustainable commercial enterprise congenial with the state’s natural, cultural, and social environments.

**Aquaculture Education Project**

Dissecting shellfish, researching filtration rates for different species of shellfish, investigating and designing alternative power sources for upwellers, Rhode Island students from grade 6 through college have been building a comfortable familiarity with aquaculture. The Ocean State Aquaculture Education Project: Building a Better Community Through Aquaculture Education integrates lessons about aquaculture into the science curriculum to enhance students’ understanding of aquaculture’s processes, practices, and benefits. Awareness of positive impacts, such as the water-cleansing properties of shellfish filter-feeding, promotes better community acceptance of aquaculture—one of the project’s goals.

More than 2,000 students from Rhode Island middle schools, high schools, and universities are exploring the impacts and potential benefits of aquaculture during the project’s first year. Opportunities ranging from introductory classroom lessons to model facility tours and hands-on shellfish filtration experiments to sample collection and lab work with research scientists bring aquaculture concepts into vivid relief.
Clownfish cultured at RW U’s Marine Ornamental Aquaculture Research Center. Photo by Constance Brown Photographer.

Ornamental sea horses growing at RW U’s Marine Ornamental Aquaculture Research Center. Photo by Constance Brown Photographer.
Shellfish Enhancement

A million-seed-clam aquaculture enhancement effort nurtures both productive commercial harvests and broader commitment to the state’s still-developing aquaculture industry. The project taps the resources of the commercial shellfishing fleet—making use of the knowledge, the boats, the established markets, and the volunteered time of the Rhode Island Shellfishermen’s Association—to generate both cooperation with the commercial shellfishing industry and a more bountiful catch for its members. As a public aquaculture enterprise, the project also finances upwellers for educational as well as commercial use. Youngsters participating in Save The Bay programs learn about aquaculture as they grow seed clams in their own upweller. These clams combine with those grown by shellfishermen in another project-funded upweller for transplanting in the wild, ultimately to be harvested by commercial shellfishermen.

Aquaculture Renaissance

From the heyday of Rhode Island’s aquaculture industry in the early 20th century, when one-third of the Bay bottom was leased for oyster culture, through the industry decline in mid-century, through the moribund period during the latter half of the 20th century, the industry has come full circle. Spurred by new regulations that recognize differences between aquaculture and wild harvest; by a more streamlined permitting process and the commitment of resources to an aquaculture coordinator; by the use of less contentious techniques, such as under-dock cage culture; and by wide-ranging economic development possibilities, Rhode Island is seizing aquaculture’s potential. The renaissance now under way bodes well for a revitalized industry that conquers historical obstacles and fully utilizes the abundant scientific, technical, entrepreneurial, and natural resources the state affords.

Rhode Island’s aquaculture products command premium prices.
Executive Committee Membership

- David Alves, Executive Committee Chair, Rhode Island Coastal Resources Management Council
- David Bengtson, Fisheries, Animal and Veterinary Science, University of Rhode Island
- David Beutel, Rhode Island Sea Grant, University of Rhode Island Fisheries Center
- Ames Colt, Rhode Island Sea Grant College Program
- Barry Costa-Pierce, Rhode Island Sea Grant College Program
- Dale Leavitt, Roger Williams University
- Michael McGiveney, Rhode Island Shellfishermen’s Association
- Michael Rice, Fisheries, Animal and Veterinary Science, University of Rhode Island
- Robert Rheault, Moonstone Oysters
- Timothy Scott, Center for Economic and Environmental Development, Roger Williams University
- William Silkes, American Mussel Harvesters, Inc.

For more information and initiative updates, see the Rhode Island Aquaculture Initiative website at: http://seagrant.gso.uri.edu/research/rhodyaquaculture/rhodyaquaculture.html

URI student and Coastal Fellow David Hudson preparing to place a fish trap for a project testing the habitat value of shellfish aquaculture. Photo by Jessica Tallman.

(Insets) Tagging and measuring tautaug. Photos by Jessica Tallman.

Opposite page: Chelsea Ricciarelli sorting shellfish harvested from her father Louis's farm off Wild Goose Point. Photo by David Alves.
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Clownfish. Photo by Constance Brown Photographer.