



Aquaculture in Rhode Island

2002 Yearly Status Report

Aquaculture in Rhode Island

2002 Yearly Status Report



Prepared by:

David Alves
Aquaculture Coordinator
Coastal Resources Management Council
4808 Tower Hill Rd.
Wakefield, RI 02879-1900

Table of Contents

Executive Summary Aquaculture in Rhode Island.....	iii
Introduction.....	1
Farm Production.....	2
Table 1: Yearly Change in Total Aquaculture Value.....	3
Graph 1: Total Aquaculture Value.....	4
Graph 2: Shellfish Culture by Species.....	5
Graph 3: Dollar Value of Shellfish by Species.....	6
Graph 4: Farms & Acreage.....	7
Graph 5: Comparison of Seed Purchased, Stock in Water and Sales.....	8
Aquaculture Related Industries.....	9
The Universities.....	9
The Rhode Island Aquaculture Initiative.....	17
The Northeast Aquaculture Conference & Expo.....	21
Regulatory Agencies.....	23
Conclusion.....	25
Caveats.....	26
Acknowledgements.....	26

Executive Summary

The year 2002 was a good year for the Aquaculture industry in Rhode Island. The value of product harvested increased by almost 60% from the previous year. The American oyster was the predominate species of shellfish grown accounting for 87% of the total harvest. The hard clam being the only other species cultivated in any numbers making up 13% of the total harvest. Oysters harvested increased 67% from the previous year, clams saw an increase of 13% harvested as compared to 2001. For the fourth year in a row 100% of all Rhode Island grown aquaculture products were shellfish. The number of farms under lease remained the same, after two farms were abandoned, two farms changed hands, and two new farms were permitted. The acreage under lease increased slightly with these changes.

The Rhode Island Aquaculture Initiative was funded during 2002. The Coastal Resources Management Council reached an agreement with the Rhode Island Sea Grant, Roger Williams University and the University of Rhode Island to manage the initiative for CRMC. During the year competitions for research grants and mini-grants for growers were held with the best grants receiving funding. Two aquaculture extension positions were funded in partnership with Roger Williams University and the University of Rhode Island. Additionally a number of projects that had been initiated in previous years were awarded continuing funds.

Research at the universities continued to be an important part of aquaculture in Rhode Island. Not including the money from the Rhode Island Aquaculture Initiative, the universities brought in more than \$2 million dollars in outside grants, and tuition for students studying aquaculture related subjects.

The year also saw the first truly all New England wide aquaculture conference held in Rhode Island. The Northeast Aquaculture Conference and Expo was held in Warwick, and included a

special Symposium on Urban Aquaculture. More than 200 people came from all of New England and New York to learn about the latest in growing technology, science, regulatory issues and to shop for the latest aquaculture in aquaculture equipment in the expo.

Aquaculture in Rhode Island is a small, diverse and very dynamic industry which is making a real contribution to the economic health of the state. The companies, farmers and universities involved will readily admit that the situation could be a great deal better, but they are showing their belief in the future of the industry by investing time and capital towards increasing their competitiveness now and into the future. Aquaculture in Rhode Island is an industry that is taking advantage of the state's assets, its clean waters, its many universities and a well trained populace, and contributing to the economic health of the state. Additionally the industry is making investments in the future to ensure its continued competitiveness.

Introduction

The year 2002 was a good year for the Aquaculture industry in Rhode Island. The value of product harvested increased by almost 60% from the previous year. The American oyster was the predominate species of shellfish grown accounting for 87% of the total harvest. The hard clam being the only other species cultivated in any numbers making up 13% of the total harvest. Oysters harvested increased 67% from the previous year, clams saw an increase of 13% harvested as compared to 2001. For the fourth year in a row 100% of all Rhode Island grown aquaculture products were shellfish. The number of farms under lease remained the same, after two farms were abandoned, two farms changed hands, and two new farms were permitted. The acreage under lease increased slightly with these changes.

The Rhode Island Aquaculture Initiative was funded during 2002. The Coastal Resources Management Council reached an agreement with the Rhode Island Sea Grant, Roger Williams University and the University of Rhode Island to manage the initiative for CRMC. During the year competitions for research grants and mini-grants for growers were held with the best grants receiving funding. Two aquaculture extension positions were funded in partnership with Roger Williams University and the University of Rhode Island. Additionally a number of projects that had been initiated in previous years were awarded continuing funds.

Research at the universities continued to be an important part of aquaculture in Rhode Island. Not including the money from the Rhode Island Aquaculture Initiative, the universities brought in more than \$2 million dollars in outside grants, and tuition for students studying aquaculture related subjects.

The year also saw the first truly all New England wide aquaculture conference held in Rhode Island. The Northeast Aquaculture Conference and Expo was held in Warwick, and included a

special Symposium on Urban Aquaculture. More than 200 people came from all of New England and New York to learn about the latest in growing technology, science, regulatory issues and to shop for the latest aquaculture in aquaculture equipment in the expo.

Farm Production

The farm gate value of Rhode Island grown shellfish increased 59% from the previous year. This increase came after a 4.7% decline in product sold in 2001. This increase puts the Rhode Aquaculture back on track after the first down year in the past seven. (see Table 1). The farm gate value is estimated to be \$478,160.00 in 2002, up from \$299,998.00 in 2001 (see Graph 1).

Again in 2002 100% of all Rhode Island aquaculture production was shellfish. The dominate species was again the American oyster with 908,000 pieces being sold (see Graph 2). This is a 67% increase from the previous year which resulted in an increase of 65% (see Graph 3) in value of the oyster production. The difference in the percentage production increase and value is due to differences in amounts sold retail versus wholesale. Clam production was up slightly with a 13% increase in harvest (see Graph 2) which resulted in a 0.8% increase in value (see Graph 3).

The number of farms active in Rhode Island Aquaculture remained the same at 18. This number was a result of two farms being transferred, two farms going out of business and two new farms joining the ranks. This shuffle resulted in a slight increase in acreage under cultivation to 53.75 acres (see Graph 4). The production per acre of aquaculture in Rhode Island was \$8,896.00 for the 2002 year.

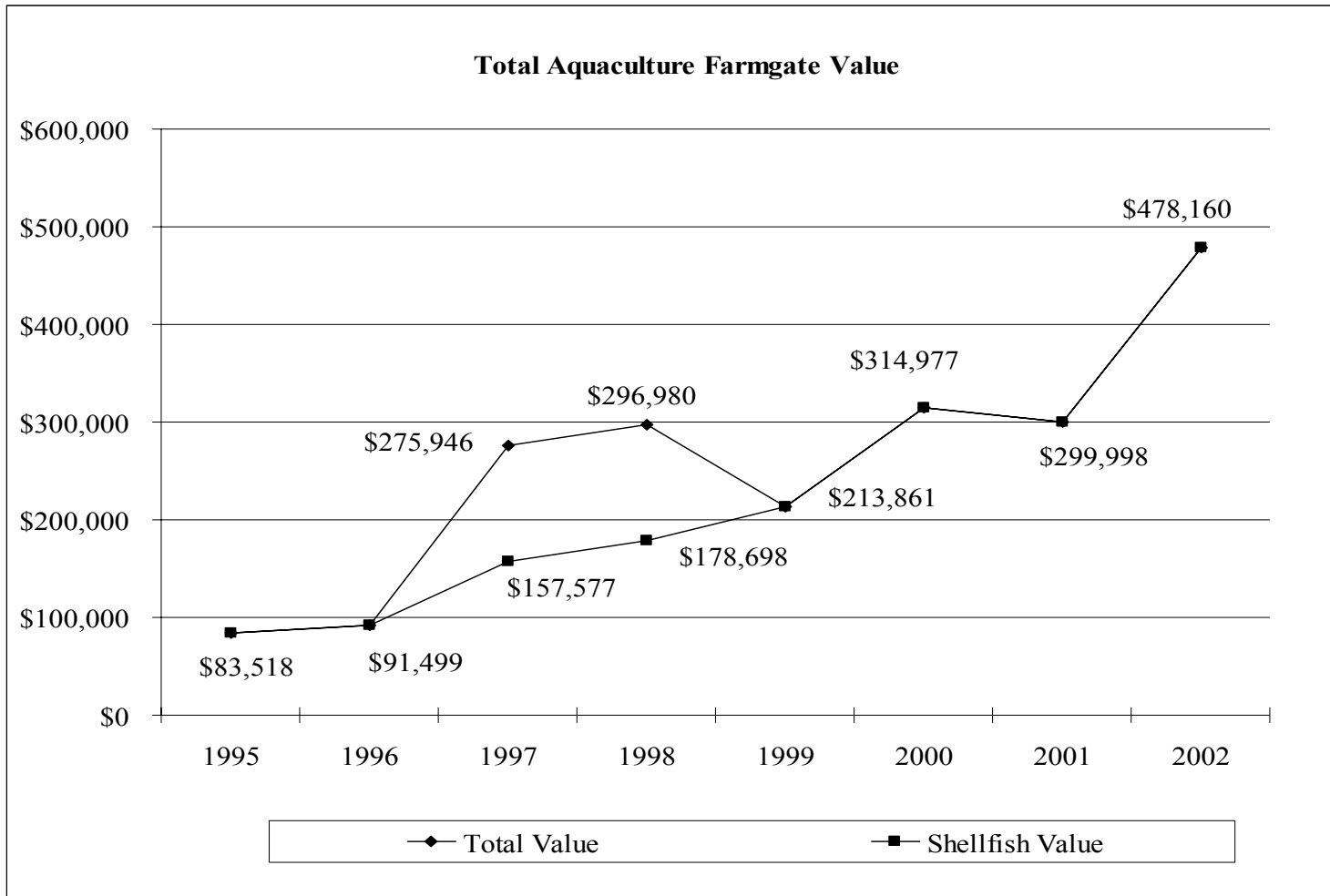
The farm related employment grew slightly. In 2002 there were 10 full-time year-around and 18 part-time year-around seasonal people employed in Rhode Island aquaculture. Employment

increases a bit during the summer with Rhode Island aquaculture farms hiring 1 full-time seasonal and 4 part-time seasonal workers.

Table 1

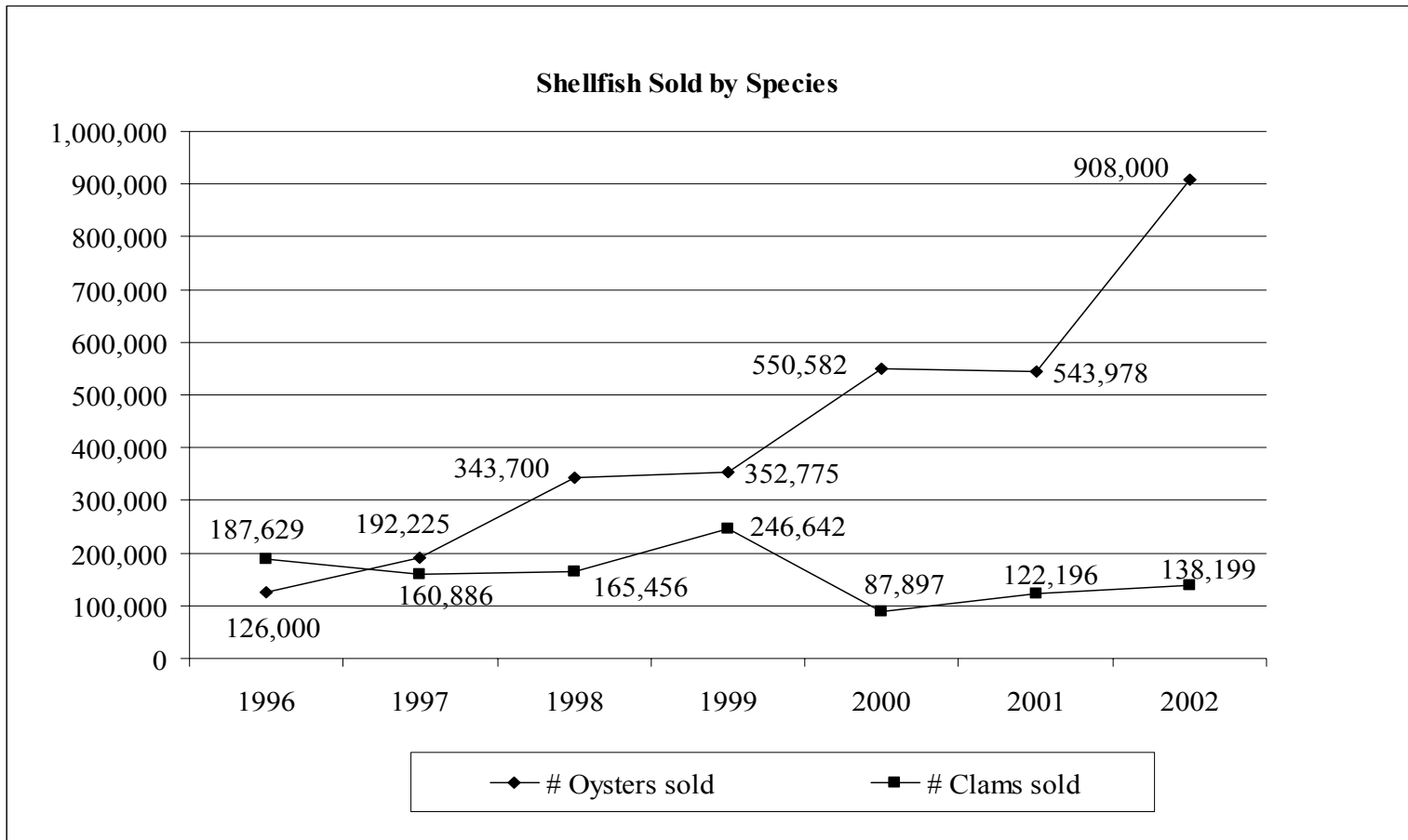
Year	Percent Change in Farm Gate Value from Previous Year
1995-1996	9.6%
1996-1997	72%
1997-1998	13%
1998-1999	20%
1999-2000	47%
2000-2001	-4.7%
2001-2002	59%

Table 1 shows the percentage change of the farm gate value of aquaculture shellfish production in Rhode Island. See Graph 1 for overall production figures.



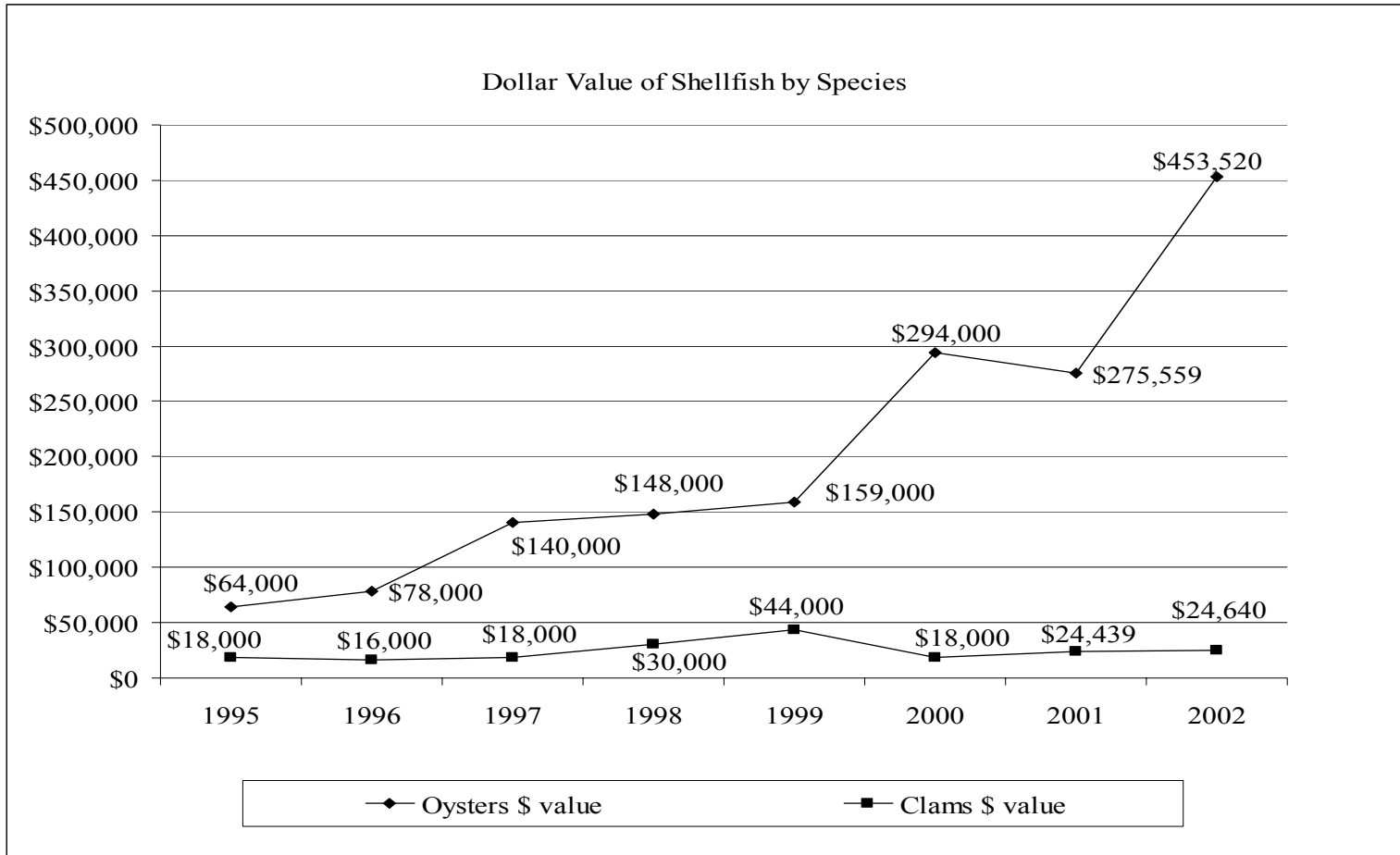
Graph 1

In 2002, total Rhode Island aquaculture production increased 59%. The total value indicated for the years 1997 and 1998 includes a retail ornamental finfish operation that was in business for those two years only. In all other years 100% of Rhode Island aquaculture production is in shellfish.



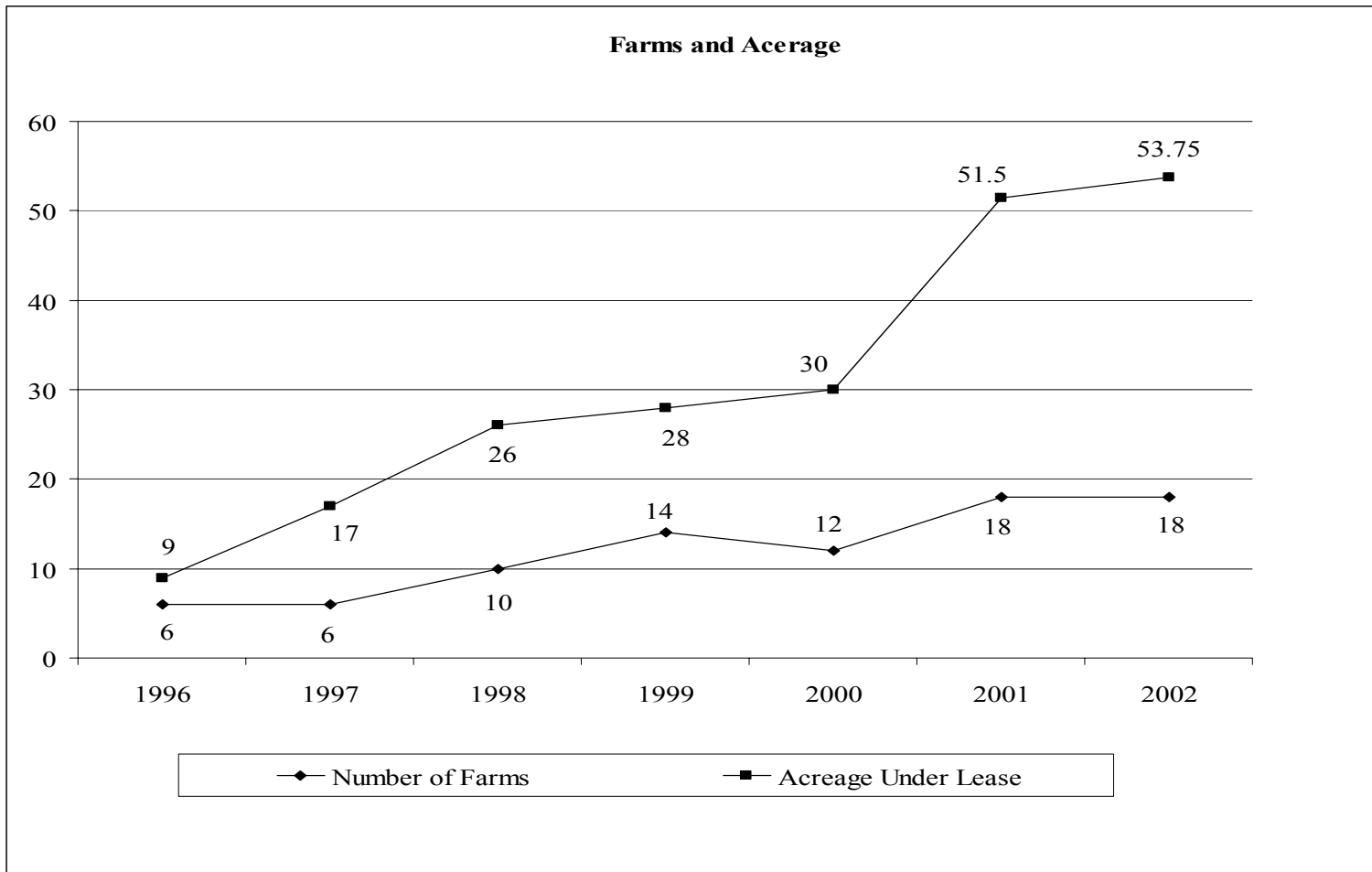
Graph 2

The American oyster is the dominant species cultured in Rhode Island waters. Oyster production accounted for 87% of the total Rhode Island aquaculture production. Slightly more than 908,000 oysters were sold in 2002, an increase of 67% from 2001. The culture of quahogs has increased with approximately 138,199 being produced in 2002, an increase of 13% from 2001.



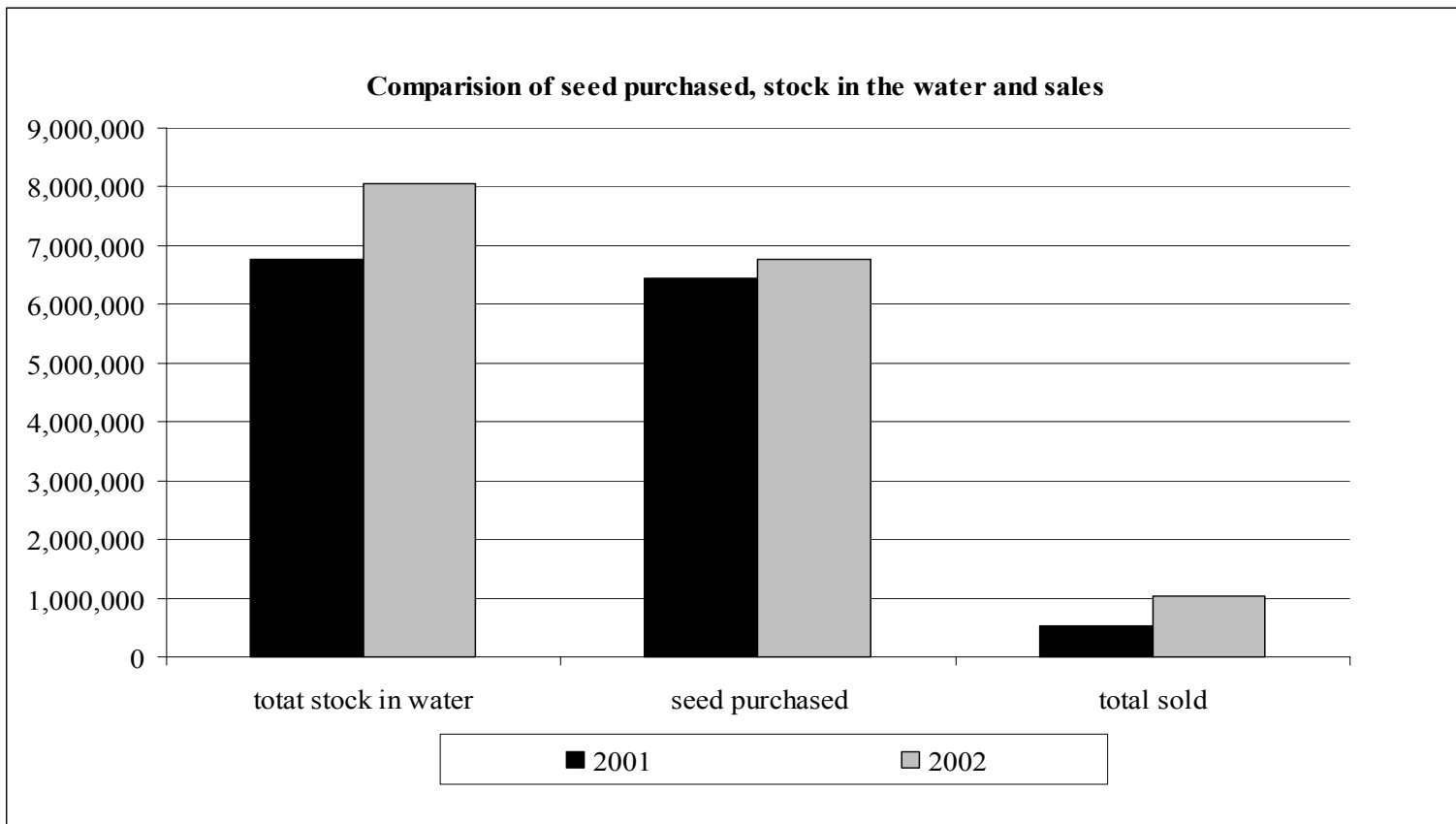
Graph 3

Graph 3 indicates the relative value of the shellfish production in Rhode Island for 2002. The increase in value of oysters from 2001 was 64%. The increase in value of quahogs was 0.8%.



Graph 4

There was some consolidation and replacement of leases during 2002 resulting in no increase. These changes did slightly increase the total area under lease. The totals for 2002 are 53.75 acres under cultivation and 18 permit holders (not including commercial viability, educational and research permits).



Graph 5

This graph shows the relationship between seed bought in a single year, the number of animals in the water on aquaculture farms and the numbers of shellfish sold. This graph indicates possible future animals available for harvest in coming years. Mortality of 40-50% per year is not uncommon in the shellfish industry. It also shows the growth in investment and stock on the farm from 2001.

Aquaculture Related Industries

It is the other aquaculture related industries in Rhode Island that are the largest contributors to the state's economic bottom line. These industries include distribution of aquaculture product (fish and shellfish), and the manufacturing of aquaculture products to be used on farms. There are a number of small privately held companies in the state that fit into this category. These companies do a gross total of 4,300,000 in business in the state, an increase of 10.2% from the 2001 numbers. These companies employ 24 full time employees, an increase of 50% from 2001. Not only do these companies serve local and regional farmers, but they also export internationally. This increase is especially impressive when the fact that one of the companies doing business in the state who contributed to this report two years ago continues to decline to contribute to this report this year. The aquaculture-associated industries within Rhode Island have contributed to the economic well being of the state. As the industry grows, in Rhode Island, the nation, and the world, this sector of the industry will continue to contribute economically.

Additionally the companies that did report have made substantial investments in facilities and employees in the past years. An estimated \$3 million has been invested during economically unsettled times to ensure the future competitiveness of these companies. The principals involved are betting that the aquaculture related support and sales industry has a viable future in Rhode Island.

The Universities

The State of Rhode Island is home to two universities that conduct aquaculture education and research; the University of Rhode Island and Roger Williams University. Each is recognized for both quality education and research. This recognition translates into grant monies flowing into

the state in order to conduct aquaculture related research. The total of external funding brought into the state for aquaculture research and education is \$2.8 million, a 115% increase from 2001.

The universities continue to be centers of excellence in the field of aquaculture. The University of Rhode Island employs internationally known and respected researchers in the field. Roger Williams University continues to compliment the efforts of URI in the aquaculture arena and is growing into a center of excellence on its own. Both universities contribute greatly to the state's economic bottom line and to supporting a viable aquaculture industry.

The University of Rhode Island has professors that are recognized as world class in many fields of aquaculture research. The university is a great resource to the state and brings in research dollars, undergraduate and graduate students from around the world. We are fortunate to have Dr. David A. Bengtson, Cooperative Extension Program Leader in Aquaculture and Animal Health, contribute the following description of the aquaculture research and projects that URI conducted in 2002.

Aquaculture Activities at the University of Rhode Island – 2002

The University of Rhode Island (URI) has a three-part mission: teaching, research and service. Aquaculture is included in all of these. Most of the aquaculture activity is centered in the Department of Fisheries, Animal and Veterinary Science, but faculty also work on aquaculture issues in the Department of Environmental and Natural Resource Economics, the Department of Nutrition and Food Science, the Graduate School of Oceanography, and the College of

Business Administration. The University offers a bachelor's degree in Aquaculture & Fisheries Technology (82 students were enrolled in this major in 2002), a master's degree in Aquaculture and Fisheries and a Ph.D. in Environmental Sciences, which includes aquaculture (12 graduate students enrolled in these programs in 2002). In 2002, the University offered the following aquaculture courses to those students: Introductory Aquaculture, Finfish Aquaculture, Shellfish Aquaculture, Applied

Physiology of Fish, Pathobiology, Aquaculture and the Environment, Salmonid Aquaculture, and Current Topics in Molluscan Aquaculture. The University also offers the following courses in odd-numbered years: Crustacean Aquaculture, Diseases of Cultured Fish, Fish Nutrition, and Marine Finfish Aquaculture.

URI aquaculture research, details of which are provided below, covers both fish and shellfish. Central themes are the development of new species and the application of biotechnology to aquaculture problems. A particularly noteworthy event in 2002 was the beginning of construction on a new Aquaculture Research Center at the Narragansett Bay Campus. The following aquaculture research projects were active at URI in 2002:

1. Bengtson, D.A. and C.M. Lee. Increased efficiency of summer flounder aquaculture through nutrition. RI Agricultural Experiment Station. *Summer flounder appear to require high levels of protein in their diets and the usual source of this protein is expensive fish meal. This project examines to what degree fish oils and plant proteins can be substituted for fish meal in the diet to reduce feed cost.*
2. Bradley, T.M. The role of myostatin (GDF-8) in muscle growth of rainbow trout. RI Agricultural Experiment Station. *Myostatin is known to be a negative regulator of*

muscle growth in mammals. Interruption of the myostatin gene stimulates increased growth rate and muscle mass in cattle. This project examines whether a similar phenomenon can be demonstrated for aquaculture of rainbow trout.

3. Bradley, T.M. Molecular mechanisms of osmoregulation in salmon. U.S. Dept. of Agriculture. *Several novel genes involved in adaptation of salmon to hyperosmotic stress have been isolated and identified. The function of these genes in salmon is being characterized.*
4. Bradley, T.M. Microbial ecology of the salmon gastrointestinal tract: a molecular approach. U.S. Dept. of Agriculture. *To date a comprehensive catalog of the microbes inhabiting the fish gut is unavailable. Using molecular techniques we are characterizing the microbiota of the fish gastrointestinal tract.*
5. Bradley, T.M. Development of diets and rearing conditions for commercial aquaculture of black sea bass. Northeastern Regional Aquaculture Center. *Aquaculture of black sea bass is still in its infancy and husbandry conditions have yet to be optimized. Diets are being developed for juvenile stages of the life cycle to increase survival and growth. Additionally, optimum rearing densities and the maximum*

concentration of environmental ammonia tolerated without effect on the animal are being determined.

6. Cohen, P., M. Gomez-Chiarri and D.R. Nelson. Vaccine development for pathogens: the nutrient approach. RI Agricultural Experiment Station. *This project uses modern molecular and microbial techniques to develop vaccines against bacterial pathogens. Two Vibrio species that are problems for aquaculture are the subjects of special consideration.*
7. Comerford, R. and M.A. Rice. Financial benchmark information for Northeastern aquaculture industries. Northeastern Regional Aquaculture Center. *This project aims to create a first-of-a-kind database of financial information about aquaculture industries in the Northeast Region. This financial database, when created, will allow lending and other financial institutions to have baseline information about comparable aquaculture enterprises when they are evaluating business plans, loan and other financial applications.*
8. Gomez-Chiarri, M., D.R. Nelson and R. Smolowitz. Management of flounder infectious necrotizing enteritis. Northeastern Regional Aquaculture Center. *We previously identified Vibrio carchariae from summer flounder as the causative agent of a disease called flounder infectious necrotizing enteritis (FINE). We have recently confirmed that V. carchariae is synonymous with V. harveyi, a major marine pathogen that affects numerous species worldwide, from grouper in Taiwan, to seabass and seabream in the Mediterranean. The goal of this project is to determine the impact of FINE to the culture of two marine finfish species, summer flounder and cod. We are following a production cycle of each species at a commercial hatchery.*
9. Gomez-Chiarri, M. and L. Martin. Feed-based delivery of recombinant antimicrobial peptides for shellfish aquaculture. U.S. Dept. of Agriculture. *This project evaluates the feasibility of feed-based delivery of antimicrobial peptides (AMPs) to shellfish. AMPs are short peptides that all kinds of organisms (animals, plants) use to fight infections. We have screened for candidate AMPs that are effective against marine pathogens, resistant to the action of proteases, and that can be expressed in algae or yeast. We are currently optimizing the conditions for expression of AMPs in yeast, and will in the future test the efficacy of the delivery system and transfer it to algae.*
10. Gomez-Chiarri, M. Shellfish Disease Survey, State of Rhode Island, 2002. Rhode Island Department of Environmental Management. *The*

goal of this survey program is to collect long-term data on the distribution of several diseases that affect cultured and wild populations of Eastern oysters (Crassostrea virginica) and Northern quahogs (Mercenaria mercenaria). This information is used by RIDEM in management decisions.

11. Lee, C.M. and D.A. Bengtson. Comprehensive utilization of squid processing waste for aquaculture feed development. RI Agricultural Experiment Station and National Marine Fisheries Service Saltonstall-Kennedy grant. *Fish processing plants discard about 40% of the tissues of each squid they process, thereby incurring disposal costs. This project investigates the use of enzyme hydrolysis to convert that discarded material into ingredients for aquaculture feeds.*
12. Rice, M.A. Filter feeding by cultured bivalve mollusks as a control of estuarine eutrophication. Rhode Island Agricultural Experiment Station. *The rates of filter feeding of oysters and quahogs was investigated in the context of their ability to remove particulate organic nitrogen from the water column. The aim of the project is to investigate the links between shellfish aquaculture and shellfish stock restoration and maintenance of good water quality.*
13. Roheim, C.A. Eco-labeling and marketing of seafood. Currently unfunded. *URI is conducting research into domestic and international policies regarding the marketing and trade of aquacultured fish and shellfish, including policies related to seafood safety, production processes impacting the environment and organic methods of production.*
14. Specker, J.L. and D.A. Bengtson. Maximizing survival of summer flounder: the importance of synchrony. RI Sea Grant. *Summer flounder hatcheries experience high mortality of fish in the late larval to early juvenile stages, due to differential growth rates, cannibalism, and difficulty of the transition from live to formulated feeds (weaning). This project examines strategies to synchronize growth and metamorphosis, as well as to improve the weaning process.*
15. Specker, J.L. and D.A. Bengtson. Improving flounder productivity through enhanced growth. U.S. Dept. of Agriculture. *Female summer flounder grow about twice as fast as males. This project seeks to produce all-female flounder by treating them with a hormone, estradiol, at the time of sex differentiation in the juvenile stage.*

In the area of service, University personnel serve the state, nation and world through their activities on committees and panels, as reviewers of scientific manuscripts and grant proposals, and in extension and outreach capacities. A shellfish aquaculture course has been offered annually by Mr. David Beutel and a shellfish disease workshop has also been instituted recently by Dr. Marta

Gomez-Chiarri. In 2002, the RI Aquaculture Initiative allowed the hiring of a new finfish aquaculture extension specialist, Mr. Randy Mickley, whose primary responsibilities are the development of an aquaculture demonstration facility at URI's East Farm and outreach to those interested in small-scale finfish aquaculture.

We are fortunate to have the Director of the Roger Williams University Center for Economic and Environmental Development, Dr. Timothy M. Scott provide this report with the following project summary for the activities conducted during 2002.

**Roger Williams University
Center for Economic and Environmental Development (CEED)**

Project Summary (April, 2003)
Dr. Timothy M. Scott, CEED Director

Staff:

Dr. Timothy M. Scott, CEED Director
Dr. Dale Leavitt, Aquaculture Faculty
Mr. Brad Bourque, Marine Laboratory
Manager

**Additional Roger Williams University
Faculty in specific aquaculture-related
projects:**

Dr. Skip Pomeroy, Marine Biology
Tropical Fish Breeding

Dr. Andrew Tate, Marine Biology
Winter Flounder Enhancement

Dr. Stephen O'Shea, Environmental
Chemistry Environmental Quality
Monitoring

Dr. Amy Tomas, Business/Marketing
Marine Biotechnology Park

Projects: Numerous undergraduate students
are involved in each of these projects.

Marine Enhancement and Restoration: A set of studies designed to 1) demonstrate the economic potential of *Public Benefit Aquaculture*, where shellfish seed are planted into the bay for subsequent harvest by commercial and recreational shellfishermen, and 2) introduce methods to reestablish commercially viable populations of scallops and oysters to Narragansett Bay. This project is partially funded by grants from the Department of Commerce (\$30,000) and the RI Aquaculture Initiative (\$100,000). Participants include commercial shellfishermen, researchers with the University of Rhode Island (URI), National Marine Fisheries Service (NMFS) and the RI Coastal Resources Management Council (CRMC). In addition we are setting up studies (in 2003) to examine methods to enhance wither flounder production in Narragansett Bay.

Marine Technology and Aquaculture Center: Designed to foster marine and aquaculture technology development from the laboratory to the marketplace in Rhode Island. CEED is currently coordinating a study assessing the economic viability of constructing a Marine Technology and Aquaculture Center in Rhode Island. This facility would serve as an R&D/Business Incubator, and support the development of the marine biotechnology and aquaculture industries. Funding from the RI Aquaculture Initiative is supporting the study (\$30,000), and participants include the CRMC and URI.

Shellfish Hatchery: Most coastal states support one to several commercial or

municipal shellfish hatcheries for local production of shellfish seed. At the present time, Rhode Island does not have such a facility, and all of our shellfish seed must come from out of state. This requires expensive disease certification for the importation of shellfish seed, and also means that the resources and expertise are not being held in the *Ocean State*. Still in the early stages, CEED is working with private companies to develop a commercial hatchery for the state.

Tropical Fish Breeding: We are investigating the development of a local tropical fish production facility. Preliminary studies suggest that the added cost of local production will be more than offset by the increased survival that we realize by being close to the major markets along the Northeast corridor. In addition, many tropical fish destined for the aquarium trade are harvested from live coral reefs using techniques that devastate the reef community. By developing hatchery protocols for many of these fish, and working to restore endangered species, our effort will promote the conservation of these species. Funding for this project has been provided by the RI Aquaculture Initiative (\$125,000).

Shellfish Extension: With the recent addition of Dr. Dale Leavitt to our Staff, we now anticipate being able to share shellfish aquaculture expertise to a wider community of researchers, aquaculturists and the general public. Dr. Leavitt's position is supported, in part, by a three year grant from the RI Aquaculture Initiative (for \$175,000) and

compliments a finfish aquaculture extension position that was funded by the same granting agency at URI.

Additional Projects include:

Marine education opportunities for pre-service teachers (funded by NASA)

Administration of Mini- and Competitive Grant Programs funded by the RI Aquaculture Initiative
Hydroponics Demonstration Facility
Conversion of Cranberry Bogs to Fish Production

Rhode Island Sea Grant

With a change in leadership, Rhode Island Sea Grant has been very active in promoting aquaculture in Rhode Island. We are fortunate to have the following contributed by the executive director, Dr. Barry Costa-Pierce.

Rhode Island Sea Grant Aquaculture Engagements, 2002

Dr. Barry Costa-Pierce

In cooperation with the Rhode Island Coastal Resources Management Council, the Rhode Island Sea Grant College Program has administered the approximately \$1.4 million Rhode Island Aquaculture Initiative. Major elements of that administration during 2002 have been:

1. Oversight of research grants awards granted in 2002 totaling approximately \$600,000. RISG conducted a transparent, external peer reviewed grant selection process. Pre- and full-

proposals were reviewed by relevant experts via mail review and via external panels on behalf of the RI Aquaculture Initiative.

Announcement of availability of another round of research awards will be made during 2003.

2. Coordinated the Executive Committee of the Aquaculture Initiative, which convened six meetings during 2002, and produced minutes of those meetings and coordinated action items and decisions made by the committee.

3. Developed the RI Aquaculture Initiative web site via the RI Sea Grant Communications Office, and is updated regularly as appropriate.

4. Presented Rep. Eileen Naughton the Sea Grant “Community Service Award for 2002” for her continuing efforts in the promotion of aquaculture in RI.

5. Sponsored, developed and ran the National Urban Aquaculture Symposium

during November 2002 as an element of the Northeastern Aquaculture Conference and Expo. The symposium was well attended, and a book, based on the talks given at the symposium, titled “Urban Aquaculture” (by CABI Publishing), is slated for publication in 2003.

6. Presented “The Rhode Island Aquaculture Initiative” at the 23rd Milford Aquaculture Seminar, 25 Feb 2003, in New Haven, CT.

The Rhode Island Aquaculture Initiative

In November 2001, at the 2nd Southern New England Aquaculture Conference it was announced that \$1.5 million, secured through the efforts of Senator Jack Reed, had been appropriated for planning and advancement of aquaculture in Rhode Island. The project has been entitled the “Rhode Island Aquaculture Initiative”. During 2002 a memorandum of understanding was reached with Rhode Island Sea Grant, Roger Williams University and the University of Rhode Island to oversee the day-to-day management of the grant. A multi-institutional executive committee comprised of Rhode Island state, university, industry, and other aquaculture leaders was formulated to determine priorities for projects to be funded with the \$1.5 million that Senator Jack Reed obtained for aquaculture development in Rhode Island. Funds are routed from the National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research to the Rhode Island Sea Grant College Program at the University of

Rhode Island (URI) and managed by David Alves, Coastal Resources Management Council (CRMC) state aquaculture initiative coordinator, assisted by Barry Costa-Pierce, Rhode Island Sea Grant director, and Ames Colt, Rhode Island Sea Grant associate director. Rhode Island Sea Grant reports to the NOAA-Sea Grant Project Manager, Jim McVey, in Washington, DC. CRMC has signed a memorandum of understanding with Rhode Island Sea Grant, the University of Rhode Island, and Roger Williams University to manage this project.

RI Sea Grant has built and hosted a web page to encourage all who might be interested to keep abreast of the developments with the initiative. The address is:

<http://seagrant.gso.uri.edu/research/rhodyaquaculture/rhodyaquaculture.html>

Grants awarded

The Rhode Island Aquaculture Initiative has awarded \$600,000 toward aquaculture research and development in the state through a series of multi-year research grants and one-year "mini-grants." The next round of grant proposals will be solicited during the fall of 2003.

Rhode Island Aquaculture Initiative Multi-Year Research Grants

- Peter August, URI natural resources science professor, received \$149,983 over three years to enhance the Rhode Island Aquaculture and Fisheries Web page and Internet map server with up-to-date physical, chemical, and biological spatial data.
- Bradford Bourque, of Roger Williams University, Harold Pomeroy, Roger Williams University biology professor, and Something Fishy, Inc. received \$125,438 over three years to develop economically and environmentally sustainable land-based culture techniques for at least three species of marine ornamentals.
- Graham Forrester, URI biological sciences associate professor, and Robert Rheault, Spatco, Ltd. President, received \$100,028 over two years to evaluate the effects of

aquaculture facilities on natural habitats and to describe the habitat values of shellfish aquaculture gear.

- Marta Gomez-Chiarri, URI fisheries, animal, and veterinary science assistant professor, Roxanna Smolowitz, Marine Biological Laboratory researcher, and Tim Scott Roger Williams University Center for Economic and Environmental Development director, received \$49,136 over three years to evaluate the presence of a parasite found in wild and farmed northern quahogs in Rhode Island and the potential effect of the disease on Rhode Island's quahog industry.
- Perry Raso, shellfish aquaculturist, and Alicia Thayer, South Kingstown High School teacher, received \$82,405 over three years to educate over 1,700 students from Grade 6 through college about shellfish aquaculture and to promote community acceptance of aquaculture. In addition, students will be involved in a cutting-edge model aquaculture facility.
- Tim Scott, Roger Williams University center for Economic and Environmental Development director, received \$100,000 over three years to determine whether producing young seed clams in a hatchery and replanting them on public grounds will result in a greater harvest of adult clams in the future or will inadvertently attract predators to a productive bed.

Rhode Island Aquaculture Initiative Mini-Grants

- Aquaculture Products of Charlestown received \$275 to test methods for reducing starfish predation in oyster culture.
- Russell Blank and William Blank of North Kingstown received \$3,000 for the purchase of materials and seed to grow bay scallops and soft-shell clams.
- Louis Ricciarelli, Jr. of West Kingston received \$3,000 to grow bay scallops to harvestable size in Narragansett Bay, using varying types of cages to determine the best method for grow-out.

- Salt Water Farms, LLC of Wakefield received \$3,000 to purchase processing machinery intended to reduce operating costs and accelerate the growth rates of cultured oysters and mussels.
- Spatco, Ltd., of Wakefield, received \$2,000 to purchase and test in-water aeration equipment that will substantially reduce ambient noise levels.
- Kenneth Thompson of North Providence received \$2,000 to grow surf clams, which have not previously been cultivated in Rhode Island.
- Christopher Warfel of New Shoreham received \$1,700 to develop a hybrid wind and solar powered upweller to enable shellfish aquaculturists to site culture operations in remote waters.

The Northeast Aquaculture Conference and Expo (NACE)

This year Rhode Island was the host of the first truly regional aquaculture conference the Northeast Aquaculture Conference and Expo. This conference's executive committee was made up of representatives from all of the New England states and Long Island, NY. We are fortunate to have the executive committee chair, Dr. Michael Rice, University of Rhode Island, add the following.

NACE 2002

Dr. Michael Rice

On November 15 & 16, 2002, Rhode Island hosted the Third Northeast Aquaculture Conference and Expo (NACE) at the Crowne Plaza at the Crossings Hotel

in Warwick. The NACE brought together national, regional, and local experts, educators, shellfish and finfish aquaculture industry representatives, and equipment

vendors to discuss issues and trends in the development of aquaculture in the northeastern United States. As part of NACE, the National Urban Aquaculture Symposium was held, bringing speakers and attendees from across the country.

The conference was hosted by the Rhode Island Legislative Commission on Aquaculture and chairperson Rep. Eileen S. Naughton, the University of Rhode Island and the Ocean State Aquaculture Association. There were 15 co-sponsors from the Northeastern States. Rhode Island co-sponsors included Rhode Island Sea Grant, Rhode Island Cooperative Extension, Rhode Island Coastal Resources Management Council, the Narragansett Bay Commission, and the Rhode Island Department of Environmental Management. The NACE steering committee consisted of representatives of each of the eight northeastern states from Maine to New Jersey and the committee was chaired by Dr. Michael A. Rice of the Department of Fisheries, Animal and Veterinary Science at the University of Rhode Island.

The keynote speaker, Mr. Richard Prickett of Mariculture Farms in Great Britain outlined the differences in aquaculture development between the United States and the various countries of the European Union. The main Luncheon Speaker Ms. Robin Downey, the executive director of the Pacific Coast Shellfish Growers Association, provided a compelling overview of the value of regional aquaculture trade organization and led discussions about the formation of a counterpart East Coast Shellfish Growers Association. Distinguished guest United States Senator Jack Reed provided information about the recently awarded federal funds for aquaculture planning in Rhode Island and reiterated his support for the development of environmentally sound forms of aquaculture in the Northeast. Other topics of interest included workshops for aquaculture regulators, presentations and discussions about biotechnology in aquaculture, and presentations on best management practices for aquaculture operations and sessions on the environmental impacts of various forms of

aquaculture. The trade exposition brought 34 vendors displaying and selling their wares. During the two days of the meeting, nearly 300 registered attendees visited the

conference which was considered a great success by most all who attended. The next NACE conference is scheduled for October 2004 in Manchester, New Hampshire.

Regulatory Agencies

The Coastal Resources Management Council (CRMC), Department of Environmental Management (DEM) and the Department of Health (DOH) continue to work closely together during the year. The staff members who deal with the day-to-day regulations concerning aquaculture in Rhode Island continue to work toward streamlining the permitting process. The staffs are also active in continuing to monitor the industry and are able to respond quickly to unforeseen contingencies that may arise.

The Coastal Resources Management Council now has all of its management plan, regulations and applications on the internet. The agency is making a major push to continue its effort to continue to provide access to all of the necessary documents in as easy form as possible. During 2002 the CRMC Aquaculture Application was rewritten to provide more information for the applicant and to clarify and simplify the process as much as possible. The CRMC web page address is: <http://www.crmc.state.ri.us>. The aquaculture and fisheries resource maps can be accessed through the Narragansett Bay web site at: <http://narrbay.org>.

The Department of Environmental Management's Division of Agriculture has been active in promoting fresh water aquaculture as an enhancement to the existing agriculture industry in

Rhode Island. We are fortunate to have the following description provided by Mr. Ken Ayars, the division chief.

DIVISION OF AGRICULTURE, RIDEM

Mr. Ken Ayars

The Division of Agriculture, RIDEM formed the RI Farm Viability Committee in 2002 to coordinate and enhance efforts within Rhode Island relating to the long term viability of agriculture in Rhode Island.

Aquaculture is agriculture, and the aquaculture industry has been well represented and active on the Committee. In April, 2002, the Division awarded 36 farm viability grants totaling \$340,000 to 33 organizations to be used for efforts that promote the long-term viability of agriculture in Rhode Island, and for educational initiatives that support the promotion of agriculture. Five of these grants were for aquaculture initiatives, and are briefly described as follows:

1) Center for Economic and Environmental Development - Roger Williams University. To purchase and utilize upweller to enhance

shellfish production for public benefit aquaculture and shellfish extension efforts. Award: \$6,500. Contact: Dr. Timothy Scott, 254-3563

2) Cranston High School West. To purchase hydroponic and grow out equipment systems to enhance the aquaculture education program at Cranston West High School. Award: \$4,760. Contact: Steven Krous, 364-9677.

3) Regional Education Aquaculture Partnership - University of Massachusetts, New Hampshire Aquaculture Association, New Hampshire Cooperative Extension. To develop a regional education aquaculture/agriculture partnership that builds educational, information and promotional links between Rhode Island's diverse communities and the

agriculture/aquaculture resources of Rhode Island and New England. Award: \$10,000. Contact: Cheryl West, (978) 934-4683

4) Ocean State Aquaculture Association. To fund and organize boat trips to provide opportunities for Rhode Island chefs to learn about the shellfish aquaculture industry, and to develop a brochure about shellfish species and nutritional and health information. Award: \$4,300. Contact: Bill Silkes, 789-1678.

5) Ocean State Aquaculture Association. To develop marketing and promotional material materials relating to the aquaculture industry in Rhode Island. Award: \$10,000. Contact: Bill Silkes, 789-1678.

The Freshwater Aquaculture Committee has been formed to coordinate efforts within this segment of the industry, and to carry out the objectives of the Regional Education Aquaculture Partnership (item #3).. The aquaculture industry has also been active in marketing and promotion venues coordinated by DEM, including RI Agricultural Day at the State House.

Agriculture is important to the economy and quality of life of Rhode Island. We are look forward to continued partnership with the industry and agencies etc. to ensure the future of aquaculture as an important component of the agricultural industry.

Conclusion

Aquaculture in Rhode Island is a small, diverse and very dynamic industry which is making a real contribution to the economic health of the state. The companies, farmers and universities involved will readily admit that the situation could be a great deal better, but the are showing their belief in the future of the industry by investing time and capitol towards increasing their

competitiveness now and into the future. Aquaculture in Rhode Island is an industry that is taking advantage of the state's assets, its clean waters, its many universities and a well trained populace, and contributing to the economic health of the state. Additionally the industry is making investments in the future to ensure its continued competitiveness.

Caveats

Harvest figures came from the yearly CRMC aquaculture questionnaire distributed to all lease holders. All reports are taken at face value and no further queries are made of the farmers.

Monetary figures for this report were calculated by averaging an estimated yearly average price from multiple sources. This figure was then multiplied by the numbers reported by growers in the yearly CRMC report to arrive at the figures used in this report.

Figures from the aquaculture associated industries came from the principals involved in these privately held companies. The figures cited are for gross sales of aquaculture related products.

The statistics cited for the universities were supplied by the universities.

Acknowledgments

Thanks to: Mr. M. Tikoian, Chair RI-CRMC; Mr. G. Fugate, RI-CRMC; Mr. R. Silkes, American Mussel Harvesters Inc.; Mr. D. Bouchard, Atlantic Aquaculture Supply; Dr. T. Scott, Roger Williams University; Dr. M. Rice, University of Rhode Island; Mr. K. Ayars, chief DEM Division of Agriculture; Dr. B. Costa-Pierce, Director RI Sea Grant; Mr. C. Powell, RI-DEM; Mr. A. Ganz RI-DEM and all of the aquaculture lease holders for their help in putting this report together.