



October 2011

# OPPORTUNITIES & POTENTIAL FOR AQUACULTURE IN NEW JERSEY

*An Update of the  
Aquaculture Development Plan*

New Jersey Aquaculture Advisory Council  
New Jersey Department of Agriculture



# *Members of the Aquaculture Advisory Council*

---

## **Ex-Officio Members**

Secretary Douglas H. Fisher (Chair), New Jersey Department of Agriculture  
Commissioner Bob Martin, New Jersey Department of Environmental Protection  
Caren S. Franzini, CEO, New Jersey Economic Development Authority  
Commissioner Mary E. O'Dowd MPH, New Jersey Department of Health and Senior Services  
Dr. Dave Bushek, Director, Haskin Shellfish Research Laboratory, Rutgers University  
(Aquaculture Technology Transfer Center)  
Dr. Thomas Isekenegbe, President, Cumberland County College  
(Aquaculture Training and Information Center)  
Dr. Robert Goodman, Executive Director, New Jersey Agricultural Experiment Station

## **President of Senate Appointees**

Oliver S. Twist III, Twist Farms, Cape May County  
J. Steve Carnahan, Pioneer Marine, Cumberland County

## **Speaker of the Assembly Appointees**

James M. Tweed, Atlantic Cape Fisheries, Cape May County  
John Maxwell, Maxwell Shellfish, Atlantic County

## **Governor Appointees**

Paul Waterman, Fins & Gills Farm, Cumberland County  
Robert Munson, Cumberland County

## **Non-Voting Members**

Gilbert Ewing, Jr., Chair, New Jersey Marine Fisheries Council  
Jeanette Vreeland, Chair, New Jersey Fish & Game Council

## **Authorship of this document is attributed to the following individuals:**

Attendees: Russel Babb, Dr. Gustavo Calvo, Walter J. Canzonier, David Chanda,  
George E. (Gef) Flimlin, Troy Joshua, Dr. John Kraeuter, Joseph J. Myers, Dr. Eric Powell,  
Monique Purcell, Richard Ritota, George E. Saridakis

## **Editing and Compilation**

New Jersey Department of Agriculture

## **Layout and Graphics**

New Jersey Sea Grant Consortium



## State of New Jersey

DEPARTMENT OF AGRICULTURE  
HEALTH / AGRICULTURE BUILDING  
PO Box 330  
TRENTON NJ 08625-0330

CHRIS CHRISTIE  
*Governor*  
KIM GUADAGNO  
*Lt. Governor*

DOUGLAS H. FISHER  
*Secretary*

October, 2011

I am pleased to present the updated Aquaculture Development Plan, "Opportunities & Potential for Aquaculture in New Jersey." This report was the work of members of the Aquaculture Advisory Council, those who routinely serve as proxies and those who bring unique expertise, all dedicated to preservation and growth of the aquaculture industry in New Jersey.

The last plan update was in 1992, and there are new sections added to the 2011 update that were not part of the original plan.

The 2011 report reflects the development of aquaculture and also focuses on issues geared toward business solutions rather than technical developments. The competitive advantage for New Jersey is growing products that consumers want, rather than growing what is technically possible to grow.

Three of the top 10 counties in the United States, in terms of median household income, are in New Jersey, so the market for aquacultured product is right at the producers' doorstep. Take, for example, the success of the Jersey Fresh program for produce, thanks to the close proximity to the major population centers of New York, New Jersey and Philadelphia.

As you read through this report, recognize since 1995, there have been numerous developments to aquaculture policy in the Garden State: Aquatic Farmer License program; Jersey Seafood quality grading program; Recommended Management Practices; Title 50 revisions; and recommendations and reports from the Shellfisheries Council and AAC.

The industry is growing and evolving. This report makes recommendations that will launch sustainable solutions for New Jersey aquaculture.

Sincerely,

A handwritten signature in black ink, appearing to read "D. Fisher".

Douglas H. Fisher

# OPPORTUNITIES AND POTENTIAL FOR AQUACULTURE IN NEW JERSEY

## *An Update of the Aquaculture Development Plan*

Over a decade has passed since the original New Jersey Aquaculture Development Plan was prepared at the request of the Governor. During this time, progress has been made in advancing aquaculture. Considerable work remains before aquaculture meets its potential as envisioned in the New Jersey Aquaculture Development Act of 1998 as an environmentally beneficial agricultural production sector that has fully achieved its economic potential.

This report, periodically required pursuant to the aforementioned Act, is developed by the Aquaculture Advisory Council and is being presented to the Governor, Legislature and to the citizens of the State of New Jersey to describe the progress that has been made in aquaculture development, what is still possible, and to set forth recommendations for more fully achieving aquaculture's potential.

Perhaps the biggest change to aquaculture involves a shift in paradigm. Aquaculture has come to be viewed and regulated more as an agricultural pursuit, rather than being historically categorized as a natural resource activity much in the way wild fisheries are managed. There is reaffirmation from the industry that aquaculture development should never be decoupled from the sustainability of natural resources upon which aquaculture is dependent. This link is assured by the formation and adoption of formal management practices. The alignment and development of aquaculture policy with agricultural policy, as intended in the Act, is a strategy that will continue.

The numerous factors that make agriculture relevant and important to the Garden State are also true of aquaculture. The availability and proximity of consumers is foremost. The original plan identifies New Jersey's unique location with respect to strong markets in the region. This fact remains especially true today because the emergence of the local food movement is one of the most significant consumer food trends in recent years. Drawing upon the concepts that make the 26-year Jersey Fresh program one of the nations most admired branding programs for farm products, the Jersey Seafood program was launched in 2006 to bring the concept of local origin to seafood products.

Proximity to consumers is also a major driver of the existence of a strong food business infrastructure in New Jersey. This infrastructure includes New Jersey's six major commercial fishing ports which landed \$147 million of seafood in 2009. Aquaculture growth can both bolster and benefit from these unique "Working Waterfronts." The much larger food business infrastructure that includes processing, storage, logistics and

marketing should be leveraged to provide aquaculture with post-production development of value-added products and efficient transport of products to market.

A robust aquaculture industry enhances the image of one of New Jersey's most important economic assets: shore tourism. Those who make their living from the water reinforce the positive experience of millions of visitors to the New Jersey Coast annually through the products and services they provide. In particular, clams and oysters farmed in New Jersey's waters are an integral part of the shore experience that visitors seek. Moreover, the multigenerational families that are engaged in shellfish aquaculture contribute to the socioeconomic fabric of the Bayman culture and New Jersey's maritime heritage. They also are a strong voice that advocates for keeping New Jersey's waters pollution free and biologically productive.

Strong, local markets for aquaculture products remain underserved by New Jersey producers. For instance, while New Jersey produces about four million dollars worth of farmed shellfish, most of the raw bar market for clams and oysters is sustained by shellfish grown and harvested outside the state. The diversity of New Jersey's population base supports dozens of ethnic live seafood markets, which represent a premium market for finfish and shellfish. Freshwater and saltwater sportfishing is a multi-million dollar sector of tourism in the State. Yet most of the baitfish used by recreational anglers is shipped in from the southern and midwestern parts of the country. Although agritourism has grown in popularity in recent years in the Garden State, virtually no locations exist in New Jersey where customers can pay to fish at private farms. Ornamental fish and aquatic plants are aquaculture products which could provide an attractive adjunct to the nursery and landscaping trade in New Jersey, yet only two commercial farms serve the lucrative market for decorative ponds and waterscapes.

Beyond the paradigm shifts which have brought aquaculture into greater recognition as an agribusiness sector, another shift revolves around New Jersey's largest aquaculture production sector: bivalve molluscan shellfish. While the expansion of aquaculture has been largely viewed as having only negative environmental impacts, there is a growing recognition of the environmental benefits conferred by shellfish culture. An ever-growing body of scientific research is documenting the free ecological services provided by the existence of shellfish aquaculture such as the function of gear in leased waters as marine habitat. In order for the shellfish culture sector to provide such ecological services, the highest water quality is required. Therefore, a robust shellfish culture sector ensures that

policies aimed at improving shellfish classification also encourage other activities enjoyed by the public that are dependent on clean water. Few other segments of agriculture

can claim such a concurrent ecological and economic benefit. In addition, each acre of shellfish culture employing intensive culture technologies creates two “green” jobs.

## STRATEGIES TO ADDRESS CHALLENGES TO AQUACULTURE DEVELOPMENT IN NEW JERSEY

In the course of highlighting the marketing, technical, cultural and economic justifications for aquaculture development in New Jersey for the updates to the New Jersey Aquaculture Plan, it has become evident that several challenges must be overcome to ensure aquaculture growth consistent with the original spirit and

intent of both the original Aquaculture Plan and the Aquaculture Development Act. Each of these challenges is described below, in conjunction with recommendations for overcoming the challenge.

### Recommendations that do not require an allocation of state funding to implement, and which in some cases, may yield cost savings

**Challenge:** Priority for comprehensive aquaculture development in the interest of the State has waned since the passage of the Aquaculture Development Act.

**Strategy:** Provide increased top-down direction on aquaculture development as has been done in other states such as Maryland and Virginia, where governors have issued directives and mandates to all agencies involved in aquaculture development.

**Challenge:** Shellfish hatcheries do not qualify for agricultural taxation rates.

**Strategy:** Develop rules/statutes that allow tax relief to the several private shellfish culture facilities in New Jersey and to any future facilities.

**Challenge:** There is no mechanism in New Jersey to force action when testing shows a downgrade in water quality for shellfish areas.

**Strategy:** Develop a model after programs in other states (i.e. Washington State). Develop a legislative framework model for New Jersey and seek legislative sponsorship.

**Challenge:** The introduction of Nationwide Permit #48 by the Army Corps of Engineers precipitated a series of increased state-level regulatory initiatives for shellfish aquaculture.

**Strategy:** Reconsider State agency’s position to deny coverage by NWP#48 as *de facto* state regulation.

*Implementation of the above strategy has implications for the following two issues:*

**Challenge:** Since 2007, shellfish leasing policy has grown increasingly complex with federal and state policy changes.

**Strategy:** Develop one cohesive, user-friendly, lease

administration system that has an equitable fee structure to encourage broad-based participation, innovation and investment.

**Challenge:** Regulations to introduce a three-tiered permitting system have been stalled for several years due to low legislative priority.

**Strategy:** Coalesce aquaculture regulations under one Division so intra/interagency conflicts do not impede aquaculture development or lead to multiple fees and or regulatory delays. Elevate regulatory priority to institute Permit-by-Rule, General Permit, Individual Permit processes in the NJDEP, Division of Land Use Regulation.

**Challenge:** Some sections of the Aquaculture Development Act remain unfulfilled.

**Strategy:** Evaluate the implementation of the Aquaculture Development Act and implement unresolved mandates.

**Challenge:** Vacancies and expired terms on the Aquaculture Advisory Council and the Shellfisheries Council stifle Council vitality and ability to act.

**Strategy:** The appropriate office in charge of appointments should move to make appointments and eliminate all vacancies and expired terms.

**Challenge:** Aquatic animal health responsibilities are split between NJDEP Fish and Wildlife for wild fish management; fish imported for stocking and shellfish import; and the NJDA Division of Animal Health for finfish imported for aquaculture.

**Strategy:** Harmonize all aquatic animal health management and import protocols.

**Challenge:** Programmatic changes to research and education centers are in poor alignment with the Aquaculture Training and Information Center and Aquaculture Technology Transfer Center, both described in the Aquaculture Development Act.

**Strategy:** Evaluate the alignment of the ATIC and ATTC to appropriate research, education and information programs, or pursue an alternative statutory designation.

## Recommendations that may require an allocation of state funding to implement

**Challenge:** Products grown out-of-state entering local markets  
**Strategy:** Develop marketing initiatives that capitalize on the unique competitive advantage that New Jersey producers possess.

**Challenge:** There is a need to develop marketing strategies with consistent and compelling positive messages about aquaculture and supporting materials to deliver these messages to multiple audiences.  
**Strategy:** Develop a marketing task force to generate effective marketing messages and strategies for implementation.

**Challenge:** Large areas of the state are closed to shellfishing and shellfish aquaculture due to pollution. In the past, the Bureau of Marine Water Monitoring made great strides in finding pollution sources and upgrading water quality. This effort needs to be revitalized.  
**Strategy:** Develop a list of high priority areas for shellfish production that are currently in areas of poor water quality and actively pursue funding that targets pollution sources and works toward solutions.

**Challenge:** The ecological services and societal benefits provided by shellfish aquaculture are not recognized by the general public.  
**Strategy:** Emphasize these positive contributions and use this information to increase public awareness and guide regulatory direction with the goal of encouraging industry expansion.

**Challenge:** Although four Aquaculture Development Zones have been established and permitted for more than five years, no mechanism exists to administer leases within these zones.  
**Strategy:** In concert with key state agencies, finalize an economically viable, functional and equitable policy and administrative mechanism to allow production to begin within ADZs.

**Challenge:** The current level of shell planting in the Delaware Bay is insufficient to rebuild oyster seed beds to levels that can support and economically viable industry.  
**Strategy:** Develop an industry-based funding mechanism, in collaboration with public entities, to support a sustained program of incremental enhancement in the Delaware Bay. Shell planting in the seed production areas of the upper Delaware Bay has been documented to generate up to a 50:1 return on investment in two years.

**Challenge:** New Jersey Aquaculture Innovation Center is uniquely capable of leading applied research and demonstration of commercial scale aquaculture production in New Jersey and the region. Fulfilling this potential is critical to realizing public return on investment.  
**Strategy:** Promote the implementation of projects in which this Center will play a key support role and secure dedicated funding.

**Challenge:** High energy costs constrain closed system aquaculture systems and shellfish hatcheries.  
**Strategy:** Explore and apply feasible technologies for the integration of sustainable and “green energy” technologies.

**Challenge:** The administrative expense of shellfish leases greatly exceeds income generated by lease and survey fees.  
**Strategy:** In collaboration with the Shellfisheries Council, develop strategies to narrow the budget shortfalls of shellfish lease administration.

# TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION . . . . .	1
1.1 Purpose of Plan. . . . .	1
1.2 Definition of Aquaculture . . . . .	1
CHAPTER 2. CURRENT STATUS OF AQUACULTURE . . . . .	1
2.1 Aquaculture World Wide . . . . .	1
2.2 Aquaculture in the United States . . . . .	1
2.3 Aquaculture in New Jersey . . . . .	1
2.3.1 Marine and Estuarine Aquaculture . . . . .	2
2.3.1.1 Eastern Oyster Culture . . . . .	2
2.3.1.2 Hard Clam Culture . . . . .	2
2.3.1.3 Crab Shedding. . . . .	2
2.3.1.4 Other Marine Organisms . . . . .	2
2.3.2 Freshwater. . . . .	2
2.3.2.1 Private Facilities . . . . .	2
2.3.2.1.1 Trout . . . . .	2
2.3.2.1.2 Ornamental Koi . . . . .	3
2.3.2.1.3 Sportfish and Foodfish . . . . .	3
2.3.2.1.4 Tropical Ornamental Fish . . . . .	3
2.3.2.1.5 Aquatic Plant s. . . . .	3
2.3.2.2 Public Facilities . . . . .	3
2.3.2.3 Public Utilities . . . . .	3
CHAPTER 3. THE BUSINESS PERSPECTIVE . . . . .	3
3.1 The Global Economic Perspective. . . . .	3
3.1.1 World Seafood Supplies . . . . .	3
3.1.2 US Seafood Demand . . . . .	3
3.2 The Local Marketing Perspective . . . . .	3
3.2.1 Marketing Strategies for New Jersey Aquaculture Product. . . . .	4
3.2.1.1 Jersey Seafood. . . . .	4
3.2.1.2 Market Research . . . . .	4
3.2.1.3 Cooperatives . . . . .	4
3.3 Employment within the New Jersey Aquaculture Industry . . . . .	4
3.3.1 Bivalve Molluscan Shellfish . . . . .	4
3.3.2 Working Waterfront . . . . .	4
3.4 Financing and Financial Resources . . . . .	4
3.4.1 Federal Funding Programs . . . . .	4
3.4.1.1 US Department of Agriculture . . . . .	4
3.4.1.1.1 Direct Farm Ownership Loans . . . . .	4
3.4.1.1.2 Direct Farm Operating Loans . . . . .	4
3.4.1.1.2.1 Beginning Farmers and Ranchers Loan . . . . .	5
3.4.1.1.3 Emergency Loans . . . . .	5
3.4.1.1.4 Conservation Loans. . . . .	5
3.4.1.1.5 Business and Industry Guaranteed Loans . . . . .	5
3.4.1.1.6 Resource Conservation and Development Loans . . . . .	5
3.4.1.1.7 Federal Cost-Sharing Programs . . . . .	5
3.4.1.1.8 Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program (ELAP) . . . . .	5
3.4.1.1.9 Noninsured Crop Disaster Assistance Program (NAP) . . . . .	5
3.4.1.1.10 Special Grant Programs. . . . .	5
3.4.1.2 US Department of Commerce. . . . .	6
3.4.1.2.1 Fisheries Obligation Guarantee Program . . . . .	6
3.4.1.2.2 Saltonstall-Kennedy (SK) Fisheries Development Grant Program . . . . .	6
3.4.1.3 Small Business Innovative Research . . . . .	6
3.4.1.4 US Small Business Administration . . . . .	6

CHAPTER 4. THE REGULATORY PERSPECTIVE. . . . .	6
4.1 Introduction . . . . .	6
4.2 State Agency Roles . . . . .	6
4.2.1 New Jersey Department of Agriculture . . . . .	6
4.2.1.1 Aquatic Farmer License Program . . . . .	6
4.2.1.2 Development and Promotion. . . . .	7
4.2.2 New Jersey Department of Environmental Protection . . . . .	7
4.2.2.1 Bureau of Shellfisheries . . . . .	7
4.2.2.1.1 Shellfish Lease Administration. . . . .	7
4.2.2.1.1.1 Aquaculture Development Zones. . . . .	7
4.2.2.2 Land Use Regulatory Program. . . . .	7
4.2.2.2.1 Waterfront Development. . . . .	7
4.2.2.2.2 Tidelands . . . . .	8
4.2.2.2.2.1 Impact on Aquaculture Development Zones . . . . .	8
4.2.2.2.2.2 Riparian Rights. . . . .	8
4.2.2.3 Bureau of Water Supply. . . . .	8
4.2.2.3.1 Surface and Groundwater Withdrawal Permits . . . . .	8
4.2.2.3.2 Agricultural Water Certification and Registration . . . . .	8
4.2.2.4 Division of Water Quality. . . . .	8
4.2.2.4.1 Water Quality Certification . . . . .	8
4.2.2.4.2 Discharge of Effluents . . . . .	9
4.3 State Coordination . . . . .	9
4.3.1 Aquatic Farmer License Program . . . . .	9
4.3.2 Vacancies on the Shellfisheries and Aquaculture Advisory Councils . . . . .	9
4.3.3 Possession and Importation . . . . .	9
4.3.4 Finfish . . . . .	9
4.3.5 Shellfish Sanitation . . . . .	9
4.3.5.1 Interstate Shellfish Sanitation Conference . . . . .	9
4.3.5.2 Enforcement Concerns . . . . .	10
4.4 Aquatic Animal Health Management . . . . .	10
4.4.1 Use of Drugs and Therapeutics . . . . .	10
4.4.2 Importation . . . . .	10
4.4.3 Diagnostic Centers . . . . .	10
4.4.3.1 Fish Diagnostic Centers . . . . .	10
4.4.3.2 Shellfish Diagnostic Centers . . . . .	10
4.4.3.3 Private Diagnostic Centers . . . . .	10
CHAPTER 5. THE TECHNICAL PERSPECTIVE . . . . .	11
5.1 Acreage Potentially Available for Aquaculture in New Jersey . . . . .	11
5.1.1 Marine and Estuarine . . . . .	11
5.1.1.1 Delaware Bay . . . . .	11
5.1.1.1.1 Aquaculture Development Zones . . . . .	11
5.1.1.1.2 Intertidal Bays along the Atlantic Coast . . . . .	11
5.1.1.1.2.1 Sandy Hook/Raritan Bays . . . . .	11
5.1.1.1.3 Coastal Ocean . . . . .	11
5.1.1.1.3.1 Atlantic Coast Aquaculture Development Zones. . . . .	12
5.1.1.1.3.2 Synergy with Offshore Wind . . . . .	12
5.1.2 Freshwater and Land Based Aquaculture . . . . .	12
5.2 Information Sources. . . . .	12
5.2.1 World Aquaculture Data. . . . .	12
5.2.2. US Aquaculture Data. . . . .	12
5.2.2.1 Census of Agriculture . . . . .	12
5.2.2.2 National Agricultural Library . . . . .	12
5.2.3 State . . . . .	13
5.2.3.1 Office of Aquaculture Coordination . . . . .	13
5.2.3.2 Aquaculture Technology Information Center . . . . .	13
5.2.3.3. Aquaculture Technology Transfer Center . . . . .	13
5.2.3.4 Rutgers Cooperative Extension, Ocean County . . . . .	13
5.2.3.5 New Jersey Sea Grant Consortium . . . . .	13
5.2.4 Professional/Non-Profit Organizations . . . . .	13
5.2.4.1 Barnegat Bay Shellfish Restoration Program (BBSRP) . . . . .	13
5.2.5 Private . . . . .	13
5.3 Education and Training Capabilities. . . . .	14
5.3.1 Associate Degree Programs. . . . .	14
5.3.2 Training Programs. . . . .	14



# CHAPTER 1. INTRODUCTION

## 1.1 Purpose of Plan

This update to the New Jersey Aquaculture Development Plan will highlight the major issues that have emerged since the last update, completed in 2002. This report will objectively discuss issues that have impacted aquaculture development in New Jersey, both negatively and positively. Recommended will be future opportunities and actions to advance aquaculture in New Jersey, as an activity that is both environmentally sustainable and economically successful.

## 1.2 Definition of Aquaculture

The New Jersey Aquaculture Development Act of 1998 provides the following definition of aquaculture: "Aquaculture" means the propagation, rearing, and subsequent harvesting of aquatic organisms in controlled or selected environments, and the subsequent processing, packaging and marketing, and shall include, but need not be limited to, activities to intervene in the rearing process to increase production such as stocking, feeding, transplanting and providing for protection from predators. "Aquaculture" shall not include the construction of facilities and appurtenant structures that might otherwise be regulated pursuant to any State or federal law or regulation."

# CHAPTER 2. CURRENT STATUS OF AQUACULTURE

## 2.1 Aquaculture World Wide

Aquaculture is the fastest growing segment of production agriculture<sup>i</sup> and currently accounts for slightly less than half of the world's total production of aquatic products. When the New Jersey Aquaculture Development Act was passed in 1998, aquaculture worldwide represented only 30% of global fishery production<sup>ii</sup>. Considering the current annual growth rate of 6.9%<sup>iii</sup>, a conservative estimate is that aquaculture will surpass capture fisheries as the primary source of food fish before the next revision of the Aquaculture Development Plan five years from now. The Asia-Pacific region is where most of the growth in the aquaculture industry is occurring.

## 2.2 Aquaculture in the United States

The United States Department of Agriculture (USDA) has conducted two Special Censuses of Aquaculture (1998 & 2005). The number of aquaculture farms in the United States increased from 4,028 to 4,309 (7%) and the total value of aquaculture products increased from 978,012 to 1,092,386 (12%)<sup>iv</sup> between these time periods.

## 2.3 Aquaculture in New Jersey

In 2004, the NJDA initiated the New Jersey Aquatic Farmer License (AFL) program. The information gathered from the Aquatic Farmer License program was provided to the National Agricultural Statistics Service in New Jersey for use in the Special Census referenced above. USDA Census figures for New Jersey report 28 aquaculture farms in 1998 and 87 in 2005. The farm gate sales for New Jersey are \$5.79 million and \$3.71 million for these time periods, respectively. The 2005 Special Census of Aquaculture figures for New Jersey most likely represent a better effort to account for aquaculture producers and a clearer distinction between aquaculture and wild-caught products. Accordingly these numbers should not necessarily be seen as an increase in farms or as a decline in sales.

Because three Censuses of Agriculture and two Special Censuses of Aquaculture have been conducted since the original Aquaculture Development Plan and the Aquatic Farmer License program was launched in 2004, quantifying the size and scope of aquaculture in New Jersey is possible. Currently, there are 96 licensed aquatic farms in New Jersey. The breakdown of these farms is listed in Table 1.

Total Number of Aquatic Farms		96
mollusks		76
hard clams	50	
eastern oysters	17	
combined clams and oysters	9	
finfish ( <i>foodfish, baitfish, sportfish, ornamental</i> )		12
aquatic plants		2
combined finfish and aquatic plants		2
other ( <i>marine soft corals, crab shedding</i> )		4

Table 1 – Aquatic Farmer License (AFL) Program Data – October 2010.

### 2.3.1 Marine and Estuarine Aquaculture

#### 2.3.1.1 Eastern Oyster Culture

Oyster culture in New Jersey utilizes both on-bottom and off-bottom (containerized) culture techniques. The majority of oyster culture is conducted in the Delaware Bay; however, commercial oyster culture is also common along the Atlantic Coast.

The Delaware Bay oyster industry is one of the oldest forms of aquaculture in North America. Harvest quotas have been drastically reduced from the historic highs of over one million bushels per year in the early 1900s to about 75,000 bushels per year now. Most of the current harvest comes directly from seed beds rather than aquaculture leases lower in the Bay. Direct harvest is a management strategy to circumvent losses due to the oyster parasite *Perkinsus marinus* (dermo).

Catch quotas from a low of less than 25,000 bushels in 2004 to levels currently above 70,000 bushels have been stabilized in part due to a combination of Federal, State and industry funding for shell planting programs in the Delaware Bay. Commercial-scale on-bottom culture of oysters is also being conducted in the Mullica River estuary along the Atlantic Coast. The quantity of shell planted from this level of funding is insufficient to replenish shell loss rates observed in the Delaware Bay today, which is due to two principal factors: natural decay at bay bottom and mortality rates from dermo.

Several acres of containerized oyster culture utilizing commercial “rack-and-bag” techniques on riparian grant are being conducted in the Cape Shore area of the Delaware Bay. Similar commercial culture techniques using floating trays are in operation in Barnegat Bay. The main difference between containerized oyster culture and bottom culture techniques is to achieve an oyster best suited for the half-shell market.

Four ADZs, totaling 1,250 acres, have been in development for more than seven years. These areas would allow the production of very high quality oysters for the half-shell market using innovative structural aquaculture practices. Projects focusing on containerized shellfish culture will create jobs that are not

subject to the seasonality that is inherent in traditional on-bottom culture and harvest of oysters.

#### 2.3.1.2 Hard Clam Culture

Hard clam production accounts for two-thirds of total aquaculture farm-gate sales in New Jersey. The top one-third of hard clam growers produce 87% of all hard clams grown in New Jersey<sup>v</sup>. Many of the individuals and families still involved today played a significant role in pioneering the hatchery and production technology of hard clams in the 1970s that form the basis for what is now a thriving aquaculture industry along the Atlantic seaboard of the United States. Many of these growers are third- to fifth-generation baymen who made their living from the waters of New Jersey long before the emergence of hard clam aquaculture. However, production levels in other states have now begun to surpass production in New Jersey. New Jersey ranks fifth among hard clam producing states behind Virginia, Florida, Connecticut and Massachusetts<sup>vi</sup>.

#### 2.3.1.3 Crab Shedding

Two AFLs have been issued since 2004 for crab shedding operations, one in Salem County and another in Cape May County.

#### 2.3.1.4. Other Marine Organisms

A few individuals have been developing techniques for production of marine baitfish to supply the recreational fishing market but none have advanced to full commercial scale. The two species of interest have been mummichogs *Fundulus heteroclitus* and spot *Leiostomus xanthurus*. Products for this market are consistent with a high value-per-pound aquaculture business model that seems to have the greatest likelihood for commercial finfish production in New Jersey.

### 2.3.2 Freshwater

#### 2.3.2.1 Private Facilities

##### 2.3.2.1.1 Trout

The only private trout hatchery in Warren County continues to produce both coldwater and coolwater fish mainly for public and private stockings for the benefit of recreational angling.

Although stocking has been a historically strong market for farmed trout in the region, increasing interest in locally-produced product has created a small, but growing market for restaurant and direct consumer sales of trout.

#### 2.3.2.1.2 Ornamental Koi

A koi farm began operation in 2003. Built on a 47-acre former asparagus farm in Salem County, this farm produces extremely high value, competition quality koi from Japanese bloodlines. This low-volume, high-value production strategy differs from what a typical farm in the southern United States would employ, where a longer growing season and lower land values enable a higher production volume of commodity-type products. However, this production strategy seems to be better suited for market demands in this region. In 2005, New Jersey produced the most valuable koi in the United States at more than 23 times the national average value.

#### 2.3.2.1.3 Sportfish and Foodfish

One fish farm in Warren County grows several species of sportfish. A handful of farms exist that produce hybrid striped bass, and largemouth bass for recreational angling and foodfish markets. There are also a few ventures that have experimented with tilapia production in indoor, water recirculation systems.

#### 2.3.2.1.4 Tropical Ornamental Fish

Little tropical fish production exists beyond an indoor hobby

scale. Florida is the center for tropical fish production in the United States.

#### 2.3.2.1.5 Aquatic Plants

One sizeable aquatic plant nursery in Salem County grows dozens of varieties of aquatic plants for an ornamental, waterscapes market.

#### 2.3.2.2 Public Facilities

The New Jersey Division of Fish and Wildlife's Pequest Trout Hatchery raises and stocks more than 780,000 brook, brown and rainbow trout each year. These trout are stocked throughout the State's waters during the spring, fall and winter trout stocking periods. Pequest also provides brown trout for the Division's successful Sea Run Brown Trout program in the Manasquan River. The Hackettstown State Fish Hatchery is currently responsible for the production and distribution of 15 species of coolwater and warmwater fish. This hatchery also raises *gambusia* (mosquitofish) to supply to county mosquito control commissions. Annual production numbers at Hackettstown range from 1.5 to 2.5 million fish per year.

#### 2.3.2.3 Public Utilities

Aquaculture was once seen as a mitigation strategy for public utilities, but has moved out of the scope of interest of public utilities in favor of other initiatives such as sustainability and green energy.

## CHAPTER 3. THE BUSINESS PERSPECTIVE

### 3.1 The Global Economic Perspective

#### 3.1.1 World Seafood Supplies

Capture fisheries and aquaculture supplied the world with about 110 million metric tonnes (MMT) of food fish in 2006. Of this total, aquaculture accounted for 47 percent<sup>iii</sup>. With capture fisheries production at a steady 93 MMT annually and the world population to increase by 1.5 billion people by 2025, assuming current per capita supply of 16.7 kg<sup>iii</sup>, aquaculture production will have to increase by 25.1 MMT (to 76.8 MMT) to maintain equilibrium. Overall, fish provided more than 2.9 billion people with at least 15 percent of their average per capita animal protein intake. The share of fish proteins in total world animal protein supplies grew from 14.9 percent in 1992 to a peak of 16.0 percent in 1996, declining to about 15.3 percent in 2005<sup>iii</sup>.

#### 3.1.2 US Seafood Demand

Although the United States accounts for only 1% of global aquaculture production<sup>vii</sup>, the US is a major seafood consumer, importing 84% of the seafood consumed<sup>viii</sup>. Seafood products are the largest contributor to the US trade deficit among all food

categories. The \$8.92 billion trade deficit in 2009 declined slightly from a 2008 record of \$9.65 billion<sup>ix</sup> which again saw a sharp rebound in 2010 of \$10.07 billion<sup>x</sup>. Americans consumed 16.0 pounds of seafood per person in 2008<sup>xi</sup>. However, in order to meet the USDA recommendations of two meals per week, per capita consumption would have to at least double. Since global capture fisheries are at maximum yield, the increase in seafood supply can only come from aquaculture. This makes aquaculture development, especially domestic aquaculture development, an issue of national food security.

### 3.2 The Local Marketing Perspective

The New York and Philadelphia regions, contain some of the more affluent areas in the county and strong interest in one of the most significant food trends in recent years, that of sourcing locally-produced food. New Jersey's proximity to these areas and their resultant large seafood demand is a strong competitive advantage to aquaculture businesses. Developing marketing related attributes into a strategic business focus is likely more important to the success of an aquaculture business than primary focus on technical production issues.

### **3.2.1 Marketing Strategies for New Jersey**

#### **Aquacultured Products**

##### **3.2.1.1 Jersey Seafood**

The Jersey Seafood brand is modeled after the state's successful Jersey Fresh branding program for produce and other products ([www.jerseyseafood.nj.gov](http://www.jerseyseafood.nj.gov)). Jersey Seafood permits aquatic farmers, commercial seafood harvesters and packers/processors of New Jersey seafood commodities to become licensed by the New Jersey Department of Agriculture pursuant to N.J.A.C. 2:71-9 and to market their products using the Jersey Seafood logo.

The most apparent aspect of the Jersey Seafood program is a promotional tool to enable consumers to identify fish and shellfish that was caught or grown by New Jersey fishermen or aquatic farmers. However, the Jersey Seafood brand is rooted in regulation that includes a rigorous set of quality assurance standards, with which branded seafood must comply. Jersey Seafood also addresses sustainability, since seafood must be harvested according to state, regional, federal and international regulations designed to help ensure the availability of this resource for future generations. The State Board of Agriculture approved the rules establishing the Jersey Seafood brand in early 2008.

##### **3.2.1.2 Market Research**

In 2004, the New Jersey Department of Agriculture, in cooperation with Rutgers University Cooperative Extension Service and the Organic Aquaculture National Advisory Committee was awarded \$61,000 to identify, evaluate and quantify market opportunities for organically grown U.S. aquaculture products. In 2005, the New Jersey Department of Agriculture, in cooperation with Rutgers University was awarded \$56,500 to survey consumers, producers, wholesalers and buyers in the Northeast about consumption of live fish, shellfish and other seafood products and produce a central resource to facilitate sales. Funds for both projects were awarded through the USDA Federal-State Market Improvement Program and the results of these studies are available at the Jersey Seafood website.

##### **3.2.1.3 Cooperatives**

In 2005, the New Jersey Department of Agriculture, in cooperation with the New Jersey Seafood Marketing Group, LLC was awarded \$46,100 to conduct a feasibility study and develop a business plan for marketing live aqua-cultured clam product. The outcome of the project was a novel retail merchandising of farm-raised hard clams in the form of a 50-count mesh bag. The NJSMG, LLC continues to wholesale this product under the retail brand Baymen's Pride.

### **3.3 Employment within the New Jersey**

#### **Aquaculture Industry**

The development of aquaculture creates jobs, not only in the farming process but also in the upstream (equipment suppliers, maintenance, hatchery technicians) and downstream industries (packing and processing staff, transportation and logistics specialists, sales and marketing professionals). Like other industries that occupy a similar position in the economy, such as

fishing, forestry and mining, growth in this production sector creates new value and wealth in the economy.

##### **3.3.1 Bivalve Molluscan Shellfish**

The appreciable rebound in oyster catch quotas in the Delaware Bay has allowed shucking and packing operations to resume. This has returned 125 jobs to south Jersey, which includes boat and dock workers, shuckers, packers, and truck drivers. In hard clam aquaculture approximately one job is created for every two actively farmed acres. Upstream jobs (that supply clam aquaculture) and downstream jobs (that are supplied by sales of hard clams) are supported by each leased acre, but this number is difficult to quantify.

##### **3.3.2 Working Waterfronts**

If an offshore aquaculture industry can develop, this technology will create high-skilled jobs in engineering and science. Even the production that may occur in Federal waters would rely on the existing infrastructure of the existing six commercial fishing ports in New Jersey, increasing land-based employment. Commercial fishing vessels already making trips could transport and land product from offshore aquaculture. The synergies with offshore aquaculture and offshore wind generation in the same lease area enable creation of additional jobs within the existing footprint and multiply the economic and environmental benefit.

### **3.4 Financing and Financial Resources**

#### **3.4.1 Federal Funding Programs**

The website [www.Grants.gov](http://www.Grants.gov) is the central storehouse for information on Federal grant programs, containing over 1,000 grant programs and access to approximately \$500 billion in annual awards. The types of grant programs available periodically change and applicant availability varies. One recommendation is to use the keyword search feature using the term "aquaculture" or another search parameter related to your business plans.

##### **3.4.1.1 US Department of Agriculture**

###### **3.4.1.1.1 Direct Farm Ownership Loans**

For family-size farmers and ranchers who cannot obtain commercial credit from a bank, Farm Credit System institution, or other lender, the USDA Farm Service Agency, provide the Direct Farm Ownership Loan program, which is eligible for the purchase of farmland, to construct or repair buildings and other fixtures, and to promote soil and water conservation. The maximum amount for Direct Farm Ownership Loans is \$300,000.

###### **3.4.1.1.2 Direct Farm Operating Loans**

For family-size farmers and ranchers who cannot obtain commercial credit from a bank, Farm Credit System institution, or other lender, the USDA Farm Service Agency provide Direct Farm Operating Loans. Operating Loans may be used to purchase items such as livestock, farm equipment, feed, seed, fuel, farm chemicals, insurance, and other operating expenses. Operating Loans can also be used to pay for minor improvements to buildings, costs associated with land and water

development, family subsistence, and to refinance debts under certain conditions. The maximum amount for Direct Farm Ownership Loans is \$300,000.

#### **3.4.1.1.2.1 Beginning Farmers and Ranchers Loan**

Each fiscal year, the USDA's Farm Service Agency (FSA) targets a portion of its direct and guaranteed farm ownership (FO) and operating loan (OL) funds to beginning farmers and ranchers. A beginning farmer or rancher is an individual or entity who (1) has not operated a farm or ranch for more than 10 years; (2) meets the loan eligibility requirements of the program to which he/she is applying; (3) substantially participates in the operation; and, (4) for FO loan purposes, does not own a farm greater than 30 percent of the median size farm in the county. The USDA also has loan programs for socially disadvantaged farmers and ranchers, and for youth farmers.

#### **3.4.1.1.3 Emergency Loans**

USDA's Farm Service Agency (FSA) provides emergency loans to help producers recover from production and physical losses due to drought, flooding, other natural disasters, or quarantine.

#### **3.4.1.1.4 Conservation Loans**

The USDA's Farm Service Agency (FSA) makes and guarantees conservation loans to promote conservation on farms and ranches throughout the United States. The goal of FSA's Conservation Loan (CL) program is to provide farmers access to credit to implement these practices. Many farmers who need and want to implement conservation measures on their land do not have the "up front" funds available to implement these practices. Unlike FSA's traditional farm ownership and operating loan programs that are targeted toward smaller and less financially established farmers, eligibility requirements are expanded to permit the agency to provide assistance to some applicants who may be large and financially strong.

#### **3.4.1.1.5 Business and Industry Guaranteed Loans**

The purpose of the B&I Guaranteed Loan Program is to improve, develop, or finance business, industry, and employment and improve the economic and environmental climate in rural communities. This purpose is achieved by bolstering the existing private credit structure through the guarantee of quality loans which will provide lasting community benefits. It is not intended that the guarantee authority will be used for marginal or substandard loans or for relief of lenders having such loans. A borrower must be engaged in or proposing to engage in a business that will: provide employment; improve the economic or environmental climate; promote the conservation, development, and use of water for aquaculture; or reduce reliance on nonrenewable energy resources by encouraging the development and construction of solar energy systems and other renewable energy systems.

#### **3.4.1.1.6 Resource Conservation and Development Loans**

The purpose of the Resource Conservation and Development (RC&D) program is to accelerate the conservation, development and utilization of natural resources, improve the general level of

economic activity, and to enhance the environment and standard of living in designated RC&D areas. Current program objectives focus on improvement of quality of life achieved through natural resources conservation and community development which lead to sustainable communities, prudent use (development), and the management and conservation of natural resources. RC&D areas are locally sponsored areas designated by the Secretary of Agriculture for RC&D technical and financial assistance program funds.

#### **3.4.1.1.7 Federal Cost-Sharing Programs**

Several federal cost-share programs in various USDA agencies can be utilized to defray the development costs with various projects. The USDA NRCS administers the conservation-based Environmental Quality Incentives Program (EQIP) and the Wildlife Habitat Incentives Program (WHIP). Management practices were developed in New Jersey specifically for aquaculture producers to improve fuel usage, promote biofuel usage, and cycle aquaculture gear. The USDA NRCS promotes conservation planning and a program specifically to restore habitat or the functions and values of wetland ecosystems that have been devoted to commercial pond-raised aquaculture.

#### **3.4.1.1.8 Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program (ELAP)**

The 2008 Farm Bill created several new disaster programs under the title "Supplemental Agricultural Disaster Assistance." One of the programs created is the Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish (ELAP) program. This provides emergency relief to eligible producers of livestock, honey bees, and farm-raised fish. The program is designed to aid in the reduction of losses not covered under established assistance programs. Eligible producers of livestock, honey bees, and farm-raised fish may receive assistance for losses that occur on or after January 1, 2008, and before October 1, 2011, during the calendar year in which the loss occurs.

#### **3.4.1.1.9 Noninsured Crop Disaster Assistance Program (NAP)**

USDA's Farm Service Agency's (FSA) Noninsured Crop Disaster Assistance Program (NAP) provides financial assistance to producers of non-insurable crops when low yields, loss of inventory or prevented planting occur due to natural disasters.

#### **3.4.1.1.10 Special Grant Programs**

Through the enactment of the American Recovery and Reinvestment Act of 2009, \$50 million was made available to U.S. aquaculture producers who experienced high feed prices in 2008. One of the primary factors for these high feed prices, which are tied to prices of raw commodities, were the record high crude oil prices in July 2008. Because the Aquatic Farmers License Program has been in place since 2004, the NJDA submitted information of eligible aquatic farmers to the USDA. The State of New Jersey received \$3,791 in 2009 under this program. Given the eligibility criteria, only one fish farmer was eligible for these funds and received the entire allocation to the State of New Jersey. Subsequently in 2010, New Jersey was awarded \$9,523 under another federal feed grant program and it

was allocated to the same fish farm based on eligibility criteria in the 2008 program.

### **3.4.1.2 US Department of Commerce**

#### **3.4.1.2.1 Fisheries Obligation Guarantee Program**

The Fisheries Obligation Guarantee Program provides direct loans for certain fisheries costs, including the purchase of used vessels or the reconstruction of vessels and financing fisheries shore-side facilities or aquaculture facilities. Loans are not issued for reconstructions that do not add to fishing capacity or for purposes which could contribute to over capitalization of the fishing industry.

#### **3.4.1.2.2 Saltonstall-Kennedy (SK) Fisheries Development Grant Program**

The program provides financial assistance (grants or cooperative agreements) for research and development projects to benefit the U.S. fishing industry. Many recipients are university research programs; however, some grant recipients in recent years have been private corporations investigating technical areas applicable to the aquaculture industry.

### **3.4.1.3 Small Business Innovative Research**

The U.S. Small Business Administration (SBA) Office of Technology administers the Small Business Innovation Research (SBIR) Program and the Small Business Technology Transfer (STTR) Program. Through these two competitive programs, SBA ensures that the nation's small, high-tech, innovative businesses are a significant part of the federal government's research and development efforts. Eleven federal departments participate in the SBIR program; five departments participate in the STTR program awarding \$2 billion to small high-tech businesses. The U.S. National Science Foundation administers the SBIR.GOV site on behalf of the federal government.

### **3.4.1.4 U.S. Small Business Administration**

The U.S. Small Business Administration (SBA) is an advocate for small business in the United States, and provides a variety of services; including business financing (loan programs, venture capital, surety bonds, export financing), entrepreneurial development assistance (education, information, technical assistance & training), assistance with government contracting, guidance on civil rights compliance, and disaster assistance. The SBA also engages in advocacy in dealing with laws and regulations.

## **CHAPTER 4. THE REGULATORY PERSPECTIVE**

### **4.1 Introduction**

As was the case at the time of the development of the original Aquaculture Development Plan in 1995, regulatory issues continue to be identified as an issue in aquaculture development. However, since the Aquaculture Development Act, commercial aquaculture has become more widely recognized as an agricultural pursuit rather than a natural resource activity. An appreciable degree of progress has been made which has converted what were barriers into simply hurdles.

In the original ADP, interagency coordination to identify and secure permitting was recognized as the most difficult task for the prospective aquaculturist. This barrier has been reduced through the establishment of the Aquatic Farmer License (AFL) Program and the cooperative work between the NJDA and NJDEP which has resulted in the processing of over 200 AFL applications. Changes have been made to Title 50 statute providing authorization for shellfish management. Changes are forthcoming to Coastal Zone Management to provide an explicit waterfront development permitting process; to rules governing the importation and identification of aquacultures species; to leasing policy and to administration of leases in ADZs. Continuing to remove barriers and likewise find the appropriate "hurdle height" will allow for the proper balance between environmental and economic interests.

Changes in regulatory perspective on aquaculture are just as important because this often drives the implementation of regulation, especially where regulatory application is more implied than explicit. One aspect to changing perspective involves looking at aquaculture impacts in terms of both environmental impacts and benefits. There has been a deeply-engrained tendency for regulators to look at regulated activities only in terms of impacts, which considers only half of the spectrum. There is a growing body of literature documenting the environmental benefits of shellfish aquaculture in terms of marine habitat, nutrient and carbon removal, seeding native habitats, and wave attenuation. In some instances, the environment may be not as well off if these aquaculture structures did not exist.

### **4.2 State Agency Roles**

#### **4.2.1 New Jersey Department of Agriculture**

##### **4.2.1.1 Aquatic Farmer License Program**

N.J.A.C. 2:89-1 et seq., which became effective in April 2004, sets forth the regulatory sections that establish the Aquatic Farmer License Program (AFL). Two AFL application forms were developed to build a database of aquaculture operators in New Jersey. An abbreviated application form that expired 90 days after the N.J.A.C. 2:89 became effective was the tool to bring all existing aquaculturists into the new Program. A more extensive application served to collect vital information on the

project and to identify potential permitting issues based on a series of questions structured around general permitting issues. The rules require the NJDA to forward applications within 30 days to NJDEP which must complete its review within 30 days. Each application is sent to the appropriate Bureau within NJDEP, depending on the technical specifications proposed by the applicant. Applications for land-based, closed aquaculture systems defined as having minimal discharge do not require NJDEP review and the review can be conducted within the NJDA.

#### **4.2.1.2 Development and Promotion**

The Aquaculture Development Plan identifies the New Jersey Department of Agriculture as the lead State agency for the development, marketing, promotion, and advocacy of aquaculture in the State. These functions are performed by the Fish and Seafood Promotion Program in the Division of Markets working together with the Office of Aquaculture Coordination in the Division of Agricultural and Natural Resources. Many of the marketing activities described in the previous chapter are a result of this coordination. Since approximately 2008, marketing and promotion activities have been scaled back. This is principally due to the reduction in funding through Jersey Fresh and the vacancy of the Fish and Seafood Coordinator position due to retirement.

### **4.2.2 New Jersey Department of Environmental Protection**

#### **4.2.2.1 Bureau of Shellfisheries**

##### **4.2.2.1.1 Shellfish Lease Administration**

Although several attempts have been made to change leasing policy in the State, a renewed effort is being made to revise leasing policy for shellfish aquaculture. The authority to lease is authorized by N.J.S.A. 50:1-18, 23, and 24. NJDEP has proposed new fee structures and administration of shellfish leases. The Shellfisheries Council, which has the authority to grant leases and set fees, has convened a subcommittee to analyze these recommendations and develop a policy favorable to the industry.

A Subcommittee on Leasing was convened in January 2008 to address the need to make changes to leasing policy. The focus for the Leasing Subcommittee included: reaching agreement on the language for traditional shellfish leases, which will include a lease fee structure agreeable to industry; agreement on the language for ADZ shellfish leases; and development of an allocation policy for Aquaculture Development Zones (ADZ) lease parcels to be employed by the Shellfisheries Council. The Leasing Subcommittee delivered its findings in a report to the Aquaculture Advisory Council in January 2009. The report was forwarded to both the Delaware Bay and Atlantic Coast sections of the Shellfisheries Council.

##### **4.2.2.1.1.1 Aquaculture Development Zones**

State shellfish aquaculture expansion plans initiated in the early 2000s included Aquaculture Development Zones (ADZs) as a mechanism to allow for a streamlined utilization of structural

aquaculture systems. Over the last ten years, the ADZ planning process progressed as a collaborative effort of the NJDEP Division of Fish and Wildlife, the NJ Department of Agriculture, the Aquaculture Advisory Council (AAC), the NJ Shellfisheries Council, Rutgers University and shellfish industry members. In May 2003, the AAC released a report entitled "Aquaculture Leasing in New Jersey with Special Emphasis on Development Zones." As documented in that report, state and federal permitting issues were considered by those surveyed in the report as a major impediment to the development of structural aquaculture operations. The ADZ concept was envisioned as a mechanism for easing the regulatory process by having the Division obtain blanket permits for a selected group of sites ready for leasing to prospective leaseholders. Consistent with the report's recommendations, the Division obtained the permits authorizing the establishment of four Delaware Bay ADZs for structural shellfish cultivation activities, including, but not limited to, use of rack and bag systems, intertidal and floating long lines, cages, trays and spat collecting devices. These permits were received from NJDEP's Division of Land Use Regulation (DLUR) in November 2005. The companion federal permit from the U.S. Army Corps of Engineers (USACE) was issued in February 2006.

A new AAC Leasing Committee Report was issued in November 2008 and approved at the AAC meeting in January 2009. ADZ leasing recommendations included applicant eligibility, selection via a lottery process, along with developing a lease fee structure, lease utilization criteria and business plan. Subsequently, the Atlantic Coast Section of the Shellfisheries Council discussed the report with the Delaware Bay Section of the Council, which would take the lead with the implementation of Delaware Bay ADZs. A leasing document with modified requirements for lessees was developed in early 2011 which would govern the allocation and administration of ADZ leases.

#### **4.2.2.2 Land Use Regulatory Program**

Much of the activity in developing new strategies for land use regulation in aquaculture came as a result of Nationwide Permit No. 48, promulgated by the U.S. Army Corps of Engineers (ACOE), which became effective as of March 17, 2007. The Land Use Regulation Program (LURP) in NJDEP denied the water quality certifications of federal NWP 48 coverage, pursuant to Section 401 of the Clean Water Act. This decision resulted in differences between the state statutes and the federal requirements, necessitating state permits that were not previously required. The Division of Fish and Wildlife applied for and obtained NWP#48 permit coverage on behalf of the shellfish industry. Applicants pursuing new leases obtained after NWP#48 became effective are required to obtain a permit from the ACOE.

##### **4.2.2.2.1 Waterfront Development**

Changes to LURP Coastal Zone Management Rules have been proposed and have yet to be implemented to create a three-tier permitting system for aquaculture. The proposed three permit classes are Permit-by-Rule, General Permit, and Individual Permit. Permit-by-Rule authorized activities described in regulation require no specific permit if certain conditions are

met. This generally covers activities of the lowest regulatory concern and provides the least amount of regulatory burden. A General Permit covers a broader category of recognized permitted activities. Those whose activities are outside the scope of a General Permit must secure an Individual Permit, which includes cost provisions, tied to the construction costs of a project. Currently, all aquaculture activities that require a Waterfront Development permit must go through the Individual Permit process.

Permits must be secured through submission of an application and fees according to a prescribed fee structure. The General Permit application review process is much shorter and fees are generally fixed and much lower than those that must be paid to secure an Individual Permit.

Because of the State's decision to deny coverage of Nationwide Permit #48, additional Land Use permits are now required for activities that were determined not to need permitting prior to March 2007. The NJDEP Bureau of Shellfisheries has agreed to apply for and hold Waterfront Development permits as a way to help the industry comply with the new state and federal rules that precipitated following the implementation of NWP#48.

Although LURP decided to manage NWP#48 in the manner as described, there are some people in and close to the aquaculture community that believe that NJDEP Land Use has no regulatory authority for aquaculture in tidal waters.

#### **4.2.2.2 Tidelands**

The NJDEP Bureau of Tidelands made the decision in 2010 that all aquatic farms on public shellfish leases that utilize off-bottom shellfish culture must seek a Tidelands License. Prior to that time, aquaculture had been a low regulatory priority within the Bureau of Tidelands. The Bureau of Tidelands has exerted authority over off-bottom shellfish culture projects, acting pursuant to N.J.S.A. 12:1 et seq. in the interest of upland landowners. There is no alternative permit track for Waterfront Development and all applicants must secure an Individual Permit, there are no separate permitting channels in the Bureau of Tidelands. In March 2010, the Tidelands Council, which advises the Bureau of Tidelands, approved a rate of \$0.01 for a Tidelands License to their Council as a way to accommodate aquaculture. The previous rate for a Tidelands License for aquaculture was the general permitting fee of \$0.49 per square foot, a rate that was deemed by the industry to be prohibitive to the establishment of aquaculture. However, because the Bureau of Tidelands is within the NJDEP Land Use Regulatory Program, some in the industry likewise question the regulatory purview of this Bureau in aquaculture.

##### **4.2.2.2.1 Impact on Aquaculture Development Zones**

While a new rule proposal governing ADZ leasing is being completed by the Division of Fish and Wildlife, leasing would be implemented via a detailed lease agreement and following a public announcement of ADZ parcel availability. Given the recent emergence of purview of the Bureau of Tidelands, primarily affecting nearshore ADZ areas, leasing might first be

limited to offshore areas (ADZ-2 and ADZ-3) that would be covered under a separate Tidelands license.

##### **4.2.2.2.2 Riparian Rights**

Some waterfront property owners have property rights that extend below the mean high water line. These riparian grants were made to individuals up to a century ago and many of the original handwritten deeds specify their use for shellfish culture and harvesting. Some owners of riparian grants have pursued shellfish cultivation techniques that occupy the water column without obtaining land use permitting. Others have secured this permitting for their riparian grants.

#### **4.2.2.3 Bureau of Water Supply**

##### **4.2.2.3.1 Surface and Groundwater Withdrawal Permits**

The NJDEP Bureau of Water Supply regulates the diversion of ground and surface waters through a water allocation permit. Aquatic Farmer License applications for crab shedding operations help further clarify the diversion of saline water for aquaculture. N.J.A.C. 7:20A-1.4(a) exempts persons who divert salt water (chloride concentration greater than 10,000 mg/L) from the requirements of this Chapter unless NJDEP determines that such diversions would adversely impact utilization of freshwater sources. It should be noted that surface waters are less than ideal for use in aquaculture because surface water utilization increases operational costs for biosecurity purposes, unless filtration and disinfection is employed.

##### **4.2.2.3.2 Agricultural Water Certification and Registration**

An agricultural well that has the pumping capacity of 70 gallons per minute or more but does not use 3.1 million gallons of water or more in any month must be registered with the NJDEP. Registration does not expire if water use remains less than 3.1 million gallons per month.

Any agriculture, horticulture, or aquaculture operation planning on using an average of 100,000 gallons of water per day for a month (i.e. a minimum of 3.1 million gallons a month) requires an Agricultural Water Certification. Certification is valid for 5 years. A renewal is required every 5 years even if there is no change in the allocation.

#### **4.2.2.4 Division of Water Quality**

##### **4.2.2.4.1 Water Quality Certification**

In spite of the burgeoning population burden on its estuaries and ever more stringent water quality requirements under the National Shellfish Sanitation Program (NSSP), New Jersey has been successful in upgrading water classifications for shellfish growing areas since the late 1960s. Since 1976 there has been a 15 % increase in acreage of estuarine waters deemed acceptable for the harvest of shellfish for human consumption. Much of the work to achieve this surprising gain can be attributed to the efforts of officials in understaffed State agencies responsible for water monitoring and classification.



Pollution-related losses of nearshore and estuarine growing waters suitable for shellfish production can only be prevented by the reduction of potential sources. If shellfish culture is to be assured future viability, it is imperative that areas now free from pollution loading remain so, and that adequate measures be implemented to recover those areas already excluded from use by identifying and mitigating sources that compromise their quality. This may require additional legislation that would require jurisdictions with unacceptable water quality in growing areas to locate the sources of pollution and institute measures to eliminate them, or face the imposition of significant monetary penalties.

#### 4.2.2.4.2 Discharge of Effluents

In June 2004, the EPA finalized a new rule establishing effluent limitations guidelines (ELGs) for Concentrated Aquatic Animal Production (CAAP), or aquaculture, facilities. The rule applies to CAAP facilities that generate wastewater from their operations and discharge that wastewater directly into waters of the United States. More specifically, the rule applies to existing and new CAAP facilities with the following characteristics: use flow-through, recirculating, or net pen systems; directly discharge wastewater and produce at least 100,000 pounds of finfish a year. Important exclusions from this rule include molluscan shellfish operations, including nurseries; and closed pond systems, aquaria and net pens rearing native species released after a growing period of no longer than 4 months to supplement commercial and sport fisheries.

### 4.3 State Coordination

#### 4.3.1 Aquatic Farmer License Program

The Aquaculture Development Act directs the NJDA to establish a permit coordination system for aquaculture development in conjunction with other permitting agencies. N.J.A.C. 2:89-1 et seq., which became effective in April 2004 is the regulation that in part, developed this permit coordination system, called the Aquatic Farmer License Program (AFL). The process of identifying permits is shared between the NJDA Office of Aquaculture Coordination and the appropriate Division or Bureau within NJDEP, depending on the technical aspects of the application.

#### 4.3.2 Vacancies on the Shellfisheries and Aquaculture Advisory Councils

Two Councils support the development of aquaculture policy in New Jersey. These are the Aquaculture Advisory Council whose business is organized by the NJDA and the Shellfisheries Council which sits within NJDEP. The Governor, the President of the Senate, and the speaker of the assembly each make two appointments to the Aquaculture Advisory Council and all appointments to the Shellfisheries Council are made by the Governor with the advice and consent of the Senate. A major impediment to the functioning of these Councils as intended are the high number of vacancies caused by expired seats, and slow or no appointments. These vacancies create a significant likelihood of a lack of a quorum at meetings. Additionally, responsibilities are spread over a smaller number of members. Overall, the mandate of these councils is weakened by the

chronic number of vacancies. In order for industry-led aquaculture policy development to advance at a more acceptable pace, it is recommended that all seats of the Aquaculture Advisory Council and the Shellfisheries Council be filled immediately and that any future vacancies be filled in a timely manner.

#### 4.3.3 Possession and Importation

The Aquaculture Development Act instructed NJDA to develop a program to regulate the import and transport of species used in aquaculture. Such a program is necessary to protect wild stock, the environment, and the growing aquaculture industry. The program would also allow for the possession and sale of species that are currently regulated by size, sex, bag and seasonal limits.

During the initial discussions of this rule, it was proposed that it be incorporated into the omnibus fish and game regulations set forth at N.J.A.C. 7:25-1 et seq. as Subchapter, hence, the proposal came to be known as "Subchapter 20." Although a complete draft of the rule has been available since October 2003, no action has been taken by NJDEP to finalize the rule. The shellfish industry supports the rule as written. The current strategy is for NJDEP to propose these rules as regulation decoupled from an omnibus rule proposal. Movement towards adoption of the rule has been delayed as a result of the prioritization of other regulations impacting public health and safety.

#### 4.3.4 Finfish

The production and import of members of the freshwater black bass *Micropterus sp.* (largemouth bass and smallmouth bass) as foodfish is no longer restricted. This exclusion existed prior to 2004 and was described in the NJ Fish and Wildlife Digest, but later editions do not have similar language. Further legislative research in 2008 revealed that this regulation had expired. Largemouth bass command a price premium in ethnic live markets.

#### 4.3.5 Shellfish Sanitation

Various bureaus within the NJDEP also work with the New Jersey Department of Health and Senior Services (NJDHSS) to ensure compliance of the state's shellfish industry with the National Shellfish Sanitation Program. NJDEP Bureau of Water Monitoring tests water quality of growing areas and assigns water quality classifications on the basis of their tests. NJDEP Bureau of Marine Enforcement patrols areas to ensure that shellfish are being harvested only from approved areas. NJDHSS Food and Drug Safety Program provides safe handling guidance to producers, certifies shellfish dealers, oversees shellfish depuration activities by private companies (which currently only exist in Monmouth County), develops regulations governing retail sales of shellfish (which are enforced by local health departments) and investigates public health incidences involving improperly handled shellfish.

##### 4.3.5.1 Interstate Shellfish Sanitation Conference

To remain in compliance with the U.S. Food and Drug

Administration's National Shellfish Sanitation Program (NSSP), states seeking certification for interstate shipping of bivalve shellfish are required to maintain defined levels of infrastructure and personnel to provide adequate practical coverage in the categories of water quality classification, field surveillance of all shellfish producing waters, and the monitoring and inspection of shellfish processing and distribution. New Jersey has typically committed minimal funding to the execution of these critical key elements, which are essential not only for formal certification, but also to assure protection of the ultimate shellfish consumer. In several instances in recent years, the deficiencies in coverage of these required components of the State program have prompted the U.S. Food and Drug Administration, in its statutory role of auditing and authorizing state programs, to issue notices of non-compliance. Persistent failure in fulfilling this obligation could eventually result in withdrawal of certification for interstate shipment of shellfish. Loss of the out-of-state market would disastrously cripple sales in the shellfish industry, considering that interstate export of oysters alone exceeds 90% of the total production.

#### 4.3.5.2 Enforcement Concerns

Minimal numbers of field staff in Marine Enforcement also contribute to minimal surveillance of leased areas, which is a required component of the NSSP. Effective surveillance is necessary to prevent theft of private cultured shellfish stocks as well as illicit harvesting off the seed beds, thereby frustrating resource management provisions. A GPS-based system of monitoring harvest vessel activities has been discussed by reputable planters and could provide a cost-effective adjunct to the current inadequate system of surveillance.

Title 4 provides penalties for the theft of shellfish products from leased areas and for damage to gear. Some level of losses attributable to illicit takings is seen by most in the industry as a manageable cost of being in the business. The highest rate of incidences of illicit takings, whether unintentional or not, has been reported from leased shellfish areas south of Atlantic City where there is greater recreational use. A signage program to increase recreational user awareness of the existence of aquaculture leases and penalties for damage to gear and livestock have been debated, but the concern with a program like this is the unintended consequence that signage could actually increase illicit takings. As an alternative, NJDEP has written articles in publications aimed at recreational boaters and anglers. NJDHSS has prepared a guide to properly harvesting, transporting and storing recreationally-caught shellfish for recreational anglers and boaters.

## 4.4 Aquatic Animal Health Management

### 4.4.1 Use of Drugs and Therapeutics

"The Minor Use and Minor Species Animal Health Act of 2004," commonly referred to as the "MUMS Act", is intended to make more medications legally available to veterinarians and animal owners to treat minor animal species and uncommon diseases in the major animal species. This law provides innovative ways to bring products for these small populations to market and is designed to help pharmaceutical companies overcome the financial roadblocks they face in providing

limited-demand animal drugs. Many species producers in aquaculture receive the "minor species" designation and the MUMS Act is seen as a benefit to advancing the ability to manage aquatic animal health.

### 4.4.2 Importation

The importation of shellfish into the state is regulated by NJDEP Division of Fish and Wildlife. Fish and Wildlife also regulates the importation of finfish into the state for stocking private and public waters. The importation of finfish into the state for the purposes of aquaculture is regulated by NJDEP under an Import Permit. The draft rule that will update the Aquaculture Rule N.J.A.C. 2:89-1 et seq. seeks to harmonize import rules for finfish in aquaculture with those for stocking and natural resource management. NJDA established an import protocol for finfish as part of the Aquatic Farmer License Rule and in partial fulfillment of the mandate under the Aquatic Organism Health Management Plan and the Agricultural Management Practices for Aquaculture, both set forth by the Aquaculture Development Act. The Aquaculture Technical Committee, a subcommittee of the Aquaculture Advisory Council, advises the NJDA and NJDEP on technical issues related to importing organisms for the purpose of aquaculture.

### 4.4.3 Diagnostic Centers

#### 4.4.3.1 Fish Diagnostic Centers

The NJDA's Office of Aquaculture Coordination, described below in Section 5.2.2.1, and its Division of Animal Health, are working together to meet the needs of the State's finfish producers. Recent federal orders and a contraction of services previously available elsewhere have provided the impetus for the NJDA to develop parasitic, bacterial and viral diagnostic capacity in aquatic animal health, with the result that the New Jersey Animal Health Lab is now a USDA-APHIS-approved laboratory for aquatic animal health testing. In the Fall of 2011, the Animal Health Laboratory will move into a new building that will serve all the laboratory testing needs for the State of New Jersey. States such as Pennsylvania, Maryland, Florida, Washington and Arkansas have laboratories capable of performing a wide variety of aquatic animal health testing services. The U.S. Fish and Wildlife Service has a diagnostic capacity in their regional fish health centers.

#### 4.4.3.2 Shellfish Diagnostic Centers

The Haskin Shellfish Research Laboratory of Rutgers University continues to be the only center in New Jersey with expertise in shellfish pathology.

#### 4.4.3.3 Private Diagnostic Centers

Aquaculture producers in New Jersey and in the surrounding region sometimes seek private diagnostic services. However, aquatic specialties continue to be sporadic among veterinarians, so that fish farmers and enthusiasts are rarely able to access private diagnostic centers. Koi hobbyists have been identified as a segment that would greatly benefit from greater access to fish health inspection and diagnostic services. There is a tremendous reliance by this segment on word-of-mouth and Internet sites for diagnosing issues and administering treatments.

## CHAPTER 5. THE TECHNICAL PERSPECTIVE

### 5.1 Acreage Potentially Available for Aquaculture in New Jersey

#### 5.1.1. Marine and Estuarine

##### 5.1.1.1 Delaware Bay

Traditional Delaware Bay leases for oyster culture cover approximately 32,200 acres. Mortality caused by dermo and a limited shell planting program has limited much of the production potential for oysters in the lower sections of the Delaware Bay. Two companies are beginning projects that will utilize several hundred acres of the leases in the lower Delaware Bay for containerized oyster culture.

##### 5.1.1.1.1 Aquaculture Development Zones

Once they become able to be fully utilized, four Aquaculture Development Zones in the Delaware Bay would increase acreage available for aquaculturists to employ technologies that utilize gear that occupies the water column to produce shellfish.

ADZ-1 and ADZ-4 are two nearshore sites. These nearshore sites continue to be impacted by the remaining jurisdictional issue with Tidelands. ADZ-1 is a 55-acre site located near East Point in Cumberland County. Recent downgrades in water quality classification may limit the utilization of this site. ADZ-4, located near the Cape Shore area of Cape May County was originally delineated at 100 acres. Only approximately 40 acres are available due to overlap of private riparian grants and refusals of some upland property owners to waive their riparian interest. Draft lease agreements have been developed by the Bureau of Shellfisheries to begin lease allocation and administration in 2011. ADZ-2 and ADZ-3 are two offshore sites of 100 acres each centrally located in Delaware Bay. Leases in these areas could serve as overwintering areas for nearshore gear or could accommodate culture gear suspended in open water.

##### 5.1.1.2 Intertidal Bays along the Atlantic Coast

Only a few hundred acres out of the 2,500 total leased acres along the Atlantic Coast are being actively farmed for hard clams. The greatest majority of leased acres are severely underutilized or being held in a speculative manner.

One of the latest expansions in lease acres for shellfish production is a new block of leases in Middle Island Channel Thoroughfare, Barnegat Bay. This area was identified by a few members of the industry as having good potential for shellfish production because of good tidal flow and a narrow channel that is less frequented by recreational users. There was also an existing research project on submerged aquatic vegetation with Monmouth University. Biological surveys permitted approximately 22 lease acres to be established. The shellfish production in areas adjacent to submerged aquatic vegetation gives an opportunity for researchers to evaluate the impact/benefit interaction of shellfish aquaculture and submerged aquatic vegetation.

##### 5.1.1.2.1 Sandy Hook/Raritan Bays

Few, if any, prospects for increases in water quality classification will continue to limit shellfish aquaculture development in Raritan Bay and in any water bodies in Northern New Jersey. Shellfish production remains limited to wild harvest of hard clams that must pass through depuration at one of the two depuration plants in Monmouth County.

##### 5.1.1.3 Coastal Ocean

Federal offshore waters, also called the Exclusive Economic Zone, extend three to 200 miles off the coast. The federal offshore waters of New Jersey include 29,000 square miles. The 445 square miles of state territorial waters from zero to three nautical miles offshore could accommodate production strategies similar to those in federal waters, conditions permitting. Even a few aquaculture projects in a very small portion of this area would provide a significant economic benefit to one or more of New Jersey's six commercial fishing ports.

Current U.S. law does not provide clear mechanisms to allow commercial aquaculture operations in federal waters, three to 200 miles off the coast. That regulatory uncertainty is widely acknowledged as the major barrier to the development of aquaculture in federal waters<sup>xii</sup>. To date, three attempts have been made by the federal government to develop the necessary federal offshore policy framework. The purpose of these iterations of the National Offshore Aquaculture Act is to create a regulatory framework that allows for safe and sustainable aquaculture operations in U.S. federal waters. The 2007 Act includes requirements to ensure that offshore aquaculture proceeds in an environmentally responsible manner that is consistent with stated policy to protect wild stocks and the quality of marine ecosystems and is compatible with other uses of the marine environment.

New Jersey should closely monitor the development of offshore aquaculture policy on the federal level, since this policy may become increasingly complicated. Opt-out provisions are a recurring policy tool in these bills to allow states to exercise their independence in participating in offshore aquaculture. When federal offshore aquaculture policy becomes established, New Jersey should be careful not to exercise an opt-out provision prematurely. Opting out to seemingly avoid the real and largely perceived negative consequences of finfish aquaculture may also inadvertently prohibit the development of shellfish and macroalgae in offshore waters. The long history of bivalve molluscan shellfish aquaculture in New Jersey makes offshore production a logical next step for expansion of aquaculture. Because the technology needed to grow shellfish offshore is readily adaptable to macroalgae and because production of marine plants has an environmental impact/benefit profile similar to that of shellfish, macroalgae production provides

considerable prospect for innovation in the expansion of offshore aquaculture.

#### 5.1.1.3.1 Atlantic Coast Aquaculture Development Zones

The establishment of Atlantic Coast ADZs has been discussed since 2000 but no such zones have been formally established. Existing aquaculture regulatory policy that covers aquaculture in bays and nearshore areas of the state could be extended to the state offshore areas. NJDEP may need to add additional resources to have the ability to perform shellfish lease surveys in offshore areas in preparation for creation of ADZs.

#### 5.1.1.3.2 Synergy with Offshore Wind

New Jersey's efforts to locate major offshore wind-energy systems in the Atlantic Ocean could spur a secondary economic development opportunity through increased aquaculture development. The infrastructure needed to support the tower superstructure of turbines and blades also could serve as nearly an ideal support for aquaculture gear. If this synergy proves successful, New Jersey could set a very powerful example for the rest of the country to emulate in pioneering offshore aquaculture.

Pairing offshore wind and aquaculture presents a potential additional revenue stream for the energy developer, either through direct involvement with aquaculture or through subleases to another entity. Larger-scale aquaculture production will enable export development into lucrative foreign markets that are currently difficult for small producers to target. Shellfish produced in association with wind energy would have an extremely strong marketing position as a gourmet, environmentally friendly product produced in association with sustainable energy and could capture a market premium from "green" shoppers. Macroalgae, which could also be supported through wind infrastructure would be marketable to New Jersey's leading biotech and pharmaceutical industries, and could also yield a feed source for non-food crop biofuels.

The economic benefits of pairing offshore wind and aquaculture further include the removal of nutrients from seawater by macroalgae and shellfish. Shellfish produce calcium carbonate shells and algae remove carbon dioxide from the water. Combining the carbon sequestration of macroalgae and shellfish production with wind energy creates an overall project that could be actually carbon-negative.

New Jersey should allow for the incorporation of aquaculture production into the wind-energy projects being proposed off the coast. This will enhance the value of the projects, as well as expanding marketing opportunities, especially the export market, for New Jersey aquacultured products.

### 5.1.2 Freshwater and Land Based Aquaculture

Because New Jersey is the most densely populated state in the United States, conflicts between competing land uses are high. The availability of land in New Jersey and high land prices, where contiguous acreage is available, constrains the development of aquatic farms that cover hundreds of acres with

production ponds, as are found in the southern and midwestern states. Flow-through systems such as those for trout production require less of a footprint, but are constrained by the lack of availability of free-flowing springs. Continuous pumping is not cost effective. Although not without unique challenges, the types of freshwater land-based aquaculture production systems that appear to have the greatest likelihood of being viable from a business standpoint are indoor recirculation systems that have high water reuse, or production of fish in cages utilizing existing private water bodies. For many of the reasons that the familiar "pick-your-own" fruit and vegetable operations are popular form of agritourism in New Jersey; fee fishing operations, where customers pay for the opportunity to enjoy recreational angling can be developed as a successful extension of aquaculture.

## 5.2 Information Sources

### 5.2.1 World Aquaculture Data

Access to information resources has become less of a limiting factor as access to the Internet has grown so tremendously over the past fifteen years. The most trusted source for global aquaculture information is the biannual publication, the [State of Fisheries and Aquaculture](#), produced by the United Nations Food and Agriculture Organization.

### 5.2.2. US Aquaculture Data

#### 5.2.2.1 Census of Agriculture

Aquaculture reporting has been a part of the USDA Censuses of Agriculture in 1997, 2002, and 2007. Additionally, two Special Censuses of Aquaculture were conducted in 1998 and 2005. A third Special Census of Aquaculture was scheduled for 2010, but the expenditure to fund this effort was removed from the 2011 Federal Budget. Future launch of a third Special Census of Aquaculture is uncertain because of other funding priorities.

The Aquaculture Advisory Council has recently started efforts to implement a shellfish survey for New Jersey on either an annual or biannual basis, which would be conducted by the State office of the USDA National Agriculture Statistics Service. A survey form has been finalized but funding for the survey has not been secured and a memorandum of agreement between the State agriculture statistics office and the proper industry representation has not been implemented. There is also discussion about Rutgers University conducting a survey similar to the annual survey conducted by the Virginia Institute of Marine Sciences for the shellfish industry in Virginia.

#### 5.2.2.2 National Agricultural Library

The National Agriculture Library maintains a comprehensive information center on aquaculture that provides information on federal and state policy, industry organizations, research and education, careers and employment and business planning. The Aquaculture Network Information Center is a similar resource maintained by several land grant and sea grant institutions and the federal government. The five regional aquaculture centers maintain a wealth of technical information with the Southern Regional Aquaculture Center maintaining an extensive library of technical fact sheets.

Harbor Branch Oceanographic Institute, Virginia Polytechnic Institute and the University of the Virgin Islands regularly offer fee-based training programs in aquaculture.

### 5.2.3. State

#### 5.2.3.1 Office of Aquaculture Coordination

The Aquaculture Development Act designated the Office of Aquaculture Coordination in the NJDA.

The Office of Aquaculture Coordination oversees the implementation of the Aquaculture Development Act, organizes the business of the Aquaculture Advisory Council and administers the Aquatic Farmer License Program.

#### 5.2.3.2 Aquaculture Technology Information Center

The Aquaculture Development Act designated the Aquaculture Technology Program at Cumberland County College (CCC) as the official Aquaculture Technology Information Center (ATIC) for the State of New Jersey. The Program was directly involved in training aquaculture technicians at the CCC and in developing three commercial ventures designed to produce tilapia, shellfish and aquatic plants, and utilized a indoor fish production system on campus called the "Fish Barn." This initiative was intended to address unique demands of local populations and nearby markets while simultaneously providing hands-on aquaculture training at the Bayshore State Prison and two high schools. Because of lack of funding, aquaculture operations have been closed at this Program since 2008.

#### 5.2.3.3. Aquaculture Technology Transfer Center

The Aquaculture Development Act also designated the New Jersey Aquaculture Innovation Center, formerly called the Multispecies Aquaculture Demonstration Facility, at Rutgers University as the Aquaculture Technology Transfer Center (ATTC). The Multispecies Aquaculture Demonstration Facility began operations late in the summer of 2008. During the first two full years (2009, 2010), the operation was focused on oyster seed production and operational improvement of new systems. Algal culture is steadily increasing so that by 2010 at least 4 species were available at all times. Oyster seed production included diploid and triploid disease-resistant eyed larvae, and seed in various sizes ranging from 1 to 15 mm. With budget restrictions the facility has been operating with a skeleton of the staff required for full operation. The rebranding of this facility as the New Jersey Aquaculture Innovation Center is part of an effort to provide a new strategic direction to the Center and increase the Center's profile as a research institution crucial to the expansion of marine aquaculture in the region.

#### 5.2.3.4 Rutgers Cooperative Extension of Ocean County

RCE of Ocean County has a marine extension agent who works on shellfish aquaculture both on the state level and for the entire East Coast. The program there focuses on hard clam and oyster culture, but also goes further into the social issues surrounding shellfish culture, that of Code of Practice, Best Management Practices and Insurance and Food Processing. The County Extension Center serves as the main address for the New Jersey Aquaculture Association, the East Coast Shellfish Growers

Association, and the Barnegat Bay Shellfish Restoration Program (BBSRP).

### 5.2.3.5 New Jersey Sea Grant Consortium

Over the past decade, the New Jersey Sea Grant Consortium has funded six research and development proposals to investigate issues surrounding shellfish aquaculture, ranging from breeding technology and techniques to developing genetically disease resistant shellfish. Of those six projects, five were awarded to researchers with ties to Rutgers and the Haskin Shellfish Research Laboratory as well as the New Jersey Aquaculture Innovation Center. In 2011, an aquaculture extension agent will join Rutgers University to support aquaculture development focused on the Delaware Bay. Funding for this position is from the National Oceanic and Atmospheric Administration's (NOAA) National Sea Grant Program awarding a three-year, \$300,000 grant to the NJS GC and Rutgers University's Haskin Shellfish Research Laboratory.

Since 2007, the New Jersey Sea Grant Consortium has awarded two scholarships annually, one to a graduating high-school senior and one to an undergraduate or graduate school student pursuing studies in fisheries and aquaculture. The Stew Tweed Fisheries and Aquaculture Scholarships were created in memory of Stew Tweed, New Jersey Sea Grant's aquaculture agent from 1978 to 2005. More information about the scholarships is at [StewTweed.org](http://StewTweed.org).

### 5.2.4 Professional/Non-Profit Organizations

Organizations such as the World Aquaculture Society and the American Fisheries Society, Fish Culture section offer a variety of books, magazines and journals devoted to aquaculture. The World Aquaculture Society ([www.was.org](http://www.was.org)) is a web-based gateway to the world's electronic resources for aquaculture information.

#### 5.2.4.1 Barnegat Bay Shellfish Restoration Program (BBSRP)

BBSRP and its volunteer group, ReClam the Bay, Inc., is a program which uses commercial shellfish aquaculture to teach environmental stewardship to Ocean County citizens, who then reach out and educate the public about the bay and its watersheds. Marine extension agents participate in this program with a specific focus on water quality. BBSRP has 19 nursery systems around the Bay for growing clam and oyster seed, does oyster spat on shell demonstration projects, grows shellfish on two leases in Barnegat Bay, and has initiated a Junior Shellfish Gardener Program with grammar school students. In the 6 years of the program, they have grown over 7 million clam seed and 1.3 million single oyster seeds through the nursery phase.

### 5.2.5 Private

Fish Farming News and Aquaculture North America are two current subscription-based publications that cover U.S. aquaculture. There are also similar publications that cover aquaculture in other regions of the U.S. and the world. A variety of publications that cover seafood and food distribution such as Seafood Leader, National Fisherman, Seafood Business and Urner Barry's Reporter also discuss markets for aquaculture products.

## 5.3 Education and Training Capabilities

### 5.3.1 Associate Degree Programs

Funding from the National Oceanic and Atmospheric Administration, PSE&G and the New Jersey Commission on Science and Technology provided for the construction of the “Fish Barn” at Cumberland Community College, and operation of the facility for a short time. The Fish Barn facility produced approximately 1,000 pounds per week of both live and fresh on-ice tilapia, which were shipped weekly through a major supermarket cooperative in New Jersey. The hope was that additional funding from the State would cover continued operations of the facility. This funding never materialized to the necessary extent and the Fish Barn ceased operations in 2008 as well as academic instruction in aquaculture.

### 5.3.2 Training Programs

A few non-profit organizations have used the emergence of interest in shellfish gardening to extend their education and training on environmental stewardship, water quality management and shellfish restoration. Shellfish gardening

involves growing shellfish on private docks for conservation and educational purposes. The Barnegat Bay Shellfish Restoration Program is a joint effort between Rutgers Cooperative Extension of Ocean County and the NJDEP Bureau of Shellfisheries. Volunteers who participate are trained to become master shellfish gardeners. Those successfully completing the training are considered Certified Shellfish Gardeners by Rutgers University. The NY/NJ Baykeeper focuses on shellfish restoration in the waters surrounding the New York area. Program PORTS in Cumberland County educates youth about oysters through a wild collection of spat on shell process.

These programs use typical commercial aquaculture nursery gear, such as upweller tanks, oyster bags and Floating Upweller Systems to grow the seed. Demonstrating the benefit of the use of these systems in a non-commercial setting can work toward reducing the number of permits that a prospective commercial shellfish grower might need to initiate a land-based nursery system or a Floating Upweller System, as well as introducing new state-of-the-art oyster culture gear.

---

<sup>i</sup> <http://www.fao.org/fishery/aquaculture/en>

<sup>ii</sup> FAO Fishery Information. 2009. FIGIS Data Collection

<sup>iii</sup> FAO. 2009. SOFIA 2008. FAO Fisheries and Aquaculture Department:Rome ISSN 1020-5489.  
<http://www.fao.org/docrep/011/i0250e/i0250e00.htm>

<sup>iv</sup> <http://www.agcensus.usda.gov/Publications/2002/Aquaculture/AQUACEN.pdf>

<sup>v</sup> NJDA AFL Program data

<sup>vi</sup> <http://www.agcensus.usda.gov/Publications/2002/Aquaculture/AQUACEN.pdf>,  
ECSGA, NJDA

<sup>vii</sup> <ftp://ftp.fao.org/fi/STAT/summary/a-0a.pdf>

<sup>viii</sup> [http://aquaculture.noaa.gov/pdf/aq\\_factsheet\\_march2010.pdf](http://aquaculture.noaa.gov/pdf/aq_factsheet_march2010.pdf)

<sup>ix</sup> Myers, J.J. 2010. A Quick Perspective of US Seafood Trade with the World – 2009. Ramblings <http://www.nasac.net/AprilNewsletter2010.pdf>

<sup>x</sup> Myers, J.J. 2011. US Seafood Trade Deficit Surpasses \$10 Billion for the First Time. Ramblings <http://www.nasac.net/MayNewsletter2011.pdf>

<sup>xi</sup> National Marine Fisheries Service. 2009. Fisheries of the United States: 2008. National Oceanic and Atmospheric Administration: Silver Spring, MD. July 2009.

<sup>xii</sup> <http://aquaculture.noaa.gov/us/2007.html>

Notes

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

**Photo Credits**

*Front Cover*

Top-left: rainbow trout and golden rainbow trout under predator control netting produced at Musky Trout Hatchery in Warren County (photo – J. Mancini)

Top-left-center: a presentation of half shell oysters, farm-raised in Cape May County (photo – J. Myers)

Top-right center: a presentation of half shell littleneck clams, farm-raised in Atlantic and Ocean Counties (photo – J. Myers)

Top-right: tategoi (juvenile koi with the potential for high quality) produced at the Nisei Koi Farm of Quality Koi Co. in Salem County (photo – J. Myers)

Bottom: a New Jersey bayman harvesting farm-raised hard clams from his lease at dawn in Atlantic County (photo – G. Mathis)

*Back Cover*

Rack-and-bag production of individually farm-raised oysters at the Delaware Bay Cape Shore in Cape May County. (photo – New Jersey Sea Grant Consortium)

Office of Aquaculture Coordination  
Division of Agricultural & Natural Resources

New Jersey Department of Agriculture  
PO Box 330  
Trenton NJ 08625-0330  
(609) 984-2502

[www.nj.gov/agriculture](http://www.nj.gov/agriculture)  
[www.jerseyseafood.nj.gov](http://www.jerseyseafood.nj.gov)

