



University of Maryland, 2113 Animal Science Building
 College Park, Maryland 20742-2317
 Telephone: 301-405-6085, FAX: 301-314-9412
 E-mail: nrac@umd.edu Web: <http://www.nrac.umd.edu>

AQUACULTURE SITUATION AND OUTLOOK REPORT 2007: CONNECTICUT

Tessa Getchis, Connecticut Sea Grant and Cooperative Extension, University of Connecticut
Robert Pomeroy, Connecticut Sea Grant, University of Connecticut

Industry Trends and Outlook

Connecticut is a major producer of farm-raised shellfish, including eastern oysters (*Crassostrea virginica*) and northern quahogs (*Mercenaria mercenaria*), valued at greater than \$16 million in 2006. The northern quahog (hard clam) is the number one product in terms of production and value. There are 46 companies cultivating shellfish on over 77,000 acres of town and State grounds in Long Island Sound. Two commercial hatcheries serve as shellfish seed sources, though the majority of the industry still relies on natural recruitment.

Each coastal town in Connecticut has a municipal shellfish commission consisting of government-appointed members from its community. These commissions are responsible for managing their local shellfisheries resources, as well as recreational and commercial shellfishing activities. A number of these commissions grow shellfish for enhancement or restoration purposes.

A small, but expanding commercial freshwater finfish industry grows mainly trout and baitfish, and contributes approximately 5% of the aquaculture revenues. The Department of Environmental Protection operates two trout hatcheries for stock enhancement, and a salmon culture facility for restoration.

Several of the State's Regional Vocational Agriculture Schools and specialized marine and aquaculture high schools participate in husbandry and restocking efforts in cooperation with producers and state agencies.



Oyster culture bags in coastal Connecticut. (Photo: Tessa Getchis)

Commercial Species List

- Eastern oyster (*Crassostrea virginica*)
- Northern quahog (*Mercenaria mercenaria*)
- Rainbow trout (*Oncorhynchus mykiss*)
- Brown trout (*Salmo trutta*)
- Brook trout (*Salvelinus fontinalis*)
- Golden trout (*Oncorhynchus aguabonita*)
- Largemouth bass (*Micropterus salmoides*)
- Bluegill sunfish (*Lepomis macrochirus*)
- Brown bullhead (*Ameiurus nebulosus*)
- Black crappie (*Pomoxis nigromaculatus*)
- Yellow perch (*Perca flavescens*)
- Pumpkinseed (*Lepomis gibbosus*)
- Fathead minnow (*Pimephales promelas*)
- Golden shiner (*Notemigonus crysoleucas*)
- Grass carp (*Ctenopharyngodon idella*)

Emerging Issues and Critical Needs

- Environmental effects of shellfish aquaculture
- Environmental effects of utility-crossing installations in Long Island Sound
- Innovative packaging, labeling and marketing for cultured shellfish
- Availability of disease-resistant oyster seed
- Economic impact of combined sewer overflows and weather events on shellfish production
- Negative public perception of aquaculture gear and associated marker buoys
- Streamlining the permitting process for coastal aquaculture
- Increased eligibility for USDA farm assistance programs (loans, grants, crop insurance, etc.)
- Impact of Viral Hemorrhagic Septicemia

Addressing Industry Needs

Researchers, extension specialists, resource managers, industry associations and concerned stakeholders all play a role in addressing industry needs. The following sections outline the new initiatives and recent accomplishments in these areas.

Aquaculture Research

The University of Connecticut (UConn) is the Land Grant and Sea Grant Institution for the State of Connecticut. Aquaculture research is conducted within various departments within the Colleges of Agriculture and Resource Economics, and Liberal Arts and Sciences. The following projects are in progress:

- **The growth and feeding of *Strombidium stylifer*, a marine ciliate that may be of use as a live feed in mariculture** *Strombidium stylifer*, a planktonic oligotrich ciliate, has been selected for its potential use as a food organism for marine aquaculture. It holds promise, especially in parts of the world that do not have access to culture collections or funds to purchase and maintain commercially-available feeds.
- **The effects of oyster depuration gear on eelgrass, sediment and water quality parameters** Concerns have arisen over the potential effects of shellfish aquaculture gear on the marine environment, and in particular to sensitive species

such as submerged aquatic vegetation. The objective of this study is to determine the degree of impacts of oyster depuration cages on sediment and water quality parameters, and eelgrass abundance in eastern Long Island Sound.

- **The effects of marine invasive species on the ecology of economically important shellfish species** The increasing number and high abundance of introduced fouling species, such as ascidians, are threatening both natural and cultured populations of commercially-important shellfish. Objectives are to determine the degree to which the invasive ascidians affect the growth and mortality of shellfish that they foul, and to determine the effectiveness of biological control to prevent or impede the recruitment of ascidians into shellfish populations.
- **Linking marine pathogens to molluscan shellfish** Within the past decade, several marine pathogens have caused high disease prevalence and mortality in cultured molluscan shellfish. Infections have led to widespread economic disaster when diseased shellfish have been transferred to naïve growing areas. This project will investigate the pathways associated with transfer of these disease agents, as well as methods to prevent the transfer of molluscan shellfish diseases.
- **Potential for transport of harmful algae via shellfish transfers** Restoration and aquaculture of bivalve shellfish frequently involves movement of the shellfish from one body of water to another. In collaboration with scientists from the National Marine Fisheries Service Milford Laboratory and North Carolina State University, researchers have been investigating the possible movement of harmful algal bloom (HAB) species via shellfish. It has been shown that HAB species pass intact and viable through the digestive system of shellfish. Researchers are working with the shellfish industry to develop best management practices to avoid unwanted introductions of HAB species.
- **Oyster immunology** A study on the defense mechanisms of oysters, in particular how they relate to resistance to *Perkinsus marinus*, has been conducted in collaboration with scientists from the Connecticut Department of Agriculture. Results to date have shown that apoptosis, the ability of cells to undergo “cell suicide” once infected, may be key in the resistance to *Perkinsus marinus*. Research is also being performed on the effects of pollutants on those defense mechanisms.
- **Development of an integrated recirculating**

aquaculture system for nutrient bioremediation in urban aquaculture

The objectives of the project are to: 1) demonstrate the performance of a continuously operating, integrated recirculating aquaculture system, from which finfish and marine plant biomass can be harvested; 2) demonstrate that acceptable water quality can be maintained and that effluent nutrient levels are well below guidelines being developed by the Environmental Protection Agency (EPA); 3) compare four candidate native species of *Porphyra* to act as biofilters and as crops; and 4) examine nutrient dose-response relationships to determine the maximum finfish biomass that can be maintained for a given marine plant biomass (and biofilter area).

The Connecticut Department of Agriculture, Bureau of Aquaculture (DA/BA) is the lead State agency responsible for commercial shellfisheries and aquaculture. The Bureau of Aquaculture and Laboratory administers the following programs: shellfish sanitation, laboratory diagnostic services, shellfish habitat management and restoration, and aquaculture development and coordination. The following research and monitoring projects are in progress:

- **Clam disease monitoring** Samples of northern quahogs are collected each spring for pathological assessment. Prevalences of infectious agents such as QPX and *Chlamydia*, and histopathological changes are recorded.
- **Soft shell clam disease monitoring** Two types of neoplasia, a malignant (leukemia) and a benign tumor (papilloma), are studied in the soft shell clam.
- **Oyster disease monitoring** Sampling sites are monitored each fall for the presence of pathogens and histopathological changes in oysters. Prevalence of viral gametocyte hypertrophy, Rickettsia, *Roseovarius crassostrea* (JOD), *Haplosporidium nelsoni* (MSX), *H. costale* (SSO), *Perkinsus marinus* (Dermo), *Nematopsis ostrearum*, ciliates, trematodes, and pea crabs are recorded, as well as histopathological changes such as inflammatory responses, degenerations, cell and tissue death, growth derangements, hemodynamic and fluid derangements, and neoplasia.
- **Disease-resistant oysters** Disease resistant oysters (*Crassostrea virginica*) have been produced by selective breeding since the MSX epizootic of 1997. Broodstock are tested for disease resistance for MSX, Dermo and JOD. This year oysters will be grown and tested for pathogens as part of a



State Shellfish Pathologist Inke Sunila monitors disease prevalence and growth rates of cultured oysters in Long Island Sound. (Photo: Tessa Getchis)

collaborative study with scientists from Maine, Massachusetts, Rhode Island and New Jersey.

- **Epizootic branchial adenocarcinoma in oysters** A collaborative study with Stony Brook University describes lesions in Long Island Sound oysters using light and electron microscopy.
- **Enteric adenocarcinoma in oysters** A collaborative study with the EPA Narragansett laboratory describes lesions recently found at low prevalence in Long Island Sound oysters. The study includes a ten-year sampling period in Connecticut and archived slides from EPA.
- **Apoptosis of *Perkinsus marinus* cells in oysters** This collaborative project with the Maryland Department of Natural Resources uses electron microscopy and *in situ* hybridization to study apoptosis, a type of cell death in cultured *P. marinus* (Dermo).
- **Immuno- and histopathological effects of toxic algal species (*Prorocentrum*, *Alexandrium*)** A study in collaboration with the National Marine Fisheries Service Milford Laboratory and scientists from Barcelona, Spain uses flow cytometry, histology, and *in situ* hybridization to determine the harmful effects of species which cause blooms on molluscan shellfish.

The National Marine Fisheries Service (NMFS) Milford Laboratory conducts research on the aquaculture of marine shellfish and finfish that are economically important in coastal areas of the Northeast region; in addition, related studies are conducted to determine how habitats function as nurseries for young fish and shellfish that might be used in stock enhancement projects.

The following include some of the major projects at the laboratory:

- **Cultivation methods for the rearing of finfish and shellfish to market size** These methods are being developed using various technologies, including flow-through systems and recirculating seawater systems. The particular species of interest at this time include the bay scallop, black sea bass and tautog. Along with these studies, strategies to reintroduce hatchery-produced finfish and shellfish into the natural environment are being evaluated.
- **Technological tools to better understand and manage marine aquaculture methods and practices** Specific areas of application include marine livestock health management and disease diagnosis and treatment (including effects of harmful microalgae and biotoxins); selective breeding of shellfish for desired traits; and production and effective use of microalgal feeds for shellfish and for invertebrate animals fed to cultured larval finfish. Directed experimental studies are conducted to develop and evaluate technologies, methods, and tools, which are tested in practice.

Aquaculture Extension

Connecticut has four full-time Extension faculty within the Sea Grant and/or Cooperative Extension Programs who are dedicated all or in part to programs in fisheries and aquaculture. These include finfish and shellfish aquaculture specialists, a resource economist, and a seafood safety specialist. These specialists, based at several campuses within the University of Connecticut, have statewide responsibilities. The following is a summary of the major outreach projects:

- **Online Resource Guide for Aquaculture in Connecticut** Connecticut Sea Grant has developed a comprehensive online aquaculture resource guide for stakeholders in Connecticut available at <http://www.seagrant.uconn.edu/aquaguide>. The guide includes practical information on aquaculture production, business development and seafood production tools, educational resources, journals and trade magazines, an event calendar, and contact information for extension, education and research specialists, as well as industry associations and private and government assistance agencies.
- **Partnering to streamline the marine aquaculture permitting process** Connecticut recently revised its marine aquaculture permitting process, which requires input and review by a number of local, state and federal agencies. The

goal of this project was to familiarize growers with the new permitting system; to aid in streamlining the aquaculture permitting system in Connecticut. Three products have been drafted including: a new marine aquaculture application, a guide to the marine aquaculture permitting process, and a manual of standard operating procedures for permitting review for regulators.

- **New gear and species development** To contribute to the expansion of environmentally- and economically-sustainable freshwater and marine aquaculture industries in Connecticut and the Northeast, extension specialists and industry members have undertaken small-scale projects to investigate culture methods for new species including blue mussels, razor clams and ornamental corals. These projects have provided a new source of revenue to producers.
- **Hazard Analysis and Critical Control Points Program** HACCP is a food safety management program that first identifies and evaluates the risk of biological, chemical, or physical food safety hazards that may be associated with a particular species of fish or seafood product. The Connecticut and Rhode Island Sea Grant programs serve the seafood industry by jointly offering seafood HACCP training courses two to four times a year. Since 1997, we have trained more than 600 seafood processors, dealers, importers, and state and federal regulators in the principles and application of HACCP to seafood processing.
- **Northeast Aquaculture Conference & Exposition (NACE)** The biennial NACE, chaired by Connecticut extension specialists, is the premier event to learn about the Northeast region's aquatic farming industry. The program for NACE 2006

The screenshot shows a web browser window with the address bar displaying <http://seagrant.uconn.edu/aquaguide/>. The page content includes a title "ONLINE RESOURCE GUIDE FOR AQUACULTURE IN CONNECTICUT" and a list of navigation links: INTRODUCTION, CALENDAR OF EVENTS, GETTING STARTED IN AQUACULTURE, SHELLFISH ENHANCEMENT / RESTORATION, EQUIPMENT AND SUPPLY VENDORS, FUNDING OPPORTUNITIES, TESTING LABORATORIES, COLLEBS, PARADISE, PRODUCTION STATISTICS, RESEARCHERS AND PUBLICATIONS, CAREERS IN AQUACULTURE, MULTI-STATE WPER SITES, CONTACT AN EXPERT, PLEASE RATE OUR SITE!, and seagrant@uconn.edu. There are logos for Sea Grant, UCONN, and NOAA. A photograph shows two people in a laboratory setting with several large aquaculture tanks. Below the photo, there is text: "Fish Watch (10/18) US Seafood Facts provided by NOAA NMFS World Bank Report (9/07) Aquaculture: Changing the Face of the Waters" and "INTRODUCTION Aquaculture is defined as the controlled cultivation and harvest in the waters and tidal wetlands of the state of aquatic animals and plants, including but not limited to, oysters, clams, mussels and other molluscan shellfish, lobsters and crabs, fish and commercially important seaweed. Connecticut General Statutes". A "Purpose" section states: "This guide is intended to provide web based educational resources that will assist Connecticut aquaculture producers, municipal shellfish and harbor management commissions, researchers, educators, students, and aquaculture enthusiasts. If you have any questions or suggestions for improvement, please contact: tesaa.ost@uconn.edu".

The Online Resource Guide for Aquaculture is a collaborative effort among Extension personnel, researchers and resource managers.

reflected the diversity of the aquaculture industry in the northeast U.S., with programs on shellfish, finfish and ornamentals, that suit both freshwater and marine businesses. The format combined over 100 traditional presentations, panels and poster sessions, along with the more informal and hands-on Technology Transfer sessions. More than 350 attendees from 20 U.S. states and Canada participated in NACE 2006. The top three attendee groups were industry, students and government officials. The trade show attracted 30 aquaculture equipment vendors and suppliers from across the country.



The Northeast Aquaculture Conference & Exposition, held in Mystic, Connecticut, attracted 350 participants. (Photo: Tessa Getcjos)

- **Increasing producer eligibility for USDA farmer assistance programs** Following a nationwide survey, it was determined that many shellfish aquaculture producers were ineligible for USDA farmer assistance programs such as non-insured crop disaster assistance, crop insurance, loans, grants or incentive programs. Extension is leading an effort, in collaboration with state and federal officials, to increase the eligibility of producers for these programs by revising eligibility requirements.
- **Northeast Aquaculture Extension Network (NAEN)** Connecticut Extension staff members lead the Northeast Aquaculture Extension Network, which is group of aquaculture extension specialists from throughout the northeast region. The goal of this NAEN is to produce and deliver accurate and credible science-based aquaculture information, educational materials and outreach activities to key stakeholders in a manner that is efficient and effective. The vision is to develop and disseminate high-quality outreach products that will facilitate NRAC's goal to increase public awareness of the social, economic and environmental importance of commercial aquaculture in the northeast U.S., and to increase the value and volume of aquaculture products cultured in the region.
- **Municipal shellfish commission assistance** Shellfisheries and aquaculture in town waters are managed by municipal shellfish and harbor management commissions in Connecticut. Commission members are volunteers appointed by town leaders. There is an ongoing need for training and the provision of educational resources to this user group. To this end, Extension has formed a partnership with municipal shellfish and harbor management commissions statewide and has established several avenues for communication within and among the commissions. Extension hosts an annual gathering and SHELLCOMM, a list-serve for these stakeholders. In 2008, Extension

staff will provide Geospatial Information Systems (GIS) training to municipal officials so that they can use this tool to better plan for aquaculture activity within their local town waters.

Aquaculture Education

Several specialized secondary schools offer aquaculture and/or marine science education, including the Bridgeport Regional Vocational Aquaculture High School and The Sound School in New Haven. A third school, the Marine Science Magnet High School, will have an aquaculture focus and is scheduled to be built in eastern Connecticut. Several Vocational-Agricultural and Vocational-Technical programs throughout the State offer coursework in aquaculture as well.

Currently, the University of Connecticut (UConn) and the University of New Haven offer minors in aquaculture business management. UConn also offers an aquaculture biology minor, and there is interest in developing an aquaculture major.



Mussel seed growth rates have been measured in several locations throughout Long Island Sound. (Photo: Larry Williams)

Research Contact Information		
Name	Address	Specialty:
Walter Blogoslawski	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6500 walter.blogoslawski@noaa.gov	marine bacteriology, with specialty in shellfish hatchery diseases, including vibriosis
Diane Brousseau	Fairfield University (203) 254-4000 Ext. 2739 brousseau@mail.fairfield.edu	marine invertebrate ecology with a special interest in the ecology and pathology of commercial shellfish species
Christopher L. Brown	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6540 christopher.L.brown@noaa.gov	fish endocrinology, larval development, and molecular biology; aquaculture technology in developing nations
Thomas Chen	University of Connecticut Department of Molecular & Cell Biology (860) 486-5481 thomas.chen@uconn.edu	structure, evolution and regulation of growth hormone and growth factor genes in finfish and shellfish
Sylvain De Guise	University of Connecticut Department of Pathobiology (860) 405-9138 sylvain.deguise@uconn.edu	immunology and immunotoxicology of bivalve shellfish, crustaceans; defense mechanisms of oysters; effects of pollutants on oyster defense mechanisms
Salvatore Frasca	University of Connecticut Department of Pathobiology (860) 486-1138 salvatore.frasca@uconn.edu	mechanisms of disease principally by infectious agents involving aquatic animal species; investigation of disease pathogenesis and virulence factors
Richard French	University of Connecticut Department of Pathobiology (860) 486-5370 richard.french@uconn.edu	diseases and pathogenesis in wildlife species including fish, and some invertebrates; areas of study include neuropathology, neuroimmunology, dermatopathology and parasitology
Ronald Goldberg	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6546 ronald.goldberg@noaa.gov	molluscan aquaculture and habitat ecology
Robert Johnston	University of Connecticut Department of Agriculture & Resource Economics (860) 405-9278 robert.johnston@uconn.edu	environmental economics, natural resource economics, economics of marine and coastal resources, and non-market valuation
Hans Laufer	University of Connecticut Department of Molecular & Cell Biology (860) 486-4117 hans.laufer@uconn.edu	crustacean endocrinology

Research Contact Information (continued)		
Name	Address	Specialty:
George McManus	University of Connecticut Department of Marine Sciences (860) 405-9164 george.mcmanus@uconn.edu	plankton ecology; aquaculture feeds
Shannon L. Meseck	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6500 shannon.meseck@noaa.gov	chemical oceanography, phytoplankton nutrient utilization
Lisa Milke	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6500 lisa.milke@noaa.gov	molluscan physiology and nutrition
Dean M. Perry	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6500 dean.perry@noaa.gov	finfish aquaculture: blackfish, black sea bass, scup culture. Live feeds culture: rotifers, brine shrimp
Robert Pomeroy	University of Connecticut Department of Agriculture & Resource Economics (860) 405-9215 robert.pomeroy@uconn.edu	financial analysis, marketing, production economics
Sandra Shumway	University of Connecticut Department of Marine Sciences (860) 405-9282 sandra.shumway@uconn.edu	shellfish biology, harmful algal blooms and impacts of biofouling on shellfish and aquaculture
Barry C. Smith	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6500 barry.smith@noaa.gov	microalgal mass culture, automation and control systems
Sheila Stiles	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6500 sheila.stiles@noaa.gov	genetics and breeding of fish and shellfish
Inke Sunila	Connecticut Department of Agriculture Bureau of Aquaculture (203) 874-0696 isunila@snet.net	shellfish pathology

Research Contact Information (continued)		
Name	Address	Specialty:
Kumar Venkitanarayanan	University of Connecticut Department of Animal Science (860) 486-0947 kumar.venkitanarayanan@uconn.edu	inactivation of pathogenic microorganisms in foods using antimicrobials; development of molecular methods for rapid detection of food-borne microorganisms
Jason Vokoun	University of Connecticut Department of Natural Resource Management and Engineering (860) 486-0141 jason.vokoun@uconn.edu	kernel estimation of fish space and habitat use; conservation of fish habitat in stream ecosystems; fish species of special conservation concern
J. Evan Ward	University of Connecticut Department of Marine Sciences (860) 405-9073 evan.ward@uconn.edu	endogenous and exogenous factors that mediate the behavior and physiology of benthic, particle-feeding invertebrates
Robert Whitlatch	University of Connecticut Department of Marine Sciences (860) 405-9154 robert.whitlatch@uconn.edu	marine benthic population and community ecology; invasives and aquaculture
James Widman	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6508 james.widman@noaa.gov	shellfish culture, shellfish hatcheries, hatchery automation, recirculating culture systems, bay scallops, hard clams, oysters, winter flounder
Gary H. Wikfors	Northeast Fishery Science Center Aquaculture & Enhancement Division Milford Laboratory (203) 882-6500 gary.wikfors@noaa.gov	microalgae, molluscan nutrition, cellular immune function in molluscs
Charles Yarish	University of Connecticut Department of Ecology & Evolutionary Biology (203) 251-8432 charles.yarish@uconn.edu	seaweed aquaculture (open water and land-based); integrated multi-trophic aquaculture (IMTA) systems; bluefin tuna ranching
Extension Contact Information		
Nancy Balcom	University of Connecticut Connecticut Sea Grant/ Cooperative Extension (860) 405-9107 nancy.balcom@uconn.edu	seafood safety; HACCP training; invasive species
Tessa Getchis	University of Connecticut Connecticut Sea Grant/ Cooperative Extension (860) 405-9104 tessa.getchis@uconn.edu	effects of shellfish aquaculture on the environment; permitting and policy; business planning

Extension Contact Information (Continued)		
Name	Address	Specialty:
Robert Pomeroy	University of Connecticut Connecticut Sea Grant (860) 405-9215 robert.pomeroy@uconn.edu	financial analysis; marketing; business planning
Lance Stewart	University of Connecticut Department of Extension (860) 405-9284 lance.stewart@uconn.edu	fisheries management
Education Contact Information		
Diana Payne	University of Connecticut Connecticut Sea Grant (860) 405-9278 diana.payne@uconn.edu	marine education; k-12 teacher training
State Aquaculture Coordinator		
David Carey	Connecticut Department of Agriculture Bureau of Aquaculture (203) 874-0696 davcarey@snet.net	aquaculture permitting
Aquaculture Industry Association(s)		
Barbara Gordon	Connecticut Seafood Council (860) 521-0545 ctseafoodcouncil@aol.com	seafood promotion and marketing
Testing Laboratories		
Inke Sunila	Connecticut Department of Agriculture Bureau of Aquaculture (203) 874-0696 isunila@snet.net	shellfish pathology
Rick Van Nostrand	Department of Environmental Protection Inland Fisheries Division (860) 622-2200 richard.vannostrand@po.state.ct.us	finfish pathology

Aquaculture Resources

Department of Agriculture, Bureau of Aquaculture
Leasing and permitting information for Connecticut aquaculture operations, education and research projects. <http://www.ct.gov/doag>

AQUAGUIDE—Online Resource Guide
Online resource guide for Connecticut producers, researchers, resource managers, municipal commissions, teachers, students, etc.
<http://www.seagrants.uconn.edu/aquaguide/>

AQUACONN—Aquaculture Producer Listserv
Connecticut aquaculture producers may subscribe to the listserv by contacting tessa.getchis@uconn.edu
Post to: AQUACONN-L@listserv.uconn.edu

SHELLCOMM—Shellfish Commission Listserv
Shellfish and Harbor Management Commission members statewide may subscribe to the listserv by contacting tessa.getchis@uconn.edu
Post to: SHELLCOM-L@listserv.uconn.edu

Northeastern Regional Aquaculture Center
The NRAC is one of five Regional Aquaculture Centers established by the U. S. Congress which supports research and outreach efforts to promote the development of the aquaculture industry.
<http://www.nrac.umd.edu>

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