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# CONNECTICUT SEA GRANT

College Program

ANNUAL REPORT 2001



  
**Sea Grant**  
Connecticut



The Connecticut Sea Grant College Program is sponsored by the National Sea Grant College Program, administered through the National Oceanic and Atmospheric Administration (NOAA) and the University of Connecticut. This document reports the program's activities during the calendar year of 2001.

The program is based at the University of Connecticut at Avery Point in Groton, Connecticut, and has branch offices at the Yale School of Forestry and Environmental Studies in New Haven, and at The Maritime Aquarium in Norwalk. It is one of a network of university-based programs in coastal and Great Lakes states. The Sea Grant Program was established by Congress in 1966, modeled after the Land Grant Colleges.

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Cover photos: The Maritime Aquarium and Tessa Simlick

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Connecticut Sea Grant College Program

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## *Letter from the Sea Grant Director*

While I tend to shy away from using the word "hectic," I know of no more appropriate term to describe 2001 when it comes to our Connecticut Sea Grant Program.

The long-anticipated move of our Connecticut Sea Grant Offices from "Building 24" on the University of Connecticut's Avery Point campus to the new, state-of-the-art, Marine Sciences Building on this same campus took place in mid-April. From our new offices on the third floor of the Marine Sciences Building we could then observe the demolition of our former, World War II-vintage, offices, a process that began the very day we moved out. With help from a variety of quarters our new Sea Grant accommodations were so well-furnished and equipped that we are now in a position to better serve our constituents.

In early August we had the long-awaited, week-long visit from the Program Assessment Team sent by the National Sea Grant College Program as part of a new process whereby each Sea Grant program is assessed once every five years. Everyone in our Sea Grant enterprise was involved in the preparations for this visit, but I would be remiss if I did not recognize in particular the great efforts put forth by Nancy Balcom, our Sea Grant Extension Program Leader, Peg Van Patten, our Sea Grant Communications Director, and Pete Tebeau, who helped craft our 2002-2006 strategic planning document. The visit by this Program Assessment Team, which culminated with a meeting with Chancellor Petersen in Storrs, was well received by all. In the report subsequently tendered by this Team, our Sea Grant program received a rating of "Excellent" in a clear majority of the sub-categories treated in this document.

As the consequence of a joint effort undertaken by the UConn Cooperative Extension System and our Sea Grant Office, in 2001 all of our Sea Grant Marine Extension Educators were awarded academic appointments in the Department of Extension of the College of Agriculture and Natural Resources. As a further reflection of our program's goal of enhancing collaborations within UConn and beyond, this year I was pleased to accept a joint appointment in the College of Agriculture and Natural Resources, to complement the academic appointment I hold within the College of Liberal Arts and Sciences.

While this past year may have been punctuated by such major practical and programmatic events, our office has continued to focus its efforts on facilitating the critical work of the marine research community on such pressing issues as the die-off of lobsters in Long Island Sound. In September we joined the rest of the nation in reacting to the tragedy of the attacks on the World Trade Center and the Pentagon, followed by the death of a Connecticut woman due to anthrax contamination in the U.S. mail. Some program events and projects were postponed due to those events, but we expect to carry on and implement those deferred in 2002. As we recover as a nation, programs like ours must continue the work we've begun.

There are bright spots to report in 2001. For the first time, the federal awards in support of our Connecticut Sea Grant Program in 2001 well exceeded \$2,000,000. Indeed, I'm pleased to note that federal funding for this program has grown five-fold since 1986, representing a more than 10% per annum growth over this extended interval.

If history is any guide, 2002 will be an exciting, if not hectic, year. And as we enter this new year, it is well to recollect what has been accomplished in 2001 by the many participants in our Connecticut Sea Grant program. The report that follows will recall for us just some of the activities of this past year.

Sincerely,



Edward C. Monahan, Ph.D., D.Sc.  
Connecticut Sea Grant Director  
Professor of Marine Sciences, and of Resource Economics



*Edward C. Monahan*  
*Connecticut Sea Grant Director*



## Introduction and Mission Statement

The Connecticut Sea Grant (CTSG) College Program, based at the University of Connecticut's Avery Point campus, is part of a national network of 30 Sea Grant programs based at flagship universities in coastal states. Its mission corresponds to the mandate of the National Sea Grant College Program: to foster the wise use and conservation of coastal and marine resources.

The program funds research, outreach, and education activities that have special relevance to Connecticut and Long Island Sound. Implemented as a partnership between the University and the National Oceanic and Atmospheric Administration (NOAA), within the U.S. Department of Commerce, the program awards grants for marine research, provides marine extension outreach services, and carries on educational activities.

As the formally designated Sea Grant College for the State of Connecticut, UConn serves as home base for the Connecticut Sea Grant College Program. A recent accomplishment has been the long-awaited completion of the University of Connecticut's magnificent \$28M Marine Sciences Building, and the relocation of the Sea Grant offices to this state-of-the-art facility. This facility provides a first-class infrastructure to support the continued growth of the marine science community at Avery Point. The Sea Grant Program will be able to take advantage of these facilities in expanding its own education and outreach programs, and access the research expertise of the growing list of potential investigators at the facility.

- 2001 marked the University of Connecticut's twelfth year as the State's Sea Grant College.
- The program relocated to its new offices in the recently-erected Marine Sciences Building, from which it will be better positioned to serve its various constituencies.
- CTSG developed its 2002-2006 Strategic Plan and its 2002-2004 Implementation Plan.
- Reflecting the leadership role played by CTSG in the National Sea Grant system, the program director received, for the second consecutive year, the Sea Grant Association's President's Award.
- As a consequence of the success of investigators in a range of Sea Grant National Investment competitions, as well as an increase in the program's base funding, for the first time in its history the Connecticut Sea Grant College Program received in excess of \$2M in external funding during 2001.
- CTSG served as lead agency in a special national Lobster Mortality Research Initiative and has allocated \$1.45 million in Congressional emergency funds to address Long Island Sound lobster mortalities.
- Sea Grant technology transfer and outreach methods were brought to universities in Chile as part of the University's formal collaboration with Universidad Los Lagos.



The Sea Grant main offices have been relocated to the University of Connecticut's magnificent \$28M Marine Sciences Building on the Avery Point, Groton campus.

The facility overlooks Long Island Sound, and laboratories have access to seawater.



## RESEARCH

Eight major and many smaller regional and pilot research efforts were supported, involving seven academic institutions in the State and their partners. Key research themes included Aquaculture, Biotechnology, Economic Leadership, Coastal Ecosystems Health, Public Safety, and Education.

### Transgenic Finfish

Researchers led by Thomas Chen, Professor and Director of the University of Connecticut Biotechnology Center, have begun working on a process of stimulating growth hormone production and in rainbow trout and tilapia, using a synthetic protein. Using transgenics, the technique of transferring DNA from one species to another, Chen is first testing a synthetic protein *in vitro* on rainbow trout pituitary cells to determine if it can effectively mimic a natural protein in stimulating growth hormone production. If it does, they will then apply the synthetic hormone to the actual fish, and analyze their growth hormone levels for changes.

The research could benefit aquaculture of these species by reducing the amount of time and feed required to produce marketable fish. More rapid growth can reduce both the length of time and amount of food needed to grow the fish to market size.

Rainbow trout are valued both as a commercial food and for recreational sport fishing. Yet large-scale trout aquaculture has been limited because rainbow trout grow slowly and when in captivity, are quite susceptible to viral, fungal, and bacterial pathogens.

The project is already showing fantastic results: when a rainbow trout growth hormone gene was transferred into common carp, catfish and tilapia (other popular seafood species), the fish with the new gene exhibited growth enhancement varying from 60 to 600 percent.



Chen and his colleagues have also observed that application of a synthetic growth hormone-releasing peptide (D-Ala-D-B-Nal-Ala-Trp-D-Phe-Lys-NH<sub>2</sub>) resulted in release of growth hormone in tilapia and rainbow trout. These results suggest that, instead of transgenesis with growth hormone gene, application of the synthetic growth hormone-releasing peptide could also stimulate enhanced somatic growth. Two *in vivo* experiments are underway to confirm this hypothesis.

Chen and his team have produced transgenic medaka (small aquarium fish) that carry a gene encoding cecropin, a peptide found in silkworms and cecropia moths that kills bacteria and fungi but is harmless to humans. The resulting transgenic medaka showed greater resistance to infection by known bacterial and viral fish pathogens. (Medaka are ornamental fish that reproduce quickly and thus are used in laboratories to demonstrate the transmission of genes to subsequent generations.) Capitalizing on this success, they have designed a shorter cecropin analog



Peter Morenus, UCONN

Dr. Thomas Chen has pioneered gene transfer techniques to improve the quality of farmed finfish, mollusks, and crustaceans.



that is 1000 times more effective! But could this synthetic gene be transferred to economically important trout, tilapia, or shrimp to produce disease resistant strains for aquaculture? To find out, Chen has introduced the cecropin gene or the synthetic transgene into rainbow trout sperm using electroporation. About 50 different "founder" fish have been produced, and many offspring (F1 generation) have resulted. After one more generation, the fish can be tested for resistance to pathogenic infection.

Eventually, other characteristics such as color and food conversion efficiency might be manipulated with transgenics. While the transgenic fish are not yet in use by any commercial aquaculture facilities, this technology could one day be a boon to the fish farming industry.

### **Scrubbing with Seaweed**

Charles Yarish, Professor of Ecology and Evolutionary Ecology at UCONN, continues to work with col-



Photo: Peg Van Patten, CTSG

Prof. Charles Yarish maintains a nori culture collection and gene bank in his laboratory at the UCONN Stamford campus.

leagues in Canada, Chile, China, Korea, Mexico, and Portugal (as well as other universities in the USA), on the best ways to use *Porphyra*, an edible red seaweed, as a bioremediation tool for aquaculture. *Porphyra*, better known as nori, is valued for its use in the food industry as sushi wrappers and in the pharmaceutical industry for its fluorescing pigments. Yarish and his colleagues have demonstrated that when nori is grown on nets surrounding fish pens or shellfish beds, it can "scrub" the nutrients nitrogen and phosphorus from the animal waste, and turn it into healthy food. (Nori has more vitamin C per serving than orange juice and more calcium than milk.) In the current phase of this multi-institutional, multi-national project, the investigators are integrating tank-based nori with summer flounder aquaculture. The team produced an overview article which appears in the publications list on page 16. Yarish has also worked with students at the Bridgeport Regional Vocational Aquaculture School to deploy a demonstration model in Long Island Sound, offshore of Bridgeport.

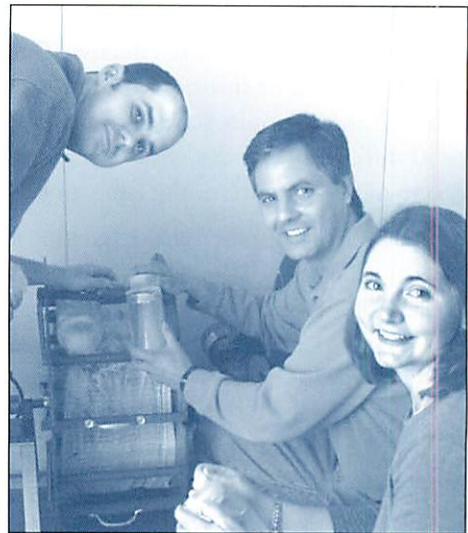
### **Consumers Influence Harmful Algal Blooms**

Zooplankters that co-exist with toxic algae which cause harmful algal blooms acclimate to life with their not-so-friendly prey, say UCONN Marine Sciences faculty researchers Hans G. Dam and George McManus and their graduate students. Dam's team performed laboratory and field experiments using two different populations of copepod zooplankters. One copepod group was collected from areas that frequently experience red tides (so-called "historically-exposed" populations), which tend to occur at higher latitudes in this part of the world. The other was collected from areas that do not routinely experience red tides (so-called "naïve" populations). Both groups were then fed diets of toxic *Alexandrium* algae, and non-toxic algae. The historically-exposed populations had similar ingestion and egg production rates on the toxic and non-toxic algae. In contrast, the naïve population had considerably lower ingestion and egg production rates on the toxic algae than on the non-toxic ones. This suggests that the historically exposed populations have indeed adapted to existence with their prickly prey. Consequently, grazer adaptation must be considered as one of the factors affecting harmful algal blooms and the fate of toxins in marine food webs.



McManus and graduate student Carol Rosetta studied the effects of two other toxic dinoflagellates on ciliate consumers, finding that a diet of toxic prey affected species of ciliates differently, proving harmless to some and toxic to others. This project builds upon results previously reported for the same Sea Grant project in the CTSG Annual Report 2000, and complements work funded by the ECOHAB program and the National Science Foundation.

Right: A UCONN zooplankton Research team is placing plankton samples in a spinning "plankton wheel", which keeps the samples in continuous suspension, simulating coastal ocean conditions.  
Left: Doctoral candidate Sean P. Colin  
Center: Professor Hans Dam  
Right: Masters candidate Sheehan Haley



P. Van Patten, CTSG

## Fossil Organisms Provide Clues to the Long Island Sound Paleoenvironment

In the final year of an ongoing investigation, researchers at Wesleyan University, funded in part by Connecticut Sea Grant, have found indications of significant changes in the Long Island Sound ecosystem over the past four decades. Micro-paleontologist Ellen Thomas examines microscopic fossils of foraminifera, unicellular organisms that live on the sea floor and in marsh sediments. By collecting fossil foraminifera, determining the species, and examining their evolution and changes in species assemblage and biodiversity over time, she and her colleagues can use the "forams" as indicators of ecosystem dynamics and attempt to relate the changes not only to the physical environment but to human activities as well.

There are few species of these tiny animals in the muddy bottom of Long Island Sound and its surrounding marshes. However, to their surprise, Thomas and colleagues found that significant changes had occurred since extensive foraminifera surveys were done in this area in the 1960's. The dominant species had shifted from one common foraminifera, *E. excavatum*, to another, *A. baccari*. They found a correlation between *A. beccari* and the presence of bacterial sewage spores, but don't yet know why.

Thomas and her co-investigator, Wesleyan geologist Johan Varekamp, are planning new studies to correlate the chemical make-up of the tests (external structures) of living foraminifera with that of the surrounding waters. The tests of the foraminifera reflect the salinity, oxygen and temperature levels in these waters, and from analyses of fossil tests we can thus reconstruct how each of these has changed over the history of Long Island Sound. "If we can get a record from the forams," Thomas said, "we can record the time at which the physical environment in Long Island Sound began to change," and begin to understand the causes of the changes in the ecosystem.

## "Piggybacking" Pests

After initial establishment, nonindigenous species such as zebra mussels can still spread from one location to another by both natural and human-mediated means. Ladd Johnson (Université Laval, Quebec) and James T. Carlton (Williams College, Mystic Seaport) have published landmark research on the travel of larvae in ballast water, documenting incredible numbers of invasive species coming in daily to major U.S. ports. In a smaller recent study, Johnson and Carlton surveyed recreational boaters and found that zebra mussels often travel by "piggybacking", or "hitchhiking" on aquatic plants that become entangled on boat propellers, and sometimes on boat anchors. So even though most people can't do much about ballast water, there is still something recreational boaters can do: get involved in the effort to prevent the spread of nonindigenous nuisance species by being vigilant. Checking propellers and gear for entangled aquatic weeds and disposing of them, as well as bait water, properly, can help control the rapid spread of nonnative organisms.



## Muddy Issues: Metal-Sulfide Complexes

Watershed and coastal zone managers would like to know more about the ecotoxicological risks posed by heavy metal pollutants in riverine-estuarine ecosystems. Many of these metals are found in complexes with sulfides. It is known that metal sulfides are catalysts in many biological processes, and that complexation can reduce the toxicity of metals as well as their availability to organisms as micronutrients. Still, much remains to be learned about their behavior and movement through food webs. Furthermore, the abundance and distribution in Connecticut waters has not been thoroughly determined. To address these concerns, Gaboury Benoit, Associate Professor of Environmental Chemistry at Yale University's School of Forestry and Watershed Studies, is sampling 10 Connecticut coastal rivers in this new project to learn more about the abundance, distribution, and behavior of these metal-sulfide complexes. He and his team are studying two rivers that are part of the Long Island Sound watershed, the Mill and Quinnipiac River, in detail. Analytic methods they are using to measure the metal sulfides include voltammetry, gas chromatography, high pressure liquid chromatography, and modified methylene blue spectrophotometry. For another part of this ongoing investigation, Benoit is teaming up with Professor Nicholas Fisher, at the State University of New York. Fisher's laboratory focuses on the interaction of metals in marine organisms and transfer through trophic levels. They are testing the uptake of metal sulfides by phytoplankton in the laboratory, to evaluate bioavailability.



Photo: Yale University

Associate Professor Gaboury Benoit holds river mud that may contain metal-sulfide complexes, and hold clues to environmental changes.

## New Probe Detects Shellfish Diseases on East Coast

Shellfish, particularly oysters, are big business in Connecticut, with an annual multi-million dollar harvest coming from underwater farms. According to the State of Connecticut Bureau of Aquaculture, Connecticut growers raise more oysters than the entire Chesapeake Bay produces – about 188 million. Following an outbreak of three diseases, Dermo (*Perkinsus marinus*), MSX (*Haplosporidium nelsoni*) and SSO (*Haplosporidium costale*), in the Eastern oyster (*Crassostrea virginica*), the populations along much of the Atlantic coast have declined and the success of the industry has been threatened. In recent years, MSX affected about 80% of the juvenile oyster crop in Connecticut. Dermo, which kills adult oysters, has a smaller effect on the populations but is still a concern as oysters can die before they can be harvested for market.

A team led by Richard French, Assistant Professor of Pathobiology at the University of Connecticut, developed molecular diagnostic tests which are sensitive, rapid, cost-effective and convenient for application in the screening and surveillance of these three disease agents of the Eastern oyster. French's team included colleagues in the UCONN Pathobiology Department, the State of Connecticut Department of Agriculture, Bureau of Aquaculture, and the Marine Biological Laboratory in Woods Hole, Massachusetts.

It is difficult to identify the various pathogens in order to determine which diseases are present and to what extent. The multiplex PCR probe was successfully completed and used to sample the entire East Coast, from Maine to Louisiana, for the three pathogens. The third disease had been unknown in Long Island Sound until now, but the new probe detected SSO in the Sound for the first time. SSO, like MSX, is a *Haplosporidian* parasite. Growers and harvesters all along the seaboard will have a clearer idea of what challenges they now face, thanks to this new tool.





## DEVELOPMENT PROJECTS

Connecticut Sea Grant development funds are available to respond to emergency needs, pilot programs, or purchase necessary equipment for investigators as unexpected needs arise. These development projects, both in-state and regional, are listed on page 22. Some selected projects are described here as examples:

### **How Many Rotifers Dance in a Salt Pond?**

answer: 3 (species, that is -)

Most salt ponds contain only 2 or 3 species of rotifers, according to Lisa Suatoni at Yale University's School of Forestry and Environmental Studies, who has just completed a first-time marine rotifer survey, supported by Connecticut Sea Grant. Yet because the species vary from one pond to the next, there is actually a great diversity of species overall in the New England region. Suatoni believes she has found 12 "new" (not yet described) species. A doctoral candidate working with Professor Adalgisa Caccone, Suatoni scoured salt ponds and marshes in Connecticut and Rhode Island seeking rotifer samples. In Connecticut, sites included New Haven, Branford, Stony Creek, Guilford, Groton, and Old Lyme. But she found *Brachionus* rotifers only in salt marsh

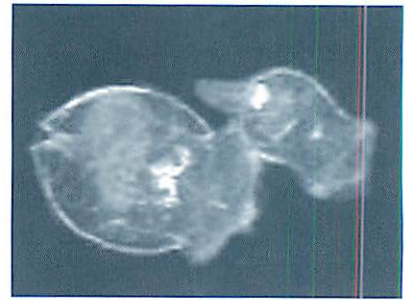


Photo: Lisa Suatoni, Yale

Marine rotifers such as these thrive and survive in New England salt ponds. The species have been surveyed for the first time and placed into a phylogeny.

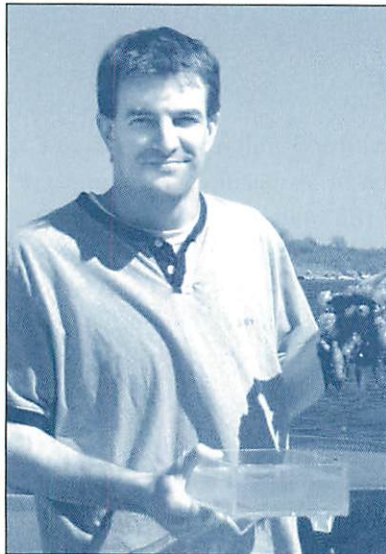


Photo: Peg Van Patten, Sea Grant

Post-doc Jeff Terwin has found that recent warmer winters are encouraging the establishment of a slimy green sea squirt in Long Island Sound waters.

and other years is completely absent. The study shows a relationship between subtle temperature variation and the success of species invasions. In general, the recent warming of Long Island Sound seems to encourage invasive species. The more native species disappear, the more aggressive newcomers move in. The study was done as part of ongoing benthic ecology work led by Professor Robert Whitlatch and the Marine Sciences "Team Benthos".

ponds- regions of salt marshes that were separated from the open ocean and had standing water all of the time. Because many species in this group are look-alikes that may or may not be closely related, Suatoni used molecular DNA techniques to identify species and evolutionary relationships between them. Testing two genes, one nuclear and one mitochondrial, in each rotifer, Suatoni created a phylogeny (evolutionary "tree"). She found three major lineages, each with several species, that had split off (diverged) way back in time. Her New England samples were then incorporated into a broader phylogeny containing samples from around the world.

### **Climate Change and Invader Success**

Winter temperatures in Long Island Sound help determine what organisms will (or won't) be there later on in the year. Jeff Terwin, a post-doctoral fellow at the University of Connecticut's Marine Sciences Department, has been studying *Diplosoma listerianum*, a non-indigenous colonial tunicate (sea squirt) thought to have arrived in Long Island Sound sometime in the mid-1980's from Europe or the sub-tropical Atlantic. Slimy and green, it grows on rocks and pilings and also on other plants and animals, notably mussels, eelgrass, and other sea squirts. Terwin found that this organism recruits in great abundance some years,



## "My Three Worms"

Even lowly worms play important roles in the structure and functions of ecosystems. Worms burrow into sand and mud, irrigating and mixing the sediments, and in the process affecting parameters such as oxygen and pH. In another UCONN Marine Sciences "Team Benthos" effort, doctoral candidate George Waldenbuser studied three species of worms that inhabit soft sediment benthic communities. Using a computerized sampling device called "ELVIS, he looked at the effects of biological disturbance in the cycling of organic matter and other ecosystem dynamics. Waldenbuser found that by eliminating even one of the worms, whole groups and functions within the ecosystem were altered, with implications for biodiversity.

## Ecological Model of Watershed Response to Nitrogen Loads

Changing land use associated with population increase and associated development often means larger amounts of nitrogen entering lagoons, ponds, and estuaries. James Kremer, Professor of Marine Sciences at the University of Connecticut and graduate student Alison Biddle carried out a project to determine how shallow coastal waters and their watersheds respond to nitrogen loads. They developed a model to simulate the ecological response of estuaries and watersheds to various development scenarios. When perfected, the model will aid managers and planners in analyzing the implications of proposed developments in an ecological context. During Summer 2001, Kremer and students completed extensive field surveys in selected coastal sites in Connecticut and Rhode Island. Measurements taken included chlorophyll, zooplankton biomass, primary productivity, biomass of benthic plants and algae, sediment organic content, and water column profiles of light, temperature, salinity, and oxygen. Water samples were analyzed for inorganic nitrogen and phosphorus, and total nitrogen.

Scientists who study shallow coastal waters are especially interested in the degradation of eelgrass, a vascular plant thought to be essential for scallop habitat. Collaborating with researcher Scott Nixon at the University of Rhode Island, Biddle selected and took a suite of new measurements of population and physiological metrics as indices of eelgrass habitat health. These data have been analyzed and are being compared with similar data from Nixon's lab, to determine if they are useful measurements to spur future research.

Biddle used GIS databases to apply a land use-nitrogen loading model to a range of sites in Connecticut and Rhode Island. Kremer and Biddle plan to use the same analysis to help select sites for future study, and are preparing a technical report containing their field data and procedural protocols. In addition to providing a data set describing the ecological condition of these habitats, the data are also being used to verify the results of the estuarine ecological model.



Photo: Peter Morenus, UCONN

UCONN pathologist Salvatore Frasca, shown here, and Joanne Borucinska found a new species of nematode infecting the pancreatic tissues of spiny dogfish sharks. Frasca is also one of the team of researchers trying to find out the causes of the Long Island Sound lobster mortalities.

## Shark Disease

Parasites are the most frequently-reported pathogens of sharks, but have been rarely described in the context of pancreatic lesions. Two veterinary pathologists, Veterinary pathologists Joanna Borucinska, at the University of Hartford, and Salvatore Frasca Jr., at the University of Connecticut, examined lesions found in sharks, and have found a new species of nematode in the process. The new nematode species has been identified and classified by Frank Moravec (Czech Academy of Sciences) as *Pancreatonema americanum*. The parasite is found in the pancreas of the Spiny Dogfish Shark (*Squalus acanthias* L.) from the northwestern Atlantic Ocean. Its morphology differs from other nematodes previously found in sharks. The researchers found parasites in the pancreas of half of the sharks sampled, all collected from waters off Massachusetts. Since many sharks are now threatened or endangered species, this finding is important for shark conservation efforts.



## DEVELOPMENT PROJECTS

While the pilot projects on the previous pages are very much research-oriented, other development grants are awarded for travel to scientific meetings, and educational activities. Some of these are described here:

### **SoundWaters Urban Explorers Program**

SoundWaters, a non-profit on-the-water marine education organization, received a development grant to hold a 6-week-long after-school program in three locations, for 40 middle school-aged urban youth. Youngsters received an introduction to Long Island Sound that included study of invertebrates and birds.

### **National Ocean Sciences Bowl**

The National Ocean Sciences Bowl is an annual academic competition for high school students, focusing on ocean topics. On February 9, nearly 100 students participated in "Quahog Bowl 2001", the CT/RI regional competition, sending a team on to the national finals. All participants received "goodie bags" of prizes and services, and students on the top two teams received \$1,000 cash scholarships.

### **Coastal Perspectives Lecture Series**

For several years, including 2001, Connecticut Sea Grant has assisted UCONN's fledgling Coastal Studies program and the community by sponsoring a semester-long, public lecture series on marine topics, "Coastal Perspectives". The evening lectures are free and address a broad range of interests. Held every other week, the lectures showcase the University and its marine programs, while also bringing in expert speakers from "outside" to inform the campus community.



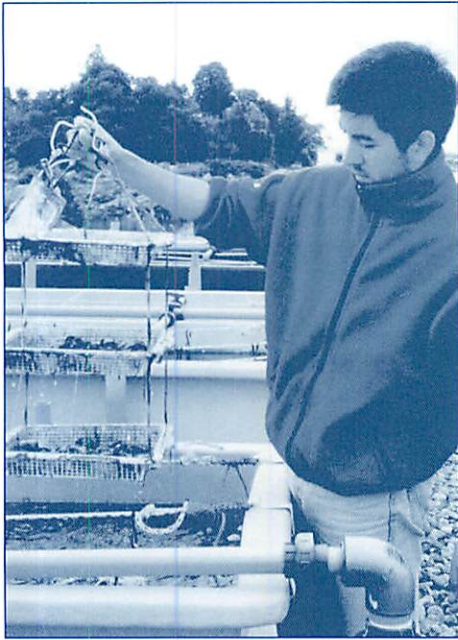
Photo: Chris Hadin, SoundWaters

The SoundWaters Explorers Club, a 6-week after-school program, introduced 40 urban youth to Long Island Sound from the water. These youngsters are learning to hoist sails and practice their navigation skills.

### **University of Connecticut / Chilean Collaboration**

In December 2000, the UCONN Office of International Relations commenced a program to develop a collaborative initiative with the University of Los Lagos (ULA) in Chile, following discussions amongst scientists working on similar topics. Ironically, both universities are located at 41°, one north and one south of the Equator. The goal is to facilitate research, education, and outreach in marine and terrestrial ecology. Fourteen scientific representatives from the University, including the Connecticut Sea Grant Director and Communications Director and many Sea Grant-supported researchers, traveled to Chile to meet with counterparts from several universities there. A formal academic exchange program was proposed and will be investigated further. Connecticut Sea Grant development funds supported a workshop held in Puerto Montt, entitled "Coastal Management: an Interdisciplinary Approach". A formal Memorandum of Understanding was signed between ULA and UCONN. Participants agreed that the collaboration has great benefits to both partners. Both universities have strong graduate and undergraduate research programs.





A technician at an aquaculture facility at Universidad Austral's field station in Puerto Montt, Chile demonstrates abalone grown in cage culture to visiting UCONN researchers.

**P**izza, cookouts and movies would make summer fun for any youngsters, but the "Taste, Touch, and Smell of Science" summer camp has all that and science too. The graduate students of the UCONN Marine Sciences Department have organized and run this summer fun learning experience for middle school students for several summers. Lucky campers learn to make plankton nets, design simple experiments, and explore marsh ecology on the shores of Long Island Sound under the guidance of the graduate students. CTSG underwrote the modest expenses for the experiments and learning activities.

### Taste, Touch and Smell of Science



Photo: Amy Smith, UCONN Marine Sciences

Kids have fun and learn science concepts during the "Taste, Touch, and Smell of Science" summer camp.

Due to the tragic events and aftermath of Sept. 11, 2001, some events and projects due to take place in the fall, such as the Thames River Basin Partnership's Floating Workshop for Decision Makers and the NEMO University II meeting in South Carolina, were postponed. These events were all rescheduled and will be described in the 2002 Annual Report.

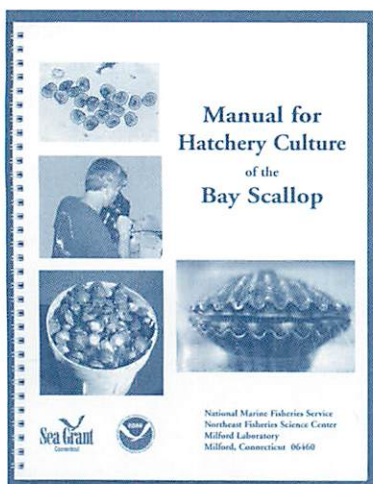
### Sea Grant Industrial Fellows

**A** project by a Sea Grant Industrial Fellow, Michael Berman, has improved our ability to quickly detect hydrocarbon pollution in the oceans and estuaries. Berman applied analytical chemistry techniques to develop a marketable prototype *in-situ* sensor. When events such as oil spills or leakage occur in aquatic environments, these hydrocarbons may negatively impact water quality, living wild resources, and aquaculture facilities. A doctoral candidate at UCONN, Berman worked with Dr. Richard Jadamec at UCONN's Coastal Environmental Laboratory and with Spectrogram, Inc., the industry partner. They have received a U.S. patent for the invention.



## COMMUNICATIONS

The Connecticut Sea Grant Communications Office disseminates information and produces the program's publications, multimedia efforts, and website. Communications serves as a link between the various program components as well as liaison between CTSG's sister programs in other states and the National Sea Grant Office.



How to grow scallops: all you have to do is ask!

living resources, in question and answer format. The first ones off the assembly line were purchased by the Long Island Sound Foundation and distributed by Governor Rowland to school children on Long Island Sound Day. Others were purchased and sold in gift shops at education centers such as Project Oceanology.

Communications Director Peg Van Patten provided assistance to the National Sea Grant Office in compiling background material on harmful algal bloom research sponsored by all of the nation's Sea Grant programs for use in a report to Congress.

The Communications office also provided assistance with editing, design and production of a manual to culture bay scallops written by the National Marine Fisheries Service (with Extension). The splash-proof cover and easy-open binding were designed to be useful in hatchery situations.

The Communications office also coordinated, for the 13th year, the International Coastal Cleanup in Connecticut. A CD-Rom with a Power Point presentation describing the effort was produced by a student intern. Data from the Cleanup for the past five years were used by the Connecticut Department of Environmental Protection for a status report on Long Island Sound.

This year's biggest accomplishment was launching the program's new magazine, *Wrack Lines*. The concept was developed and the first issue was designed, edited, published, and distributed to 2,000 people in the Sea Grant network and the Long Island Sound region.

Copies were sent to Connecticut legislators, conference attendees, teachers, students, and libraries. Recruitment efforts for UCONN's Coastal Studies program were aided by a feature article in the magazine.

A new educational toy, the Long Island Sound Fact Pack, was also conceived, designed, and produced by the Communications Office, working with Peabody Toys, Inc. The Fact Pack contains colored pencils, a sharpener, stickers, and 12 cards with outline art depicting wildlife of Long Island Sound. On the back of each card are fun facts about the liv-



A new educational toy helps youngsters learn about Long Island Sound.



The premiere issue of *Wrack Lines* made its debut in late summer 2001.



## OUTREACH

The Sea Grant Extension program works directly with coastal communities, industries, and other marine resource-users to transfer technology. Current staff includes three educators specializing in aquaculture, fisheries, water quality, aquatic nuisance species, and seafood safety.

In a landmark Memorandum of Agreement between CTSG and the University of Connecticut Department of Extension, College of Agriculture and Natural Resources, these Sea Grant extension educators have become faculty members of the Department of Extension. This relationship strengthens and formalizes ties between the University's Cooperative Extension System and the Sea Grant Extension Program.

### Safety First!

This year, CTSG Extension provided sea safety and survival training for more than 100 commercial fishermen, researchers, resource managers and students in conjunction with the U.S. Coast Guard and Oregon Sea Grant. Participants learned the best ways to call for distress, what to do first when trouble starts, how to correctly and quickly don a survival suit and inflate a raft, and other critical skills for braving rough seas.

Sea Grant Extension Leader Nancy Balcom trained 60 seafood professionals and 13 vocational-aquaculture high school students and teachers in the safe processing and handling of fish and shellfish, following the principles of the HACCP (Hazard Analysis and Critical Control Point) program, in conjunction with CT Department of Agriculture, Bureau of Aquaculture. Balcom also provided assistance to the Connecticut Seafood Council by means of *ex officio* membership and newsletter editing.



Wardrobe is important – in this case of life-or-death importance. Nancy Balcom, CTSG Extension Leader, demonstrates how to wear the "Gumby" (immersion) suit correctly at a CTSG/U.S. Coast Guard sea safety workshop.

### Fisheries Outreach

Lobstering is an important commercial fishery in Long Island Sound that has been severely impacted by a massive die-off of the resource beginning in 1999. Balcom has coordinated the CTSG Extension outreach program by organizing symposia and serving as primary contact between the Connecticut lobster industry, the research scientists, and the Lobster Research Steering Committee. Balcom works in conjunction with a counterpart in the New York Sea Grant program to coordinate the bi-state effort.

CTSG Extension Aquaculture specialist Tessa Simlick and the CTSG Communications Office worked with the National Marine Fisheries Service, Milford Laboratory to create a new manual for the hatchery culture of bay scallops, *Argopecten irradians*. The manual has been distributed both in the U.S. and overseas.

### Aquaculture: Underwater Farming

After losses to the shellfish (mollusk) industry due to MSX and Dermo, industry members are seeking new ways to supplement their existing shellfish-growing activities. Simlick successfully carried out a blue mussel long-line culture demonstration project to



Photo: Tessa Simlick, CTSG

Sea Grant Extension helped shellfisherman Larry Williams learn to grow blue mussels on long lines in Long Island Sound.



Photo: Larry Williams



Sea Grant Extension Aquaculture Specialist Tessa Simlick in the field.

for homeowners. The 11 fact sheets cover a variety of activities that impact water quality. Topics include managing household chemicals, caring for septic systems, integrated pest management, conservation landscaping, and animal waste disposal. Others address lawn care, water conservation, and environmentally-responsible boating. The Fact Sheets are available in a printed version or PDF format for downloading on the Sea Grant website. The program helps meet the growing demand for public environmental stewardship by training volunteers to give environmental programs and distribute the fact sheets, following the model of the Sound Gardener and Master Gardener programs

assist Larry Williams, a member of the Connecticut shellfish industry. Mussels were grown to marketable size and commercial permits are now being sought.

As the mussel project neared fruition, Simlick began a second project, funded by the USDA's Northeast Regional Aquaculture Center, to grow another underutilized species, the razor clam, in another fishing industry collaboration. Simlick also produced a seed oystering fact sheet, and a resource guide for the industry.

## Water Quality

On another front, Extension Educator Heather Crawford served as a resource and liaison to ten Master's degree candidates at the Yale School of Forestry and Environmental Studies who were awarded Sea Grant internships. (see page 15.)

Crawford, whose speciality is water quality, created a successful program called "Clean Waters: Starting in your Home and Yard". The program includes a Fact Sheet series of the same name



Photo: Cindi Kobak

Heather Crawford (3rd from left) and Diana Payne(4th from left) talk to teachers on Hammonasset Beach, sharing tips and techniques for marine education.



Photo: Tessa Simlick, CTSG

Captain John Wadsworth of Waterford, CT is working with Sea Grant Extension in a project to grow razor clams as a new aquaculture species with potential for Long Island Sound.

Crawford collaborates with the U.S. Department of Agriculture (USDA) and the Connecticut Cooperative Extension System and is part of the Nonpoint Education for Municipal Officials ("NEMO") team. NEMO provides training and information to help officials, commission members, and community leaders make well-informed decisions regarding development, land-use patterns and non-point pollution control in their coastal towns. The technology used includes GIS data and build-out scenarios. She is also part of a national invasive plants task force and a member of the Connecticut Invasive Plant working group.

Altogether, the Program's Extension Educators participated in five teacher-training efforts statewide, covering such topics as bioinvasions, coastal habitats and Long Island Sound.

CTSG Extension Educators also served on advisory boards for two vocational-aquaculture high schools, the Fisheries Division of the State's Department of Environmental Protection, and on the planning and curriculum committees for a marine science magnet high school.



## EDUCATION

### K-12 Teacher Training

CTSG's formal K-12 Education headquarters is based at The Maritime Aquarium (TMA) in Norwalk, which this year opened a \$9.5 million addition to further expand its activities. Diana Payne, the Connecticut Sea Grant Education Coordinator, plans teacher training workshops, coordinates teacher internships, develops curricula and carries on field study expeditions at The Maritime Aquarium at Norwalk. In addition, she serves as Secretary for the Sea Grant Educators national network. Payne also links K-12 teachers to UCONN faculty researchers, tying students with exceptional scientific ability to real ongoing scientific investigations. Sea Grant-supported educational programs held at The Maritime Aquarium in Norwalk during the period from 1997 to 2000 served 1500 schools in five states. Activities in 2001 included planning and hosting a teacher workshop on invasive species.



Photo: Peg Van Patten, CTSG

*Making Waves*, the professional development newsletter for marine educators, was continued. The newsletter brings events and associated sample lesson plans to teachers. Paid summer Sea Grant Teacher Internships were again implemented, and the Sea Grant Teacher Resource Center at TMA was maintained and expanded.

In addition to these ongoing duties, Payne was part of a team coordinating a national program called *Deep East 2001: Voyage of Discovery To Deep Sea Frontiers*. This educational undersea expedition off the U.S. East Coast was created in response to a national strategic report, *Discovering the Earth's Final Frontier: A U.S. Strategy for Ocean Exploration*. Payne accompanied the *R/V Atlantis*, with the deep submergence vehicle *Alvin*, on Leg 1 of the exploration, investigating coral communities in the Georges Bank Canyons, in September. More information can be seen on this website: <http://oceanexploration.noaa.gov>. Payne helped to develop downloadable lesson plans and logs of the educators' daily activities.

### Linking with Marine Science High Schools

CTSG maintains ties to two unique aquaculture and marine technology high schools in Connecticut: The Bridgeport Regional Vocational Aquaculture School and the Sound School (New Haven). The CTSG Sea Grant Extension Leader currently serves as the chairperson of the Sound School's Aquaculture Program Advisory and Consulting Committee. A third marine magnet school is in the planning stages.

### GRADUATE EDUCATION

Many undergraduate and graduate students, as well as post-doctoral fellows, are directly or indirectly involved in Sea Grant-sponsored research, as described in this report. In addition, these ongoing formal programs continued:

### Yale Sea Grant Coastal Interns Solve Watershed Problems

The Sea Grant internship program at the Yale School of Forestry and Environmental Studies (YFES) continues to provide excellent practical experience for the student interns on the role of science in the actions of government and the formulation of public policy as well as providing important data or analyses to local organizations and regulatory agencies. The program structure is described on the program's website: <http://www.yale.edu/ccws/seagrantinternships.html>.



## GRADUATE EDUCATION continued . . .

### Knauss Fellows Contribute on Capitol Hill

The Sea Grant Knauss Marine Policy Fellowship Program provides opportunities for qualified graduate students to work in key federal offices in Washington D.C. on marine issues. Fellows are recommended by their state's Sea Grant Program and selected by the National Sea Grant Office in a keen national competition. In 2001, Connecticut Sea Grant supported two Fellows, Sean Corson and Lisa Max, both from the Yale University School of Forestry and Environmental Sciences. Corson is now Sanctuary Designation Coordinator for the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. Max is working with the International Office of the National Ocean Service. Both love their assignments and are gaining invaluable experiences.

Connecticut Sea Grant researchers and extension educators have worked in concert to educate the public about identifying invasive species and how to prevent invasion or control their spread. Johnson and Carlton have shown how larvae travel in ballast water, and also how organisms "piggyback" on aquatic weeds.

Connecticut Sea Grant sent Drew Lohrer, then a doctoral candidate, to study the Asian shore crab in its natural habitat, in order to compare its characteristics with the invasive crabs now thriving around Long Island Sound.

The State's boat launch areas have posted Connecticut Sea Grant's signs warning boaters not to carry "hitchhikers" away with them.

Connecticut Sea Grant participates in regional and national efforts to educate about nuisance species, and is helping to develop curricula for schools.



Photo: Nancy Balcom, CTSG

The Asian shore crab shown here in the palm of a hand is one of those nonindigenous aquatic nuisance species that has invaded our shores, displacing native crabs and altering food webs.

### Selected Reprints from Sponsored Research

The following references are publications resulting from either the projects described in this annual report or those described in previous annual reports, now coming to fruition. In the case of incomplete citations from works in progress, inquiries can be made to our offices or directly to the PIs. Otherwise, order from the Sea Grant Library, as described on the facing page.

- Acharya, G. and L. Bennett. (submitted) Valuing open space and land use chaos in urban watersheds: an hedonic property value analysis. *Journal of Real Estate Economics and Finance*.
- Borucinska, J. D. and S. Frasca. (accepted for 2002) Pancreatic fibrosis and ductal ectasia associated with the nematode *Pancreatonema americanum*, sp. nov., in spiny dogfish sharks (*Squalus acanthias*) from the northwestern Atlantic. *Journal of Fish Diseases*, Vol. 25.
- Chopin, T., A. Buschmann, C. Halling, M. Troell, N. Kautsky, A. Neori, G.P. Kraemer, J. Zertuche-Gonzalez, C. Yarish, and C. Neefus. 2001. Integrating Seaweeds into Marine Aquaculture Systems: a Key Toward Sustainability. *J. Phycol.* 37, 975-986.

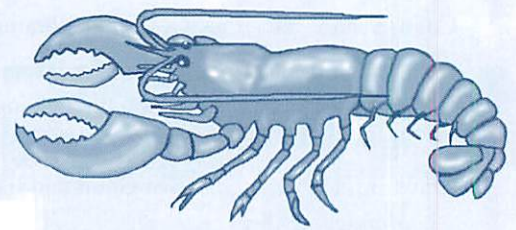


- Colin, Sean P. and Hans G. Dam. (submitted) Adaptation of marine zooplankton to toxic dinoflagellates.
- Colin, Sean P. and Hans G. Dam (accepted for 2002). Latitudinal differentiation in the effects of the toxic dinoflagellate *Alexandrium* sp. on the feeding and reproduction of populations of the copepod *Acartia hudsonica*. *Harmful Algae* 1, No. 1.
- Crawford, H. M., *et als.* Sea Grant and Invasive Aquatic Plants: A National Outreach Initiative. *J. Aquat. Plant. Manage.* 39:8-11.
- Colin, Sean P. and Hans G. Dam . (accepted) Testing for toxic effects of prey on zooplankton using sole versus mixed diets. *Limnology & Oceanography*.
- Kellert, S. (in press) *Ordinary Nature: Exploring and Designing Natural Diversity in Everyday Life*. Berkeley: University of California Press.
- Horton, B.P., Edwards, R.J., Thomas, E. and Varekamp, J.C., (submitted): Reconstructing late Holocene sea-level changes using foraminifera-based transfer functions, North Norfolk, England. *J. Quaternary Research*
- Kellert, S. 2001. (submitted) Ordinary nature: the value of exploring and restoring nature. *Landscape Ecology*.
- Lohrer A.M. and R.B. Whitlatch. Alien crabs in Long Island Sound: relative impacts of two exotic brachyuran species. Submitted to *Mar. Ecol. Prog. Ser.*
- Lohrer, A.M. and R.B. Whitlatch. (in press) Modeling life-stage based dynamics of marine invertebrates in soft-sediment habitats: some implications for habitat conservation. In: J.B. Lindholm and M. Ruth (eds.). *Dynamic Modeling for Marine Conservation*. SpringerVerlag, New York, USA.
- Lohrer, A.M. and R.B. Whitlatch. (submitted) Interactions among aliens: apparent replacement of one exotic species by another. *Ecology*.
- Moravec, F., J.D. Borucinska and S. Frasca, Jr. 2001. *Pancreatonema americanum* sp. nov. (Nematoda, Rhabdochoniidae) from the pancreatic duct of the dogfish shark, *Squalus acanthias*, from the coast of Massachusetts, USA. *Acta Parasitologica* 46(4): 293-298.
- Snoeyenbos-West, O L O, T Salcedo, G B McManus, and L A Katz. (submitted) Insights into the diversity of choreotrich and oligotrich ciliates (Cl: Spirotrichea) based on genealogical analyses of multiple loci. *J. International Soc. Evol. Microbiol.*
- Thompson, W.G., Thomas, E. and Varekamp, J.C., 2000, 1500 Years of Sea Level Rise in Long Island Sound, *Fourth Biennial LIS Research Conference proc.* R.B. Whitlatch and J. Wood-Martin, eds. Univ. of Connecticut Marine Sciences Department.
- Whitlatch, R.B., Lohrer, A.M., and S.F. Thrush. *in press.* Scale-dependent recovery of the benthos: effects of larval and post-larval life-stages. In: J.Y. Aller and S.A. Woodin (eds.). *Organism-Sediment Relationships*. University of South Carolina Press, Columbia, SC, USA.
- Varekamp, J.C., Kreulen, B., and Buchholtz ten Brink, M.R, and Mecray, E. (accepted) Mercury contamination chronologies in Connecticut wetlands and Long Island Sound sediments. *Environmental Geology*.

Reprints, technical manuals, and other literature resulting from Sea Grant-sponsored activities are available from the **Sea Grant Library** located in the Pell Library at the University of Rhode Island. The Sea Grant Library, with a wealth of downloadable resources, can easily be accessed online at <http://nsgd.gso.uri.edu>.



## *Long Island Sound Lobster Initiative*



In Connecticut's commercial fisheries, the lobster industry is second in economic importance only to the bivalve mollusk shellfish industry. Following a massive die-off of Long Island Sound lobsters in 1999, Secretary of Commerce William M. Daley declared the Long Island Sound lobster resource as a commercial fishing failure in 2000. The cause is unknown.

With early-response Connecticut Sea Grant funding soon after the die-off, lobsters, seawater, and sediments were tested for toxins and pathogens. University of Connecticut pathobiologists conducted necropsies on sick lobsters, and discovered parasitic paramoebae in the lobster nervous system tissues. It was unclear, however, whether the paramoeba was the primary cause of the lobster deaths, or whether other stressors were also involved. The exact species of paramoeba was (and still is) not clear.

A Congressional allocation of \$6.6 million in federal funds was made to NOAA and the National Sea Grant Office, to address the lobster mortalities by means of scientific research, and to evaluate the economic impacts. Congress directed that approximately \$3.5 million of those federal funds be dedicated for research investigating potential causes. The Long Island Sound Lobster Steering Committee, a multi-agency group composed of scientists, fishery managers, federal and state regulators, and representatives from the lobster fishing industry, was formed, with Connecticut Sea Grant playing a leading role in the coordination of efforts. The ongoing Long Island Sound Lobster Research Initiative was subsequently developed and implemented.

The awards given out by Connecticut Sea Grant for 2001-2002 as part of this initiative, totalling \$1.1 million, resulted from a national research competition for projects to investigate the causes of mortality and shell disease in Long Island Sound lobsters. The funded researchers are investigating many different possible factors on an ecosystem-wide basis. These include disease-causing organisms, pesticides, pollution, lobster crowding, water quality conditions, including elevated temperatures and changes in salinity, and environmental conditions such as storm events. The selections were finalized by the Long Island Sound Lobster Research Steering Committee.

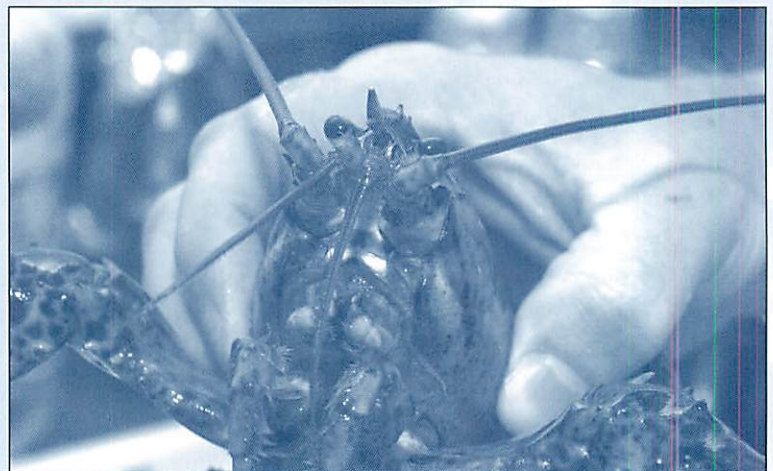


Photo: Peter Morenus, UCONN

Research to understand what is killing the lobsters is expected to yield important information about the environmental health of Long Island Sound. CTSG is implementing a comprehensive program.

### **Sea Grant Lobster Outreach**

Additional federal funds were allocated for lobster outreach and development, to facilitate rapid response to any new emergencies, and facilitate communication between scientists, Sea Grant, resource managers, and the lobster industry. Workshops were held to develop the research program and to keep the collaborators informed, in line with that goal.

A Long Island Sound Lobster Information website has been developed and is being maintained. The website can be accessed via the Connecticut Sea Grant home page.



## Lobster Research and Outreach Projects Funded:

- LR/LR-1      Stress Indicators in Lobsters (*Homarus americanus*): Hormones and Heat Shock Proteins  
Primary P.I.: Ernest S. Chang, Bodega Marine Laboratory, University of California, Davis  
2-Yr. Funding Totals: \$170,115 (Sea Grant); Matching Funds: \$155,197
- LR/LR-2      Development of Assays for the Evaluation of Immune Functions of the American Lobster  
                  (*Homarus americanus*) as a Tool for Health Assessment  
Lead P.I.: Sylvain De Guise, University of Connecticut  
2-Yr. Funding Totals: \$198,271(Sea Grant), Matching Funds: \$67,734
- LR/LR-3      Determination of the Toxicity and Sublethal Effects of Selected Pesticides on the American  
                  Lobster (*Homarus americanus*)  
Primary P.I.: Sylvain De Guise, University of Connecticut  
2-Yr. Funding: \$140,000 (Sea Grant), Matching Funds: \$70,201
- LR/LR-4      Oligonucleotide-based Detection of Pathogenic Paramoeba Species  
Primary P.I.: Rebecca J. Gast, Woods Hole Oceanographic Institution  
2-Yr. Funding: \$113,587 (Sea Grant) Matching Funds: \$37,681
- LR/LR-5      Phenotypic and Molecular Identification of Environmental Specimens of the Genus  
                  *Paramoeba* Associated with Lobster Mortality Events  
Primary P.I.: Patrick M. Gillevet, George Mason University  
2-Yr. Funding: \$299,761 (Sea Grant), Matching Funds: \$100,477
- LR/LR-6      Acute Effects of Methoprene on Survival, Cuticular Morphogenesis Shell Biosynthesis in the  
                  American Lobster, *Homarus americanus*  
Primary P.I.: Michael N. Horst, Mercer Univ. School of Medicine  
2-Yr Funding: \$230,000 (Sea Grant) Matching Funds: \$100,000
- LMP/A-1      LIS Lobster Disease Research Management  
Primary P.I.: Edward C. Monahan, Connecticut Sea Grant College Program  
2-year Funding: \$35,000 (Sea Grant) Matching Funds \$11,900
- LMP/D-1      LIS Lobster Disease Program Development  
Primary P.I.: Edward C. Monahan, Connecticut Sea Grant College Program  
2-year Funding: \$98,266 (Sea Grant) Matching Funds 0
- LA/E-1      LIS Lobster Extension Program  
Primary P.I.: Nancy C. Balcom, Sea Grant Extension Program  
3-year Funding: \$165,000 (Sea Grant) Matching Funds \$58,700

Additional lobster projects were funded by the Connecticut Department of Environmental Protection, the NOAA National Marine Fisheries Service, and New York Sea Grant.



**FINANCIAL REPORT****MAJOR PROJECTS FUNDED 2001**

<b>Project No.</b>	<b>Title</b>	<b>Investigator</b>
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***Core Program Elements***

M/PA-1	Program Management/ Admin. & Planning	E. Monahan
M/PD-1	Program Development	E. Monahan
M/PD-4	Multi-program and Regional Initiatives	E. Monahan
A/E-1	Sea Grant Extension Program	N. Balcom
M/CP-1	Core Communications Program	M. Van Patten

***Research Projects***

R/A-25	"... Growth Enhancement in Two Economically Important Euryhaline Teleosts, Rainbow Trout and Tilapia"	T. Chen
R/A-28	"Sustainable Integrated Finfish/Nori Aquaculture for Bioremediation and Production of Food and Biochemicals"	C. Yarish
R/ER-14	"...Sulfide Complexation on Heavy Metal Biogeochemistry and Bioavailability in Conn. Rivers and Estuaries"	G. Benoit
R/ER-15	"The Long Island Sound Paleo-Environment Program"	E. Thomas, J. Varekamp

***Education and Outreach Initiatives***

A/E-3	"Yale/ Sea Grant Coastal Internship Program: Development and Coordination of Public Policy"	G. Geballe M. Tyrell
E/T-7	"New Recruits: Marine Science for the Next Generation" (K-12 education and teacher support)	J. Schneider
E/T-10	"Marine Science Education for the Deaf: Classroom of the Sea"	P. Scheifele
A/E-14	"Enhancing the Sea Grant Network's Ability to Address Land Use Impacts on Coastal Resources ('NEMO')"	C. Arnold
	Knauss Marine Policy Fellowships (2)	

**SUBTOTALS****MULTI-YEAR LOBSTER****TOTALS**



Institution	NOAA Funds	Non-Federal Match	Totals
UCONN	\$185,900	\$ 220,700	\$406,600
UCONN	\$ 57,000	0	\$ 57,000
UCONN	\$ 17,500	0	\$ 17,500
UCONN	\$141,800	\$ 71,900	\$213,700
UCONN	\$130,700	0	\$130,700
UCONN	\$ 44,562	\$ 23,021	\$ 67,583
UCONN	\$ 70,301	\$ 53,491	\$123,792
Yale U.	\$ 61,308	\$ 59,419	\$120,727
Wesleyan U.	\$ 27,357	\$ 34,307	\$ 61,663
Yale U.	\$ 30,400	\$ 15,327	\$ 45,727
The Maritime Aquarium	\$ 65,000	\$ 56,200	\$121,200
NURP, UCONN	\$ 19,900	\$ 36,211	\$ 56,111
CES, UCONN	\$ 12,187	\$ 4,882	\$ 17,069
	\$ 76,000	0	\$ 76,000
	<b>\$ 939,915</b>	<b>\$ 575,458</b>	<b>\$ 1,515,373</b>
	<b>\$ 1,450,000</b>	<b>\$ 601,890</b>	<b>\$ 2,051,890</b>
	<b>\$ 2,389,915</b>	<b>\$ 1,177,318</b>	<b>\$ 3,567,263</b>



## FINANCIAL REPORT

### M/PD-1 DEVELOPMENT PROJECTS

#### Project/Request Title

#### Investigator

Coastal Perspectives Lecture Series	C. Crosby
Eelgrass response to nitrogen loads	J. Kremer
Longline culture of blue mussels	T. Simlick
Microbial Diversity Course at MBL	P. Visscher/L. Baumgartner
Taste, Touch and Smell of Science	T. Feinstein
Food preferences of <i>Hemigrapsus sanguineus</i>	D. Brousseau
Fecal Bacteria Indicator	C. Anderson
First time inventory of marine rotifers...	A. Caccone
Planning meeting for UCONN/Chilean collaboration	B. Bravo-Ureta
Sea Safety Training Workshop (with U.S. Coast Guard & Oregon Sea Grant)	N. Balcom
Effects of climate warming on invasion success of <i>Diplosoma listerianum</i>	J. Terwin
Development of ocean-going sensors for climate models	J.P. Boyle
Student travel to Phycological Society of America meeting	S. Lin
Developing <i>Wrack Lines</i> magazine	P. Van Patten
Travel to IAMSLIC (int'l marine libraries) conference	J. Heckman
SoundWaters Explorers Club programs	C. Hadin
Floating Workshop for Decision Makers	E. Thomas
Long Island Sound Educators Workshop	D. Payne
Student travel to physical oceanography meeting	J. O'Donnell
Student travel to Microbiology By-the-Sea meeting	M. Anderson
Effect of sonoluminescence on marine organic matter	A. Skoog
Benthic biodiversity in Long Island Sound ecological functioning	G. Waldbusser
94th Nat'l Shellfisheries Assn. Meeting	T. Simlick
National Ocean Sciences Bowl	G. Skowcroft

### M/PD-4 REGIONAL AND MULTI-PROGRAM PROJECTS

#### Project/Request Title

#### Investigator

<i>Publication of monograph</i>	M. Weinstein
<i>Phragmites</i> Technical Forum	M. Weinstein
Northeast Regional Sea Grant Website	A. Cohen
EPA Long Island Sound Study Research Competition	E. Ward

**Note:** projects R/A-28, C. Yarish, and A/E-14, C. Arnold, were also supported from M/PD-4.  
(see pages 20-21)



<b>Institution</b>	<b>Funds</b>
UCONN	\$ 460
UCONN	\$4,500
UCONN	\$3,300
UCONN	\$1,200
UCONN	\$ 300
Fairfield U.	\$3,900
UCONN	\$2,695
Yale U.	\$4,580
UCONN	\$2,167
UCONN	\$2,436
UCONN	\$2,911
U. of Bridgeport	\$ 3,289
UCONN	\$ 500
UCONN	\$ 3,875
UCONN	\$ 450
SoundWaters Inc.	\$ 3,000
Thames River Basin	\$ 1,000
The Maritime Aquarium	\$ 2,000
UCONN	\$ 510
Pfizer Inc.	\$ 400
UCONN	\$ 4,576
UCONN	\$ 1,505
UCONN	\$ 2,200
Univ. of Rhode Island	\$ 2,500

<b>Institution and Partner(s)</b>	<b>Funds</b>
New Jersey Sea Grant	\$ 847
New Jersey Sea Grant	\$ 2,000
MIT Sea Grant	\$ 1,162
	\$25,000



## CONNECTICUT SEA GRANT STAFF

Edward C. Monahan, Ph.D., D.Sc., Director  
Nancy C. Balcom, Extension Leader  
Heather M. Crawford, Extension Educator  
Karen Massaro, Administrative Assistant  
Capt. Charles H. Nixon, Executive Officer  
Diana L. Payne, Education Programs Coordinator  
Irene K. Schalla, Secretary  
Tessa L. Simick, Extension Educator  
Peg Van Patten, Communications Director

## SENIOR ADVISORY BOARD

The Connecticut Sea Grant Advisory Board is comprised of senior individuals at academic institutions in the state and representatives of state and federal agencies. The group guides the policy and direction of the Sea Grant College Program.

RADM Michael W. Bordy, USN retired  
President/CEO  
The Maritime Aquarium

Dr. Orrin Grossman  
Acting Vice President for Academic Affairs  
Fairfield University

Dr. Ian Hart (chairperson)  
Interim Vice Provost for Research and Grad. Education  
University of Connecticut

Dr. Thomas Haas  
Dean of Academics  
U.S. Coast Guard Academy

Dean J. Gustave Speth  
School of Forestry and Environ. Studies  
Yale University

Dr. Herman Lujan  
Chief Academic Officer for Academic Affairs & Research  
Connecticut State University System

Dr. Mark Zimmer  
Dean of Natural Sciences  
Connecticut College

Dr. Laura Grabel  
Dean of Natural Sciences & Mathematics  
Wesleyan University

Dr. Anthony Cerneria  
President  
Sacred Heart University

Dr. Gerald Burrow  
President  
Mystic Aquarium and IFE

RADM Douglas Teeson  
President  
Mystic Seaport Museum

### Agency Representatives

Mr. Arthur Rocque, Jr.  
Commissioner  
State of CT, Dept. of Environmental Protection

Dr. Anthony Calabrese,  
Director  
NOAA National Marine Fisheries Service  
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