

**Long Island Sound Lobster Initiative**  
**Research Projects**  
**7/1/01 – 6/30/03**

**1. Immunology & Endocrinology**

**Title: Development of an Assay for Phagocytic Activity in the Immune System of Lobsters**

*Jan Factor*, Division of Natural Sciences, SUNY Purchase  
Phone: (914) 251-6659; E-mail: [jfactor@purvid.purchase.edu](mailto:jfactor@purvid.purchase.edu)

Factor is looking at how lobsters defend themselves against infection and disease. He is seeking to develop methods that will allow the assessment of cellular defenses against infection and disease after sublethal exposure to environmental stresses and toxic substances. Research may lead to an explanation of the recent mortalities by enabling assessment of impacts on the immune system that may lead to lethal infections.

**Title: Immunological Health of Lobsters: Assays and Applications**

*Robert S. Anderson*, Chesapeake Biological Laboratory, Center for Environmental Sciences, University of Maryland. Phone: (410) 326-7247; E-mail: [anderson@cbl.umces.edu](mailto:anderson@cbl.umces.edu)

Anderson is using biotechnology tools to measure the blood cell-related defense system of the lobster against disease. This research will lay the groundwork for discerning changes in immune response due to toxicity or other environmental stressors.

**Title: Stress Indicators in Lobsters: Hormones and Heat Shock Proteins**

*Ernest S. Chang*, Bodega Marine Laboratory, Univ. California Davis  
Phone: (707) 875-2061; E-mail: [eschang@ucdavis.edu](mailto:eschang@ucdavis.edu)

Chang is investigating the relative impacts of stresses from environmental factors (like temperature and salinity), biological factors (including bacteria and protozoa), and human-caused stresses (pesticides). Lobsters exposed to these stresses are being examined for changes in stress proteins and steroid molting hormones.

**Title: Development of assays for the evaluation of immune functions of the American Lobster (*Homarus americanus*) as a tool for health assessment**

*Sylvain DeGuise*, The Dept. of Pathobiology, University of Connecticut, Storrs  
Phone: (860) 486-0850; E-mail: [sdeguise@canr.uconn.edu](mailto:sdeguise@canr.uconn.edu)

*Co-investigators:*

*Richard A. French*, UConn, Phone: (860) 486-5370, E-mail: [french@uconnvm.uconn.edu](mailto:french@uconnvm.uconn.edu)  
*Salvatore Frasca, Jr.*, UConn, Phone: (860) 486-1138 E-mail: [salvatore.frasca@uconn.edu](mailto:salvatore.frasca@uconn.edu)

The University of Connecticut Pathobiology team is seeking to develop new tools to use in evaluating how immune systems work in both sick and healthy lobsters. They are exposing lobsters to various chemicals and other stressors and measure the response of the immune system in each case.

**Title: Effects of Environmental Stressors on Disease Susceptibility in Lobsters:  
A Controlled Laboratory Story**

*Richard Robohm*, NOAA Fisheries Laboratory, Milford, CT

Phone: (203) 579-7037, E-mail: [Richard.Robohm@noaa.gov](mailto:Richard.Robohm@noaa.gov)

Co-Principal Investigator:

*Andrew F.J. Draxler*, NOAA Fisheries, Howard Laboratory, Sandy Hook, NJ

Phone: (732) 872-3054, E-mail: [Andrew.Draxler@noaa.gov](mailto:Andrew.Draxler@noaa.gov)

Robohm and Draxler are investigating the effects of environmental stressors on the susceptibility of lobsters to pathogens. The work tests whether depressed habitat quality may have compromised lobsters' immune systems and contributed to the die-off. The researchers are exposing healthy lobsters to two bacterial pathogens in the presence of varying levels of environmentally relevant bio-geochemicals such as sulfide and ammonia as well as environmental conditions such as low oxygen and increased temperatures. After the exposures, changes in bacterial numbers and five, lobster, immune-system indices are measured. The protocol also allows for testing of stressors on the growth of a parasitic amoeba in lobsters, should the amoeba be cultured successfully by other researchers.

## **2. Pesticides**

**Title: Effects of Pesticides of Lobster Health: Trace Level Measurements and  
Toxicological Assessment at Environmentally Realistic Concentrations**

*Anne E. McElroy*, Marine Sciences Research Center, Stony Brook University.

Phone: (631) 632-8488; E-mail: [Anne.McElroy@sunysb.edu](mailto:Anne.McElroy@sunysb.edu)

Co-Investigator:

*Bruce J. Brownawell*, Marine Sciences Research Center, Stony Brook University.

Phone: (631) 632-8658; E-mail: [Bruce.Brownawell@sunysb.edu](mailto:Bruce.Brownawell@sunysb.edu)

McElroy and Brownawell are addressing the potential link between pesticide use and lobster mortality. They are measuring mortality and immune response in larval and juvenile lobsters exposed to environmentally realistic levels of pesticides (malathion, methoprene, and selected pyrethroids such as Anvil and Scourge). The team is also looking to develop ways to measure levels of these pesticides and their breakdown products in seawater, sediment, and possibly lobster tissues. They are particularly interested in sampling water after storm events when concentrations may be highest. The results of this study should provide a strong indication whether or not pesticide use is likely to contribute to degraded lobster health in Long Island Sound. This study will also shed light on the effects of temperature on the immune response of young lobsters.

**Title: Determination of the toxicity and sublethal effects of selected pesticides on the  
American Lobster (*Homarus americanus*)**

*Sylvain De Guise*, University of Connecticut, Storrs. Phone: (860) 486-0850; E-mail:

[sdeguise@canr.uconn.edu](mailto:sdeguise@canr.uconn.edu)

Co-investigators:

*Richard A. French*, University of Connecticut, Phone: (860) 486-5370, E-mail:

[french@uconnvm.uconn.edu](mailto:french@uconnvm.uconn.edu)

*Christopher Perkins*, University of Connecticut, Phone: (860) 486-2668 E-mail:

[Christopher.Perkins@uconn.edu](mailto:Christopher.Perkins@uconn.edu)

The research team are exposing lobsters to malathion, resmethrin, and methoprene, three pesticides used in the region to control mosquitoes after West Nile virus was found. The subtle effects of low levels of pesticides on the lobster immune system is being measured, in addition to high level exposures, to determine toxicity.

**Title: Acute Effects of Methoprene on Survival, Cuticular Morphogenesis and Shell Biosynthesis in the American Lobster, *Homarus americanus***

*Michael N. Horst*, Mercer University School of Medicine, Macon GA  
Phone: (478) 301-2558 E-mail: [horst\\_mn@mercer.edu](mailto:horst_mn@mercer.edu)

Co-investigators:

*Anna N. Walker*, Department of Pathology, Mercer University, Macon, GA.  
Phone: (478) 301-4067, E-mail: [walker\\_an@mercer.edu](mailto:walker_an@mercer.edu)

*Thomas G. Wilson*, Department of Biology, Colorado State University, Fort Collins, CO.  
Phone: (970) 491-2542, E-mail: [twilson@lamar.colostate.edu](mailto:twilson@lamar.colostate.edu)

*Parshall B. Bush*, Agricultural and Environmental Services Laboratories, University of Georgia, Athens. Phone: TBA E-mail: [pbush@arches.uga.edu](mailto:pbush@arches.uga.edu)

*Timothy E. Miller*, Darling Marine Center, University of Maine, Bristol, ME.  
Phone: (207) 563-3146 ext. 218, E-mail: [TEMiller@maine.edu](mailto:TEMiller@maine.edu)

*Ernest S. Chang*, Bodega Marine Laboratory, University of California.  
Phone: (707) 875-2061, E-mail: [eschang@ucdavis.edu](mailto:eschang@ucdavis.edu)

*Robert L. Vogel*, Department of Community Medicine, Mercer University School of Medicine, Macon, GA. Phone: (912) 784-3581, E-Mail: [vogel.robert@mccg.org](mailto:vogel.robert@mccg.org)

Horst has hypothesized that methoprene could kill lobsters and cause biochemical changes in juvenile and adult lobsters. His team is studying the effects a range of doses have on nerve, skin, and pancreatic cells, shell formation.

**Title: Hormonal Responses of Lobsters to Stresses of Western LIS**

*Hans Laufer*, Dept. of Molecular & Cell Biology, University of Connecticut, Storrs, CT  
Phone: (860) 486-4117 E-Mail: [laufer@uconnvm.uconn.edu](mailto:laufer@uconnvm.uconn.edu)

Co-investigators:

*Ernest S. Chang*, Bodega Marine Laboratory, University of California.  
Phone: (707) 875-2061, E-mail: [eschang@ucdavis.edu](mailto:eschang@ucdavis.edu)

*Richard French*, University of Connecticut, Phone: (860) 486-5370  
E-mail: [french@uconnvm.uconn.edu](mailto:french@uconnvm.uconn.edu)

*Shili Liu*, University of Connecticut, Phone: (860) 486-2586 E-mail: [Shili.Liu@uconn.edu](mailto:Shili.Liu@uconn.edu)

*Chris Perkins*, University of Connecticut, Phone: (860) 486-2668 E-mail:  
[Christopher.Perkins@uconn.edu](mailto:Christopher.Perkins@uconn.edu)

*Lance Stewart*, University of Connecticut, Phone: (860) 486-1608; E-mail:  
[lstewart@canr.uconn.edu](mailto:lstewart@canr.uconn.edu)

*Michael Syslo*, MA State Lobster Hatchery Res. Stn, Phone: (508) 693-0060 E-mail:  
[lobster@vineyard.net](mailto:lobster@vineyard.net)

*Michael Thusty*, New England Aquarium, Phone: (617) 973-6715 E-mail: [mtlusty@neaq.org](mailto:mtlusty@neaq.org)

*Charles Yarish*, University of Connecticut, Phone: (203) 251-8432 E-mail:  
[yarish@uconnvm.uconn.edu](mailto:yarish@uconnvm.uconn.edu)

Laufer is assessing the effects of long-term stresses-heat, methoprene, and infection-on the growth, maturation and reproduction processes of lobsters. Western LIS lobsters exposed to

known stress factors, as well as those infected by the paramoeba are being compared to field collected lobsters in the laboratory. The potential of elevated temperature and elevated pesticide levels could alter lobster endocrinology leading to effects on growth, molting and ultimately, survival. This project measures several endocrine levels in response to laboratory manipulation of temperature and pesticide levels.

### **3. Physical\Chemical Environment**

#### **Title: Relationship Between American Lobster Mortality in LIS and Prevailing Water Column Conditions**

*Robert E. Wilson*, Marine Sciences Research Center, Stony Brook University. Phone: (631) 632-8689; E-mail: [Robert.Wilson@sunysb.edu](mailto:Robert.Wilson@sunysb.edu)

Co-investigators:

*R. Lawrence Swanson*, Marine Sciences Research Center, Stony Brook University. Phone: (631) 632-8704; E-mail: [Robert.Swanson@sunysb.edu](mailto:Robert.Swanson@sunysb.edu)

*Duane E. Waliser*, Marine Sciences Research Center, Stony Brook University. Phone: (631) 632-8647; E-mail: [Duane.Waliser@sunysb.edu](mailto:Duane.Waliser@sunysb.edu)

Wilson, Swanson and Waliser are examining water quality factors such as temperature, salinity, dissolved oxygen, and pollutants with respect to the lobster mortalities. The lobsters are vulnerable to stress and sometimes mortality when exposed to unfavorable environmental conditions, especially during the molt cycle. Environmental factors can act singularly or in combination to cause sublethal stress that increases sensitivity to events that would normally be tolerated. Significantly elevated bottom temperatures during the summer and fall of 1999 lead the team to focus primarily on co-variations in temperature and dissolved oxygen.

#### **Title: Effects of Temperature and Body Size on Metabolic Stress in LIS Lobsters**

*Glenn Lopez*, Marine Sciences Research Center, Stony Brook University  
Phone: (631) 632-8660; E-mail: [Glenn.Lopez@sunysb.edu](mailto:Glenn.Lopez@sunysb.edu)

Co-investigator:

*Robert M. Cerrato*, Marine Sciences Research Center, Stony Brook University  
Phone: (631) 632-8666, E-mail- [Robert.Cerrato@sunysb.edu](mailto:Robert.Cerrato@sunysb.edu)

Lopez and Cerrato are trying to determine to what extent high summer temperatures in Long Island Sound's bottom waters have negative impacts on lobsters and if larger lobsters are more susceptible to temperature stress than smaller ones. The results of their lab studies may be used to predict the effects of long term changes in summer temperatures on the health of the LIS lobster population. The study will shed light on normal patterns of lobster stress and mortality as well as the extraordinary mortality event of fall 1999.

#### **Title: Exposure of Lobsters to the Varied Chemical and Biological Environment of Long Island Sound**

*Andrew F.J. Draxler*, NOAA Fisheries, Howard Laboratory, Sandy Hook, NJ  
Phone: (732) 872-3054, E-mail: [Andrew.Draxler@noaa.gov](mailto:Andrew.Draxler@noaa.gov)

*Ashok Deshpande*, NOAA Fisheries, Howard Laboratory, Sandy Hook, NJ  
Phone: (732) 872-3043 E-mail: [Ashok.Deshpande@noaa.gov](mailto:Ashok.Deshpande@noaa.gov)

Paulson, Deshpande, and Draxler are documenting lobster responses to the chemical and biological conditions of Long Island Sound in an attempt to uncover any direct relationship between lobster health and their environment. The experiment examines the health of lobsters under ambient Long Island Sound conditions during the time period when lobsters are believed to be most susceptible to these conditions. Lobsters taken from uncontaminated regions are being evaluated, then placed in cages at six sites around western and central Long Island Sound. The sites have been chosen to span a variety of environmental conditions. For four weeks, scientists will monitor the cages, routinely recover lobsters from each site, and evaluate them for changes attributable to exposure to naturally occurring biogeochemicals (such as ammonia and sulfide) as well as to contaminants. Lobster health will be assessed by bacterial determinations, and physiological condition. A limited number of the exposed lobsters will also undergo pathological examination.

**Title: Environmental Change in LIS in the Recent Past**

*Johan Varekamp*, Wesleyan University, Phone: (860) 685-2248 E-mail:

[jvarekamp@wesleyan.edu](mailto:jvarekamp@wesleyan.edu)

Co-Investigators:

*Ellen Thomas*, Wesleyan University, Phone: (860) 685-2238 E-mail: [ethomas@wesleyan.edu](mailto:ethomas@wesleyan.edu)

*Mark Altabet*, Dept. Chemistry & Biochemistry, UMass, Dartmouth

*Sherri Cooper*, Bryn Athyn College, Phone: (215) 938-2554 E-mail: [slcooper@duke.edu](mailto:slcooper@duke.edu)

*Marilyn Buchholtz ten Brink*, US Geological Survey, Phone: (508) 457-2392 E-mail:

[mtenbrink@usgs.gov](mailto:mtenbrink@usgs.gov)

This project is building on an ongoing study, and includes the development of a detailed time line of environmental changes in LIS over the last decade by evaluating sediment cores. Evaluation of sediment will provide information on water temperatures, organisms within the food chain, dissolved oxygen levels, pollution and salinity. This study will help ascertain whether the lobster die-off is more strongly linked to global climate change or local contamination with pollutants or nutrients.

## 4. Shell Disease

**Title: Bacterial Assemblages Involved in the Development and Progression of Shell Disease in the American Lobster, *Homarus americanus***

*Andrei Chistoserdov*, Marine Sciences Research Center, Stony Brook

University. Phone: (631) 632-9233; E-mail: [Andrei.Chistoserdov@sunysb.edu](mailto:Andrei.Chistoserdov@sunysb.edu)

Co-investigator:

*Roxanna Smolowitz*, Marine Biological Laboratory, Woods Hole, MA

Phone: (508) 289-7400; E-mail: [rsmol@mbi.edu](mailto:rsmol@mbi.edu)

By comparing shell disease in lobsters from Eastern Long Island Sound with those from Buzzards Bay, Massachusetts, Chistoserdov and Smolowitz seek to identify the kinds of bacteria that cause lobster shell disease. The team is also designing a set of specific probes that are being used to test for such pathogens.

## 5. Paramoeba

### **Title: Phenotypic and Molecular Identification of Environmental Specimens of the Genus *Paramoeba* Associated with Lobster Mortality Events**

*Patrick M. Gillevet*, George Mason University, Fairfax VA

Phone: (703) 993-1057, E-mail: [gillevet@ib3.gmu.edu](mailto:gillevet@ib3.gmu.edu)

#### Co-investigators:

*Charles J. O'Kelly*, Bigelow Laboratory for Ocean Sciences, West Boothbay Harbor, ME.

Phone: (207) 633-9616, E-mail: [cokelly@bigelow.org](mailto:cokelly@bigelow.org)

*Thomas A. Nerad*, American Type Culture Collection, Mannassas, VA

Phone: (703) 365-2722

*Thomas K. Sawyer*, Rescon Associates, Inc. Turtle Cove. Royal Oak, MD

410-745-5669, E-mail: [rescon@goeaston.net](mailto:rescon@goeaston.net)

Gillevet is using a combination of methods to isolate and characterize the paramoeba that has been identified in Long Island Sound lobsters. Gillevet and O'Kelly hope to develop a sensitive "fingerprinting" tool that will detect this paramoeba in the environment.

### **Title: Oligonucleotide-based Detection of Pathogenic *Paramoeba* Species**

*Rebecca J. Gast*, Woods Hole Oceanographic Institution, Woods Hole, MA.

Phone: (508) 289-3209, E-mail: [rgast@whoi.edu](mailto:rgast@whoi.edu)

Gast is seeking to develop a method to facilitate the detection of paramoeba in animal tissues, water, and sediment samples. Using the new method, the researchers are performing a year-long sampling of Long Island Sound to analyze the paramoeba's fluctuation and distribution.

### **Title: Development of polymerase chain reaction- and in situ hybridization-based tests for the specific detection of the paramoeba associated with epizootic lobster mortality by determination of the molecular systematics of the genus *Paramoeba***

*Salvatore Frasca, Jr.*, Dept. of Pathobiology, University of Connecticut

Phone: (860) 486-1138 E-mail: [salvatore.frasca@uconn.edu](mailto:salvatore.frasca@uconn.edu)

#### Co-investigators:

*Richard French*, University of Connecticut; Phone: (860) 486-5370 E-mail:

[french@uconnvm.uconn.edu](mailto:french@uconnvm.uconn.edu)

*Sylvain De Guise*, University of Connecticut, Phone: (860) 486-0850 E-mail:

[sdeguise@canr.uconn.edu](mailto:sdeguise@canr.uconn.edu)

The purpose of this project is to produce and analyze gene sequences of a number of *Paramoeba* spp. and to develop a molecular diagnostic assay for the lobster *Paramoeba* sp.

## **6. Monitoring & Assessment**

Two projects being conducted by NYSDEC and CTDEP are looked at as the glue that binds the 17 research projects together. Each is geared towards monitoring and assessing Long Island Sound's lobster population and its commercial lobster fishery.

Carl LoBue, New York State Department of Environmental Conservation  
Phone: (631) 444-0444; E-mail: [cplobue@gw.dec.state.ny.us](mailto:cplobue@gw.dec.state.ny.us)

David Simpson, Connecticut Department of Environmental Protection  
Phone: (860) 434-6043; E-mail: [david.simpson@po.state.ct.us](mailto:david.simpson@po.state.ct.us)

Carl Lo Bue, from NYSDEC's Division of Fish and Wildlife and Marine Resources, heads a study to combine a variety of lobster sea-sampling data to describe the existing population in the western Sound, document the commercial lobstering activities throughout the entire Sound, and develop methods to properly index the recruitment strength of young-of-year lobsters each year.

The second study, overseen by David Simpson from CTDEP's Marine Fisheries Division, addresses the need for expanded sea-sampling and trawl survey monitoring, sample collections for researchers, stock movements and identification, and habitat use.