Sea Grant

New Jersey

PROJECTS

&

PROGRESS

1995-

1997

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Rowan College of New Jersey
Rutgers University*
Saint John's University
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*** Indicates institutions participating in New Jersey Sea Grant research projects listed in this directory.**

INTRODUCTION

The National Sea Grant College Program, created by Congress in 1966, is operated by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). Sea Grant is a unique partnership with public and private sectors combining research, education and technology transfer for public service. This national network of universities meets changing environmental and economic needs of people in our coastal, ocean and Great Lakes regions.

Since 1975, New Jersey Sea Grant has been managed by the New Jersey Marine Sciences Consortium, an alliance of 30 colleges and universities, private organizations and individuals interested in marine affairs. Having met the high standards and program balance set by the National Sea Grant Program, New Jersey Sea Grant became the 26th program in the nation to earn the status of "Sea Grant College", in 1989.

The value of Sea Grant to New Jersey has grown steadily by addressing the ever-changing challenges and opportunities presented by the state's extensive and invaluable marine and coastal resources. Emphasis on critical coastal problems that focus on fisheries, shoreline processes, water quality, and marine biotechology continue to be at the forefront of current New Jersey Sea Grant research activities.

Scientifically sophisticated, these activities are also relevant to the state's economy. Despite its small size, New Jersey is bounded by more than 1,700 miles of coastline. Tourism is the second largest industry, accounting for over five billion dollars annually, most of that generated by marine recreational activities. New Jersey consistently ranks among the top ten in the nation in commercial fishing landings, and along with recreational fishing generates more than one billion dollars income annually.

From Sandy Hook to Cape May, and into the shallows of Delaware Bay, New Jerseyans are becoming increasingly aware of the importance of preserving the state's marine resources. They have also come to recognize the leadership of the New Jersey Marine Sciences Consortium and the New Jersey Sea Grant College Program in these efforts.

PROGRAM INFORMATION

FOLLOWING IS A CAPSULE DESCRIPTION OF NEW JERSEY SEA GRANT SPONSORED RESEARCH PROJECTS FOR PROGRAM YEARS XXI-XXII (1995-1997). TO OBTAIN ADDITIONAL INFORMATION ABOUT A SPECIFIC PROJECT, PLEASE CONTACT THE RESEARCHERS DIRECTLY. PARTICIPATING PRINCIPAL INVESTIGATORS ARE LISTED IN THE DIRECTORY BEGINNING ON PAGE 19.

BIOTECHNOLOGY

Hyperthermophiles-A Treasure Trove of Industrial Enzymes

D. Eveleigh, Rutgers University
Initiation Date: Completion Date:

Enzymes have long been used as catalysts for industrial processes. Classic examples of their use include conversion of starch to high fructose sweeteners used in soda drinks, and cleaners for laundry detergents both of which are produced as large scale commodities. A more general commercial application of enzymes has been hampered by their somewhat unstable nature. But mud samples taken from ocean hot smoker vents contain bacteria that bask in temperatures over 175° F. These heat loving bacteria produce extremely stable and efficient enzymes. One example being studied is *Thermotoga neapolitana*, from ocean hydrothermal vents which produce enzymes of potential use in the paper and pulp industry. This microbe produces extremely stable enzymes that have potential value to the paper industry for biobleaching. The "biobleached pulp" can be produced with a 25-50% reduction in the use of water polluting compounds. This study addressed the isolation of heat loving bacteria strains that demonstrated potential industrial applications.

New Opportunities for Ploidy Manipulation in Shellfish Using Tetraploids

S. Allen, Rutgers University
Initiation Date: Completion Date:

In the last decade, triploid Pacific oysters *Crassostrea gigas* have become an important component of the aquaculture industry. Until recently, triploid oysters were induced primarily by inhibiting the second polar body with a substance called cytochalasin B (CB). But limitations to using CB included FDA restrictions, its inefficiency in producing triploids and possible negative genetic effects. This project focused on eliminating these problems by creating a way to cross diploids and triploids. Beside serving as brood stock for the creation of triploids, tetraploids appear to offer other breeding possibilities in shellfish that were previously thought to be impossible, could be candidates for aquaculture, and may offer a bridge to higher levels of polyploids. By testing the breeding potential of tetraploids with the goal of determining promising directions for this new technology, the long term goal of this study is establishing tetraploids in the mainstream of shellfish hatchery production.

COASTAL ZONE MANAGEMENT

Determination of Recharge/Discharge Rates to/ from Barnegat Bay Sediments

B. Carson, G. Lennon, D. Allen, Lehigh University
Initiation Date: Completion Date:

Barnegat Bay, NJ is a shallow bay, typical of those found behind barrier island systems. Many studies have been conducted to better understand the bay's ecology as well as the physical and chemical environment. But the distribution, direction and flow rate of water movement between the bay and the underlying aquifer haven't been adequately determined. This flow

rate is needed to understand bay circulation patterns and distributions of salinity, nutrients and contaminants. Using an instrument (Portable, In-Situ Pore Pressure Instrument or PISPPI) previously designed and developed through Sea Grant funding, the pore pressure within shallow, relatively fine-grained bay sediments were measured in various locations. The flow rate was obtained from the pressure and a field-determined parameter called *hydraulic conductivity*, a measure of the ease with which water flows through the bay sediments. Numerous sediment cores were obtained to determine the grain size distribution, porosity, and density. These flow rates will be compared to predictions made by a U.S. Geological Survey groundwater flow model. Accurate flow rates will allow an increased understanding of conditions such as salinity and nutrient levels within the bay that are essential to ecosystem analysis and management.

Dune Development Related to FEMA Standards: A Test and an Application

N. Psuty, Rutgers University
P. Gares, East Carolina State University
M. Mauriello, New Jersey Department of Environmental Protection
Initiation Date: 8/93 Completion Date:

It's now widely regarded by the disaster community that hazard mitigation is the approach that needs to be adopted at all levels of government. Mitigation (moderating or alleviating impact) approaches take many forms. In the coastal zone, one approach is dune creation and maintenance to increase protection from the effects of coastal storms. Much of the burden of dune development rests on the coastal communities that need guidelines to assist in the evaluation of dune building and levels of mitigation afforded by these dunes. This project was initiated to add to the empirical data matrix of dimensional foredune changes associated with storm events so communities can be better advised about the proper setting of dunes, the

localized effects of alongshore beach/dune interaction, the effects of various densities of development and structures on the dune systems, and the measures of mitigation created by local dune-building programs. This project was carried out at several New Jersey locations for two storm seasons. An evaluation of the foredune development program at each site will be made, providing a better appreciation of both the on-site and inter-site variation especially the interaction with cultural features and shore structures. The focus of the evaluation will be on the spatial variation in foredune response to storm processes and deriving quantitative measures of the variation.

Shoreline Change on the Developed New Jersey Coast

K. Nordstrom, Rutgers University
M. Bruno, New Jersey Institute of Technology
N. Jackson, New Jersey Institute of Technology
Initiation Date: Completion Date:

This study is examining the effects of human actions on the physical evolution of the New Jersey shoreline to identify changes due to social and natural processes. Information is being gathered at representative coastal segments on the northern headlands section of the New Jersey shoreline, north of Manasquan Inlet, and on Absecon and Seven Mile Islands. The evolution of these segments over the past 150 years is being examined to identify spatial and temporal scales of change. The effects of major storms are being examined to describe storm-altered and human-restored landscapes and identify the implications of changes during subsequent storms. Structural and non-structural shore protection strategies are being examined to assess their performance in reducing erosion and coastal flooding. The results will provide managers with information to develop strategies that can be made more compatible with the holistic view of the coastal resource as a human-altered system and provide a realistic basis for future management decisions.

ECOSYSTEMS RESEARCH

Estuarine Eutrophication: Contribution of Dissolved Organic Nitrogen From Non-Point and Point Sources

S. Seitzinger, Rutgers University
R. Sanders, Academy of Natural Sciences of Philadelphia
Initiation Date: [illegible] Completion Date: [illegible]

Nitrogen is an essential element in the life-support systems of estuaries. But an excess of nitrogen and other nutrients results in dense populations of microscopic algae. When these single-celled plants become very abundant, water quality is degraded and other estuarine life such as finfish, shellfish and bottom vegetation are threatened. Both urban and agricultural coastal development continue to add more nutrients to estuarine ecosystems despite efforts to reduce overall nutrient loads. More development can mean more sewage and runoff. A large proportion of nitrogen from both of these sources is in the form of dissolved organic nitrogen (DON), but scientists do not yet know the overall contribution of DON to the eutrophication of estuaries. This project is using a combined field and laboratory approach to evaluate the changes in algal and bacterial production that result from increased loading rates of dissolved organic nitrogen to estuaries specifically from urban and agricultural sources. This information will help local, state and national agencies involved in nutrient management decisions to set appropriate, cost-effective policies regarding reduction of nutrient sources that contain significant amounts of dissolved organic nitrogen. Initial data has already been presented to several state agencies and the U.S. EPA and is being used in various estuarine management programs.

FISHERIES AND AQUACULTURE

Enhancing Hard Clam Aquaculture Through Manipulation of Larval Culturing Techniques

M. Russell, Villanova University
Initiation Date: [illegible] Completion Date: [illegible]

The hard clam, *Mercenaria mercenaria*, supports an economically important commercial fishery along the eastern coast of the United States. The share of this fishery attributable to the aquaculture industry has been increasing over the last decade. As aquaculture production of this and other species increases, basic research on the biology of these species takes on applied significance. This research is focusing on one of the earliest phases of the life cycle of the hard clam, veliger larvae, a small, planktonic, embryonic stage. During commercial production, hard clam veligers are raised in large culture tanks and it is necessary to change the waters periodically be sieving the larvae. During this drain down process the "runts of the litter" are allowed to pass through a sieve and are discarded. Only the largest of fastest growing larvae are retained. This procedure is intended to produce fast growing juvenile clams. However, other species of molluscs (the group that includes clams) show a negative correlation between larval and juvenile growth rates. This project is quantitatively evaluating the drain procedure by tracking the juvenile growth rates of both fast and slow growing larvae.

MARINE BIOTECHNOLOGY
MARINE TECHNOLOGY RESEARCH & DEVELOPMENT

Antimicrobial Peptides from Fish Skin
R/I-95003

G. Diamond, UMDNJ, The NJ Medical School
Initiation Date: 8/1/95 Completion Date: 7/31/96

Infectious agents continue to be a major concern both in human medicine and agriculture. In an attempt to discover new antimicrobial agents which may overcome this problem, research has focused on naturally occurring antimicrobial peptides. These molecules form a prevalent component of host defense found throughout nature. Previous research revealed one of those molecules in the skin of the winter flounder (*Pleuronectes americanus*). This peptide, named pleurocidin, exhibits *in-vitro* antimicrobial activity against bacteria and may form a first-line of host defense against pathogenic infections. The predicted secondary structure of pleurocidin suggests that it is a membrane-active antibiotic similar to the mangainin peptides first isolated from amphibian skin. This project extended studies of this antibiotic peptide both at the protein and nucleic acid levels, with a focus on its role in host defense. Not only could the results of this research provide the pharmaceutical industry with a new class of antibiotics, a better understanding of antimicrobial defense in fish will provide applied researchers in the field of aquaculture with the tools to examine ways to produce better, healthier stocks.

Tropic Transfer of Contaminants from Organisms Attached to Chromated Copper Arsenate (CCA) - Treated Wood to Their Consumers: A Field Study R/N 95002

P. Weis, UMDNJ - The NJ Medical School
J. Weis, Rutgers University
Initiation Date: 8/1/96 Completion Date: 7/31/97

Contaminants (copper, chromium, and arsenic), which leach from CCA-pressure-treated wood used for dock and bulkhead construction in estuaries, can accumulate to high concentrations in the epibiota ("fouling community") that grow attached to the wood (primarily barnacles, bryozoans, and algae). This project is investigating whether there is transfer of these wood-derived contaminants to animals that consume the attached organisms. Hypothetically, organisms that feed on the attached fauna will also accumulate the metals as a result. While it has been demonstrated in laboratory studies that trophic transfer of the metals from the attached organisms to their consumers can occur, this project will determine the degree to which such transfer can actually occur in the field and thus enter the food web. The degree to which the toxic metals leached from treated wood can get into the general estuarine food web is probably more important overall and of greater concern than the effects of the leachate on the fouling organisms that grow directly on the wood. This study will give insight into the potential transfer of these wood-derived contaminants in estuaries. Coastal managers concerned about cumulative effects of non-point pollution by toxins could decide to restrict the use of this material if significant amounts of metals enter the general food web in certain estuarine environments.

Cooperative Regional Oyster Selective Breeding (CROSBreed) Project R/F-9500

S. Allen, Rutgers University
Initiation Date: 12/1/95 Completion Date: 11/30/98

The need for a strain or strains of oysters resistant to both MSX and Dermo disease is critical on the East coast. Because of its long-standing activity in oyster breeding, the Haskin Shellfish Research Laboratory has produced several lines of MSX-disease resistant oysters. Recently, these strains were used to create a new synthetic line, a High Survival Resistant Line (HSRL) which are also under selection for Dermo-disease. Using HSRL lines and with funding from the Oyster Disease Research Program, Rutgers University is directing a regional project (CROSBreed) to demonstrate the general utility of these lines in three Mid-Atlantic environments (a site in Delaware and sites in the lower Chesapeake Bay). If these lines are superior across environments, this breeding program could provide select stock for aquaculture across the region. Alternatively, the HSRL lines could be interbred with local stock to create specific strains. This project will asses these alternatives. The regional nature of this project ensures that results will be generally useful across the Mid-Atlantic. The end users of this brood stock development will be oyster aquaculturists, both the hatchery and grow out industries, and if multiplied appropriately, the stocks could also be used in repletion programs.

Crassostrea virginica Pathogens in Chesapeake Bay Oyster Populations

E. Powell, Rutgers University
Initiation Date: [illegible] Completion Date: [illegible]

Understanding how environmental variations and biological processes control the relative abundance of MSX and Dermo disease and subsequent mortality in oyster populations is an important goal in oyster research. A collaborative modeling effort between the Haskin Shellfish Research Laboratory at Rutgers University and the Center for Coastal Physical Oceanography at Old Dominion University has resulted in development of an oyster populations dynamics model and a model for Dermo disease. This model has been used to examine the mechanisms by which epizootics (animal epidemics) are produced by Dermo in oyster populations and the mechanisms that control them. Key environmental variables include temperature, salinity, food supply and turbidity. Warm winters followed by dry summers, for example may trigger a Dermo epizootic that results in massive mortalities for several subsequent years. A drop in food supply or an increase in turbidity can also trigger an epizootic. Present modeling efforts, being conducted jointly by the Haskin Lab, Center for Coastal Physical Oceanography and the Cooperative Oxford Laboratory, Maryland Department of Natural Resources, are now directed at including MSX in this dual oyster-Dermo model to look at the relationship between these two diseases and better predict how each produces mortality under a suite of environmental conditions. The final model, containing the two diseases, Dermo and MSX will be the first dual-disease model developed for any invertebrate. It will permit examination of the mechanisms by which one of the two diseases becomes the principal source of mortality in oyster populations for a period of years and enable evaluation of different oyster culture strategies.

Gene Transfer in Oysters Through Gene Transfer in Oysters Through Allotetraploids, Hyperallotetraploids and Hypolotetraoploids: Towards The Transfer and Mapping of Disease Resistant Genes

X. Guo, Rutgers University
Initiation Date: Completion Date:

This study explored promising but untested forms of interspecific chromosome constructs for gene transfer in oysters, in an effort to transfer dermo and MSX resistance from Pacific oysters (*Crassostrea gigas*) to the American oyster (*Crassostrea virginica*). By developing allotetraploids, hyperallotriploids and hypoallotetraploids with specific chromosome combinations and evaluating their effectiveness, this study provided additional information and analysis of major approaches to gene transfer between the two oyster species that is part of a comprehensive, ongoing oyster disease research effort at the Haskin Shellfish Research Lab. The project could have profound impact on disease research and breeding in the American oyster by developing a method of rapid transfer of dermo and MSX resistance from the Pacific to the American oyster, which could in turn, contribute significantly to the revival of the oyster fisheries in the mid-Atlantic region. The successful transfer of disease resistance genes could lead to the localization and identification of those genes and contribute significantly to understanding the molecular basis of disease resistance in oysters. The study also set the first precedent of its kind in animal genetics and could be extended to other species and situations.

Life Cycle Studies of *Haplosporidium nelsoni* (MSX) using PCR Technology

S. Ford, Rutgers University
E. Burreson, Virginia Sea Grant
Initiation Date: Completion Date:

The oyster pathogen *Haplosporidium nelsoni*, popularly called MSX, has been a major cause of mortalities of the eastern oyster, *Crassostrea virginica*, for nearly 40 years. Despite much knowledge about the basic biology of the parasite, the life cycle stage infective to oysters and the source of that stage remain a mystery. A major question to be resolved in the life cycle of *H. nelsoni* is whether parasite transmission between oysters occurs directly or via an intermediate host. Laboratories at Rutgers and the Virginia Institute of Marine Sciences have recently developed gene probes for *H. nelsoni* and are collaborating in searching for a potential intermediate host using these probes in combination with polymerase chain reaction (PCR). Collections of estuarine organisms, with emphasis on those that feed on dead and dying oysters will be made on a regular basis in Delaware and Chesapeake Bays, where *H. nelsoni* is present. DNA will be isolated and subjected to PCR using primers specific to *H. nelsoni*. If PCR reaction products are found, samples will be further screened to identify the source (host). The morphology of the parasite in the intermediate host will be described and infection of this host will be attempted using spore stages of *H. nelsoni* isolated from oysters.

MARINE ADVISORY SERVICE

NJ Sea Grant Marine Advisory Service MAS-1

A. Wypyszinski, Rutgers University

One of New Jersey Sea Grant College Program's main objectives is providing marine-related information to people who depend on coastal and ocean resources for their livelihoods or use them for recreational purposes. MAS staff members are generalists, but also have special areas of expertise. These areas include commercial and recreational fisheries, marine recreation and safety, aquaculture, coastal law, seafood marketing, and marine and coastal pollution. Working daily with residents and other organizations, MAS staff members deliver the latest marine information and related research results. They also bring to program management new or potential problems and needs that should be addressed by research and education. Through this project, residents and target user groups have access to and benefit from program-generated information about managing, utilizing and conserving the state's marine and coastal resources.

COMMUNICATIONS

New Jersey Sea Grant Communications MAS-2

K. Kosko, New Jersey Marine Sciences Consortium

Communications plays a key role in the NJ Sea Grant College Program. Information about research, MAS, and education activities is distributed and publicized through brochures, fact sheets, newsletters, the print and electronic media, technical reports, conferences, workshops, and other outlets. Communications develops, produces, distributes and organizes these products or events. Scientists, educators, legislators, industry, the press and the general public use and benefit from the products and services.

MANAGEMENT AND DEVELOPMENT

Program Management MAN-1

Michael P. Weinstein, New Jersey Marine Sciences Consortium

Through this project, the Director and staff of the New Jersey Sea Grant College Program manage the program by planning, coordinating and evaluating its activities. These efforts maintain and improve both the program and its relationship with educational institutions, federal, state and local agencies and marine and coastal businesses and industries.

Program Development MAN-2

Michael P.Weinstein, New Jersey Marine Sciences Consortium

These project funds are used to provide support for research and other activities that respond to the needs of the state, industry and businesses on short notice. Information obtained from activities supported through program development is then used for long-range planning and often encourages the submission of future proposals to address these needs. The following projects are being supported with development dollars during the 1995-1997 funding cycle:

DEVELOPMENT GRANT AWARDS 1995-1996

BIOTECHNOLOGY

Polysaccarides of Entomorpha Clathrata
BT-95004D
B. Moll, Pennsylvania State University

The Use of a Marine Resource to Develop a Pulsed Delivery System for Administration of Bioactive Compounds B-95007
M. Wheatley, Drexel University

ECOSYSTEMS RESEARCH

Development of Controlled Cultures for Use in the Study of Brown Tides *R/L-95010D*
K. Keating, Rutgers University

FISHERIES AND AQUACULTURE

Reproductive Timing and Larval Abundance of the Introduced Crab, *Hemigrapsus sanguineus* *R/F-95011D*
P. Fong, Gettysburg College
E. Bochenek, NJ Sea Grant MAS

MARINE TECHNOLOGY

Development of Metal Binding Adhesives and Coatings from Chitosan *R/N-95013D*
S. Erhan, Ertech, Inc.

COASTAL ZONE MANAGEMENT

A Coastal Hazard Vulnerability Classification for Assessing Effects of Sea Level Rise in Estuaries *R/S-95006D*
K. Nordstrom, Rutgers University

EDUCATION

Design and Implementation of a Hydrothermal Vents Instructions Video for Precollegiate Audiences *E/T-95002D*
M. DeLuca, J. McDonnell, Rutgers University

NEW JERSEY SEA GRANT DIRECTORY

The following directory includes NJ Sea Grant staff, researchers and useful e-mail addresses related to current research projects. For more information regarding a specific project or activity, please contact the people or departments listed on the following pages.

SEA GRANT ADMINISTRATION

Dr. Michael P. Weinstein, Director, NJ Sea Grant
Bldg. #22, Sandy Hook Station
Fort Hancock, NJ 07732
TEL: 908/872-1300 ext. 21
FAX: 908/291-4483
E-Mail: mweinstein999@aol.com

Steven Litvin, Associate Director, NJ Sea Grant
Bldg. #22, Sandy Hook Station
Fort Hancock, NJ 07732
TEL: 908/872-1300 ext. 20
FAX: 908/291-4483
E-Mail: LITVINNJSG@aol.com

COMMUNICATIONS

Kim Kosko, Director of Communications
Bldg. #22, Sandy Hook Station
Fort Hancock, NJ 07732
TEL: 908/872-1300 ext. 18
FAX: 908/291-4483
E-Mail: KKNUJERSEA@aol.com

MARINE ADVISORY SERVICE

Dr. Eleanor Bochenek, Marine Agent
Ocean County Agricultural Center
1623 Whitesville Road
Toms River, NJ 08755
TEL: 908/349-1210
FAX: 908/505-8941
E-Mail: BOCHENEK@aesop.rutgers.edu

Gef Flimlin, Marine Agent
Ocean County Agriculture Center
1623 Whitesville Road
Toms River, NJ 08755
TEL: 908/349-1152
FAX: 908/505-8941
E-Mail: FLIMLIN@aesop.rutgers.edu

Stew Tweed, Marine Agent
Cape May Extension Center
Dennisville Road
Cape May Court House, NJ 08210
TEL: 609/465-5115
FAX: 609/465-5953
E-Mail: TWEED@aesop.rutgers.edu

Alex Wypyszinski, Director, NJ Sea Grant MAS
Institute for Marine and Coastal Sciences
Rutgers University
PO Box 231 CCRU
New Brunswick, NJ 08903
TEL: 908/932-9636 ext. 221
FAX: 908/932-6557
E-Mail: WYPYSZINSKI@aesop.rutgers.edu

PRINCIPAL INVESTIGATORS

Mr. Douglas C. Allen
Lehigh University
31 Williams Drive
Lehigh University
Bethlehem, PA 18015
TEL: 610/758-3660
FAX: 610/ 758-3677
E-Mail: dca4@lehigh.edu

Dr. Standish Allen
Rutgers University
Haskin Shellfish Research Lab
RD #1, Box B-8
Port Norris, NJ 08349
TEL: 609/785-0074 ext. 127
FAX: 609/785-1544
E-Mail: sallen@hsrl.rutgers.edu

Mr. Michael DeLuca
Rutgers University
Institute of Marine and Coastal Sciences
P.O. Box 231
New Brunswick, NJ 08903-0231
TEL: 908/932-6555 ext. 512
FAX: 908/932-8578
E-Mail: deluca@imcs.rutgers.edu

Dr. Gill Diamond
UMDNJ, New Jersey Medical School
Department of Anatomy, Cell Biology and
Injury Sciences
185 South Orange Avenue
Newark, NJ 07103
TEL: 201/982-3324
FAX: 201/982-7489
E-Mail: gdiamond@umdnj.edu

Dr. Douglas Eveleigh
Rutgers University
Department of Biochemistry Lipmann Hall-333A
P.O. Box 231
New brunswick, NJ 08903-023
TEL: 908/932-9829 ext. 328
FAX: 908/932-8965
E-Mail: eveleigh@mbcl.rutgers.edu

Dr. Susan Ford
Rutgers University
Haskin Shellfish Laboratory
Box B-8, RD #1
Port Norris, NJ 08349
TEL: 609/785-0074
FAX: 609/785-1544
E-Mail: susan@hsrl.rutgers.edu

Dr. Paul Gares
Department of Geography
East Carolina State university
Greenville, NC 27834
TEL: 919/328-6084
FAX: 919/328-6054
E-Mail: GEGARES@ECUVM1

Dr. Xming Guo
Rutgers University
Haskin Shellfish Research Laboratory
RD #1, Box B-8
Port Norris, NJ 08349
TEL: 609/785-0074 ext.124
FAX: 609/785-1544
E-Mail: xguo@hsrl.rutgers.edu

Dr. K. Irwin Keating
Rutgers University, Cook Campus
Department of Environmental Sciences
New Brunswick, NJ 08903
TEL: 908/982-8012
FAX: 908/932-8644
E-Mail:kkeating@rci.rutgers.edu

Dr. Gerard P. Lennon
Lehigh University
13 East Packer Avenue
Bethlehem, PA 18015
TEL: 610/758-3558
FAX: 610/758-6405
E-Mail: GPL0@lehigh.edu

Mr. Mark E. Mauriello
NJDEPE Environment and Land Use Reg.
CN-401, 401 East State Street
Trenton, NJ 08625
TEL: 609/292-8262
FAX: 609/292-8115

Dr. Benjamin Moll
Pennsylvania State University
519 Wartik Lab
University Park, PA 16802
TEL: 814/865-3777
FAX: 814/863-1357
E-Mail: bam22@psu.edu

Ms. Janice McDonnell
Rutgers University
Institute of Marine and Coastal Science
P.O. Box 231 CCRU
New Brunswick, NJ 08903-0231
TEL: 908/932-6555 ext. 521
FAX: 908/932-8578
E-Mail: mcdonnel@ahab.rutgers.edu

Dr. Karl Nordstrom
Rutgers University
Institute of Marine and Coastal Sciences
P.O. Box 231 CCRU
New Brunswick, NJ 08903-0231
TEL: 908/932-6555 ext. 502
FAX: 908/932-1820
E-Mail: nordstro@imcs.rutgers.edu

Dr. Eric Powell
Haskin Shellfish Research Laboratory
Rutgers University
RD #1 Box B-8
Port Norris, NJ 08349-9736
TEL: 609/785-0074 ext. 109
FAX: 609/785-1544
E-Mail: eric@hsrl.rutgers.edu

Dr. Norbert Psuty
Rutgers University
Institute of Marine and Coastal Sciences
P.O. Box 231 CCRU
New Brunswick, NJ 08903-0231
TEL: 908/932-6555 ext. 500
FAX: 908/932-1820
E-Mail: Psuty@imcs.rutgers.edu

Dr. Michael Russell
Villanova University
Biology Department
Villanova, PA 19085-1699
TEL: 610/519-4695
FAX: 610/519-7863
E-Mail: russell@ucis.vill.edu

Dr. Sybil Seitzinger
Rutgers University
Institute of Marine and Coastal Sciences
P.O. Box 231 CCRU
New Brunswick, NJ 08903-0231
TEL: 908/932-6555 ext. 342
FAX: 908/932-1792
E-Mail: SYBIL@imcs.rutgers.edu

Dr. Judith Weis
Department of Biological Sciences
Rutgers University
Newark, NJ 07102
TEL: 201/648-5387
FAX: 201/648-5518
E-Mail: jweis@andromedia.rutgers.edu

Dr. P. Weis
UMDNJ, New Jersey Medical School
Department of Anatomy, Cell Biology &
Injury Sciences
Newark, NJ 07103
TEL: 201/982-4409
FAX: 201/982-7489
E-Mail: weis@umdnj

E-SSENTIAL E-MAIL ADDRESSES

Following is a useful list of e-mail groups and web site addresses for Sea Grant, marine and coastal agencies, and related industries.

Fisheries Statistics:
http://remora.ssp.nmfs.gov/

The National Marine Fisheries Service (NMFS), and NOAA web site offers statistics, trade data bases and commercial landing data.

National Fisheries Institute:
http://www.nfi.org

Seafood industry news, statistics, trends, recipes, promotions and links to other seafood web resources.

National Sea Grant Depository (Pell Marine Science Library, University of Rhode Island):
http://nsgd.gso.uri.edu/

Archive of all Sea Grant publications nationwide, including a simple searchable database.

National Sea Grant Office Home Page:
http://www.mdsg.umd.edu/nsgo/index.html

Staff directory, research and funding information.

New Jersey Marine Trades Association:
http://www.amer.com.com/nimta/default.html

Membership directory, business and trade show listings, recreational boating links.

New Jersey State Legislature:
http://www.njleg.state.nj.us

Legislative roster, Bill text, legislative calendar.

Ocean and Coastal Resources:
http://seagrant.orst.edu/otherwww.html/

Includes links to dozens of Internet resources related to ocean and coastal issues. One of the most informative, interesting pages to-date.

Sea Grant MarinaNet/Coastal Recreation and Tourism Pages:
http://seagrant.orst.edu/ert/index.html

Links for information about marinas, waterfronts, ports, recreational boating, charterboats, sports fishing, travel & tourism, Clean Vessel Act.

Sea Grant Media Center Home Page:
http://www.mdsg.umd.edu/seagrantmediacenter/

Press releases, radio scripts, videos, special events, publications, newsletters, and other media resources available through Sea Grant.

Sea Grant Nonindigenous Species Site:
http://www.ansc.purdue.edu/sgnis/

Infocenter and links on zebra mussels and other aquatic nuisance species.

Wetlands, Oceans and Watersheds:
http://www.epa.gov/OWOW

EPA newsletters, fact sheets, brochures, press releases, regulations, order EPA publications, Congressional testimony, water quality data.

Sea Grant is a unique partnership with public and private sectors combining research education and technology transfer for public service. This national network of universities meets changing environmental and economic needs of people in our coastal ocean and Great Lake regions.

ACTIVITY BUDGET

PROGRAM BUDGET
1995 - 1996

TITLE	SEA GRANT FUNDS	MATCHING FUNDS
Ecosystems Research	151,166	112,916
Fisheries & Aquaculture	257,358	157,852
Marine Biotechnology Marine Technology Research& Development	168,680	117,075
Coastal Zone Management	180,062	157,448
Marine Advisory	183,164	182,707
Communications	118,375	60,126
Education/Outreach	186,059	72,996
Management & Development	236,762	97,552
TOTAL	**1,481,626**	**958,645**

ACTIVITY BUDGET

PROGRAM BUDGET
1996 - 1997

TITLE	SEA GRANT FUNDS	MATCHING FUNDS
Ecosystems Research	145,781	96,167
Fisheries & Aquaculture	259,984	164,899
Marine Biotechnology Marine Technology Research & Development	172,468	121,283
Coastal Zone	140,230	114,248
Marine Advisory	226,377	196,968
Communications	123,297	64,602
Education/Outreach	187,718	76,024
Management & Development	247,240	102,514
TOTAL	**1,503,112**	**936,705**

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Sandy Hook Station
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