



**Belle W. Baruch Institute
for Marine Biology & Coastal Research
University of South Carolina**



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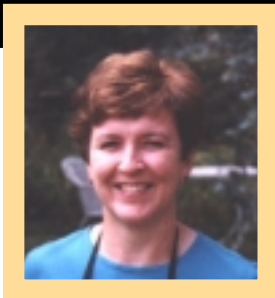
Mission

The Belle W. Baruch Institute for Marine Biology & Coastal Research is dedicated to fostering discovery, advancing existing knowledge, and providing a sound understanding of marine and coastal environments. Excellence in both basic and applied research of these complex and diverse ecosystems is the governing principle.

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Director's Perspective



Increasingly, the Institute's focus is on collaborative efforts to utilize diverse information from a variety of sources to address critical regional and local environmental processes and their relationships with human activities.

Partnerships continue to be an important theme in our program development. For example, USC, North Carolina State University, and the University of North Carolina-Wilmington have partnered in launching a major new initiative, the Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS). Caro-COOPS will establish a coastal mooring array of instruments off the Carolinas' coast, which will provide information on coastal conditions and will be used for modeling and predicting coastal flooding during storm events. Caro-COOPS will be deployed in 2002, and you will hear more about it in next year's report. Similarly, the Cast-Net program, developed in coordination with the Southeastern Universities Research Association (SURA) and funded by the National Science Foundation's EPSCoR program and by SURA, established a framework for data and information sharing among marine laboratories in the Southeast. Cast-Net is a partnership among USC, Dauphin Island Sea Lab in Alabama, Louisiana Universities Marine Consortium in Louisiana, Skidaway Institute of Oceanography in Georgia, and the University of Southern Mississippi, and represents an element of LabNet, founded by the National Association of Marine Laboratories. Efforts for 2001 focused on the creation of tools that facilitate documentation of environmental information, and promoting the integration and sharing of diverse data representing a variety of time scales and formats. Increasingly, the Institute's focus is on collaborative efforts to utilize diverse information from a variety of sources to address critical regional and local environmental processes and their relationships with human activities.

Research at the Baruch Institute continued to thrive. Grant and contract income for FY01 was \$1.6 million, which is an increase of 27% over the preceding year. Much of this research is focused at the Baruch Marine Field Laboratory (BMFL) near Georgetown, although many programs are based on campus and other university and field sites. In 2001, 75 research projects involving 100 investigators were conducted at the BMFL. Last year also represented the 10th year of funding for the North Inlet-Winyah Bay National Estuarine Research Reserve (NERR), which is one of 25 nationally designated NERR sites that conduct research and monitoring of sensitive and valuable estuarine environments and conduct educational programs based on those research activities. We also continued as the headquarters for the NERR Centralized Data Management Office (CDMO), which provides support and leadership for the national NERR system. The variety and scope of these many research activities are reflected in the research projects and grant funding listed in this report.

Growth in research has been enhanced by increase in our physical plant. In November 2001, we occupied the new North Inlet-Winyah Bay NERR building, a 4,500-sq-ft wing of the BMFL. This new space now houses the NERR activities, including the CDMO and laboratory and classrooms for monitoring and education programs. It has also released laboratory space in the BMFL for USC faculty and

student researchers and visiting scientists, which took some pressure off of the increasingly cramped research and teaching space.

Research is our foundation, but channeling that research to the public is critical to our mission. Outreach is essential, and many of our outreach activities are mounted through the NERR. Our ongoing Coastal Decision-Makers Series included workshops on Assessing the Health of South Carolina's Coasts, Pond Management, and Petroleum Contamination. These workshops are designed for professionals, public officials, and private citizens involved with environmental planning, regulation, and management of coastal areas. On the Columbia campus, we hosted the 4th South Carolina-Georgia Regional Competition of the National Ocean Sciences Bowl, a national competition developed to stimulate interest in the ocean sciences among high school students and demonstrate to the public the importance of the oceans in our daily lives. The winner of the regional competition, Irmo High School, Columbia, SC, went on to place 4th in the national competition - a significant accomplishment!

As with every successful organization, the heart of the Baruch Institute is its people. And we have seen some transitions and important events regarding ours during 2001. In conjunction with the USC Bicentennial Homecoming celebration, the College of Science and Mathematics and the Norman J. Arnold School of Public Health honored Drs. John and Winona Vernberg for their major contributions to education and research in the marine and health sciences. As part of the celebration, the Baruch Institute established the F. John Vernberg Fellowship in Coastal and Ocean Sciences in honor of its founding director, who did so much to make this such a successful research institution. The Institute also said farewell to Virginia Smith, who retired in June after 34 years at USC. Virginia had been with the Institute for many years as its Business Manager, and we were very sorry to see her go. Margaret Bergin, formerly Business Associate, was hired as the Institute's new Business Manager, and Teresa Donelan, formerly Laboratory Manager for USC's Marine Science Program, became the new Business Associate. We also take this opportunity to express our sincere thanks to our supporters and friends. So many of you have contributed to our activities in a variety of ways, enriching our programs and helping to broaden the impact of our research and educational pursuits. Thank you for your support, which is so essential to our success in having an impact on research, education, and outreach in the coastal and marine sciences.

These are a few highlights from a very successful year, and you will find more information in the pages of this Report. We are pleased to be able to share with you an accounting of our progress and achievements, and look forward to continuing with a productive 2002.

Madilyn Fletcher
Director

Research

Commitment to research and education can serve to guide future interactions with marine and coastal environments and their wealth of resources

Our research program is comprehensive and may focus on a particular organism or ecosystem component or encompass an entire coastal landscape. Long-term datasets (since 1980) provide an unusually extensive analysis of coastal processes and stability. These datasets, which comprise regular measurements of approximately 100 biotic and abiotic components, also provide our scientists and visiting researchers with an invaluable basis for and/or complement to further studies. Our research program can be described by the following broad areas:

Coastal & Estuarine Dynamics

Much of our research focuses on estuarine and coastal sciences, and the Baruch Marine Field Laboratory (BMFL) provides an excellently located, well-equipped platform for studies of geological, chemical, hydrological, and biological processes. Moreover, North Inlet - the site of the BMFL - is essentially unaffected by human activities and thus provides a valuable reference for comparison with other more developed coastlines, for assessment of human impacts on ecological processes. Primary focus areas include wetlands ecology, estuarine and coastal oceanography, groundwater chemistry and dynamics, watershed/water quality modeling and analysis, coastal geology, human impact on coastal ecosystems, systems ecology.

Pelagic & Benthic Processes

Estuarine systems involve complex interactions among organisms in both the water column and bottom sediments. Numerous factors, such as the needs and tolerances of the organisms, nutritional and geochemical environments, their movement via water currents or swimming, predator-prey or competitive interactions, or habitat degradation, influence the communities' structures. Primary focus areas are: population and community dynamics and structure, larval ecology and recruitment, nutrient dynamics, algal physiology and ecology, zooplankton ecology and nutritional biochemistry, sediment toxicology, microbial communities and transformations, coral reef ecology.

Fisheries Research

Increasing pressures from overharvesting or changing habitat requires information on the reproduction, feeding ecology, and growth, migratory behavior, disease susceptibility, and environmental requirements of finfish and shellfish. We are addressing these needs through research ranging from molecular biology of population dynamics to physiological and ecological studies of nutritional relationships. Primary focus areas are: Physiology and growth, health and disease, finfish and shellfish

recruitment and habitat use, population biology and evolutionary genetics, trophic dynamics.

Coastal & Ocean Observations

To understand the mechanisms of change in environmental systems, it is necessary to measure a variety of system properties over very large spatial and temporal scales. Such extensive observation systems require consistent, comprehensive, and reliable monitoring programs that provide high quality data for important environmental properties. In turn, the amount of data generated by such observations is enormous, and advanced computer technologies have enabled management and analysis of environmental data on an unprecedented level. For example, geographic information systems (GIS) and bioinformatics facilitate identification of coupling among biological and oceanographic processes with environmental parameters on the landscape scale. Such interactions and relationships must be identified to characterize natural variations and to identify long-term change or human-derived impacts on environmental systems. Primary focus areas are: geographic information processing, coastal ocean observing systems, satellite oceanography, bioinformatics.

Our primary research site, North Inlet Estuary, offers the unique opportunity to study essentially pristine major coastal habitats. The Institute's researchers and Associates also are involved in studies of other systems, locally and throughout the world.

The Baruch Marine Field Laboratory (BMFL) was utilized in 2001 for more than 75 research projects involving over 100 investigators. These efforts were in addition to field studies elsewhere and projects on the Columbia campus.

Our continuous monitoring and observing program represents over 20 years of observations.

Research Projects at the BMFL

Our primary research site, North Inlet Estuary, offers the unique opportunity to study essentially pristine major coastal habitats. The Baruch Marine Field Laboratory (BMFL) provides facilities for on-site studies and was utilized for more than 75 research projects involving over 100 investigators and 30 institutions. Abstracts for all projects being conducted at the BMFL by staff, graduate students, and faculty associated with the University and other institutions are available on our website (<http://www.baruch.sc.edu>). A wide variety of basic and applied research is represented. Although many other investigators use the BMFL to support their studies, the list only includes those projects that make regular use of the site.

Research Projects at Other Sites

In addition to our coastal field site, the Institute's researchers and Associates also are involved in studies locally (in Columbia and at other sites in South Carolina) and throughout the world. Cooperative studies with other institutions, which increase understanding of process and function under different environmental regimes, are enabled by international scientific exchange and cooperative agreements.

Scientific Service

Within the scientific community, our faculty, staff, and Associates are active in professional societies as members and officers, serve as reviewers and/or editorial board members of numerous scientific journals, and lend their expertise to the community and to local, state, and national government agencies on environmental issues.

They also further the advancement of scientific research and education through their service on University committees, through community speaking, seminars for scientists and students, and as judges in academic science competitions.

Long-term Datasets

Our continuous monitoring and observing program represents more than 20 years of observations for some measurements. Long-term datasets provide an unusually extensive analysis of coastal processes and stability. These datasets, which comprise regular measurements of approximately 100 biotic and abiotic components, also provide our scientists and visiting researchers with an invaluable basis for and/or complement to further studies. The data are accompanied by metadata and graphics, and are categorized as water chemistry and quality data; weather and meteorological data, north inlet tide data; and biological data. Maps, images, and archived collections are also available.

These databases are the result of long-term monitoring begun in the late 1970s and early 1980s in the North Inlet Estuary, Georgetown County, South Carolina. The National Science Foundation funded the Long-Term Ecological Research (LTER) program in the North Inlet Estuary from 1981 to June 1993. From 1993 to the present, the National Estuarine Research Reserve (NERR) Program has continued the support of the North Inlet-Winyah Bay monitoring.

North Inlet-Winyah Bay National Estuarine Research Reserve

North Inlet and Winyah Bay were designated a National Estuarine Research Reserve (NI-WB NERR) in 1992, making it part of the national system of coastal and marine habitats in the US and its territories. The NERR System was established as state-federal partnerships to conduct research, monitoring, and education.

The two estuarine systems of the NI-WB NERR differ substantially. North Inlet Estuary has been minimally disturbed by human activity, and Winyah Bay has been substantially altered by activities in the bay and in the surrounding area. The outstanding water and resource quality in North Inlet Estuary have provided the basis for a widely recognized program focused on understanding ecological processes. Winyah Bay is being studied to determine what can be done to reduce the stress on this system and restore healthier conditions.

NERR sites serve as laboratories and classrooms where the effects of natural and human activities on estuaries can be monitored and studied, with the purpose of generating and providing information for better management and conservation. The NI-WB NERR was established through a cooperative agreement with the USC Belle W. Baruch Institute for Marine Biology & Coastal Research, the National Oceanic and Atmospheric Administration (NOAA), and the Office of Ocean and Coastal Resources Management of the SC Department of Health and Environmental Control. Headquarters of the NI-WB NERR are located at the Baruch Marine Field Laboratory.

Centralized Data Management Office

NOAA's National Estuarine Research Reserve System (NERRS) acknowledges the importance of both long-term environmental monitoring programs and data and information dissemination through the System-wide Monitoring Program (SWMP). The SWMP's goal is to "identify and track short-term variability and long-term changes in the integrity and biodiversity of representative estuarine ecosystems and coastal watersheds for the purpose of contributing to effective national, regional and site specific coastal zone management." This comprehensive program consists of estuarine water quality monitoring, biodiversity monitoring, and land-use and habitat change analysis.

The Centralized Data Management Office (CDMO), established in 1994 in support of the SWMP, provides management of the basic infrastructure and data protocol to support the assimilation and exchange of data, metadata, and information within NERRS sites, coastal zone management programs, and other state and federally-funded education, monitoring, and research programs. The CDMO office is housed at the North Inlet-Winyah Bay NERR at the Baruch Marine Field Lab. The CDMO staff work with Research Coordinators and technicians at each of the 25 NERRS Reserves.

A Research Sampler

The following research highlights illustrate the breath of our research effort. These also emphasize integration of disciplines and collaboration.



Left unmanaged, anthropogenic activities threaten the environmental health and economic vitality of coastal estuaries. **The Urbanization and Southeastern Estuarine Systems (USES) project defines, measures, and models the impacts of urbanization on coastal estuaries** of the Southeastern United States. The objectives are to delineate the impact of multiple stresses resulting from urbanization on high salinity estuaries and to develop models that will provide a scientifically valid basis for land-use management decisions pertaining to the coastal zone. This long-term monitoring and research project, being conducted by **Dr. Dwayne Porter** and a team of scientists, encompasses current issues of both ecosystem health and public health. The multidisciplinary project is a collaborative effort involving researchers from the Baruch Institute, the USC Norman J. Arnold School of Public Health, the NOAA Center for Coastal Ecosystem Health and Biomolecular Research, the College of Charleston, and SC Sea Grant. Funding is provided by Coastal Oceans Program/NOAA/US Department of Commerce.

Given their distribution and potential to adversely affect shellfish, the ecological and economic impacts of red tides, *Pfiesteria*, and toxic algae may be considerable. Studies by **Dr. Alan Lewitus** and associates are

using a multi-pronged approach to the study of harmful algal blooms. These studies focus on the identity of organisms causing toxic blooms, the nutritional and physiological ecology of these organisms, and environmental conditions affecting algal communities. Other studies include a collaborative statewide survey of the distribution and potential adverse effects of harmful algal blooms (HABs) in South Carolina estuaries and a regional comparison (Delaware, Maryland, North Carolina, South Carolina) of the physical, nutritional, and trophodynamic mechanisms that contribute to blooms of *Pfiesteria* and other dinoflagellates that cause harmful blooms. Funding for these research efforts is provided by NOAA, SC Department of Health & Environmental Control, Sea Grant, and SC Department of Natural Resources.



Improving current risk assessment and risk management capabilities of organic pollutants in coastal environments is

the goal of research by Dr. Miguel Goni and associates. This requires assessing the role of natural organic matter on the behavior of particle reactive contaminants in coastal environments. Efforts on this area include parallel investigations of PAHs and natural organic matter in sediments from estuaries. The goal is to decipher the probable links between the sources, transport and cycling of natural organic matter and those of important anthropogenic pollutants. Determination of the sources and mode of contaminant introduction in coastal areas and estimation of pollutant residence times in estuaries are two key issues. Taking a multidisciplinary approach, these researchers hope to provide diagnostic as well as predictive information on the transport, deposition, and dispersion of contaminants in estuaries. These research efforts are funded by the US Environmental Protection Agency..



Basic and applied aspects of the **physiological ecology of plants adapted to wetland habitats and the biogeochemistry and systems ecology of wetlands**,

primarily intertidal wetlands, are the core of research efforts by **Dr. Jim Morris**. Studies combine **field work, analytical chemistry, remote sensing, and numerical modeling**. Long-term monthly measurements of salt marsh primary production and sediment chemistry (funded by NSF LTREB) have been made on permanent plots established in North Inlet salt marshes in 1982. The objective is to quantify the variability and assess the relative importance of physicochemical parameters that regulate productivity. The results have documented long-term increases in the net primary productivity of North Inlet salt marshes and significant changes in sediment chemistry. A collaborative study in North Inlet salt marshes (funded by USGS) is examining the processes controlling sediment accretion. Research on sedimentation and erosion in coastal wetlands will help manage these resources and forecast responses to environmental change. This is especially

...scientific research advancing knowledge for wise management...

important given predictions of an acceleration of sea level rise due to global warming. An EPA-funded project (CISNet: Molecular to Landscape-Scale Monitoring of Estuarine Eutrophication) involves several research teams looking at different strategies of monitoring estuarine eutrophication. Dr. Morris is focusing on remote sensing of salt marsh productivity. Ongoing biophysical data collections are being correlated with the spectral distribution of light reflected from leaves and with remote sensor data. Remote sensing of the concentration of chlorophyll in emergent wetland vegetation may provide a quantitative index of wetland condition and will demonstrate differences in nutrient loading among estuaries. Algorithms are being developed that will be used to remotely monitor the condition of coastal wetlands.



Non-indigenous species introductions to US estuaries are considered a potent economic and ecological threat to the coastal zone.

These organisms can significantly affect ecosystems through competition for resources, disruption of habitats, and changes to trophic systems. While many studies

have examined the role of a new predator to a system, less is known of the effect of these exotic species as prey. Research by **Dr. Andrew Lohrer** and others are quantifying the response of native predators to a novel prey (*Petrolisthes armatus*) by simulating pre- and post-invasion scenarios in laboratory mesocosms. Studies are also providing baseline information on invasion of exotic species, factors affecting successful invasion, and examining the influence on South Carolina oyster reefs. Related efforts involving quarterly monitoring of decapods in an intertidal oyster reef habitat are providing baseline data from which to calculate the potential impacts to SC of invasion by alien crab species found in the Southeast. Funding for this research is provided by NOAA.

Dermo disease in the Eastern oyster, *Crassostrea virginica*, poses an important challenge to estuarine management as it is responsible for oyster mortalities from Maine to Mexico. The causative agent of Dermo disease is

Perkinsus marinus, a protozoan endoparasite. **Dr. Dave Bushek** and others are investigating the ecological factors triggering outbreaks of this parasite; the mechanics of planktonic transmission; and analysis of parasite strains (population genetic structure). These studies will help identify mechanisms of dispersal of



P. marinus, provide a means to evaluate the effectiveness of management strategies designed to reduce the spread of various strains, and provide a mechanism to enforce management regulations. Funding for this research is provided by Sea Grant, NOAA, and SC Department of Natural Resources.

Stress factor gradients and interspecies interactions in salt marshes result in a number of well-defined vegetation zones. Differences in abundance and activity of rhizosphere nitrogen-fixing bacterial (NFB) may be explained by the stress gradients that contribute to formation of vegetation zones, as well as by the host plant responses to them. The feedback of host plants on the activity and stability of NFB assemblages is of particular interest due to the importance of nitrogen fixation to salt marsh productivity. **Dr. Charles Lovell** and students are examining the

population dynamics and activities of rhizosphere NFB assemblages associated with several species of salt marsh plants. They are also engaged in other studies of microbial communities, including the microbial colonization of submerged

surfaces. Colonization ultimately results in the formation of biofilms, which contribute very substantially to the process of biofouling. The consequences are clear, but the events leading to biofouling are poorly understood. The primary colonists on a variety of surfaces have been identified and are believed to facilitate the attachment of other species, leading to biofouling. If the primary colonists in marine systems have this essential role in the generation of marine biofouling communities, they may hold the key to controlling biofouling. Funding for this research is provided by the National Science Foundation and the US Department of Defense.



Dr. Sarah Woodin's research is directed to analysis of the importance of various factors in determining the abundance of organisms living in marine sedimentary environments, including the relative roles of direct and indirect competition, disturbance, predation (partial and complete), biogenic structural heterogeneity, and biogenic halogenated compounds. Her emphasis has been on experimental field manipulations of shallow water marine

sedimentary assemblages with parallel laboratory experiments. Many polychaete and hemichordate worms produce brominated aromatic compounds. These compounds are similar to another group of compounds (chlorophenols) released by pulp mills and other industries. Sediments contaminated by these noxious organic compounds have been shown in previous studies to act as negative recruitment cues and as predator deterrents. Areas where the sediments are appreciably contaminated by these compounds may act as chemical refuges from predation. Many of the worms that produce these compounds are very small (< 5 cm in length). Dr. Woodin and associates are exploring how the predator deterrentcy of these compounds is affected by the community context in which they occur, including patch density, size and composition. These studies will further explore how biogenic brominated aromatic compounds affect infaunal community structure. Research funding is provided by the National Science Foundation, Office of Naval Research, and the US Environmental Protection Agency.

Research Funding

Outside grants and contracts remained high at \$1.67 million, and were provided by federal, state, and private sources. These are new grants awarded in 2001. Not listed: funding for projects in progress and projects funds administered by outside sources.

Allen, D.

* North Inlet-Winyah Bay National Estuarine Research Reserve (NERR) \$232,000 Sponsor: SC Dept. of Health & Environmental Control/NOAA

Almeida, J.

* Optimization of nonlinear data analysis tools for the assessment of microbial communities \$26,380 Sponsor: SCRI/US Dept. of Energy

Beseres, J.

* Field and laboratory feeding dynamics of penaeid shrimp \$600 Sponsor: Slocum-Lunz Foundation

Bushek, D.

* The Caribbean oyster: Genetic resource for American oyster culture \$7,596 Sponsor: Harbor Branch Oceanographic Institute/NOAA

* Urbanization of southeastern estuarine systems \$48,001 Sponsor: SC Sea Grant Consortium/NOAA

Dean, J.

* Graduate assistantship \$8,000 Sponsor: SC Dept. of Natural Resources

* IOU larval/juvenile fish survey \$116,607 Sponsor: SC Universities Research & Education Foundation/DOE

Feller, R.

* Nitrogen assimilation and gut evacuation time in penaeid shrimp fed different quality food: Promoting environmentally safe shrimp culture \$28,154 Sponsor: SC Sea Grant Consortium/NOAA

Fletcher, M.

* A regional framework for interconnectivity of coastal ocean observing systems \$206,346 Sponsor: Southeastern Universities Research Association/NSF

* A regional framework for interconnectivity of coastal ocean observing systems - matching account \$100,000 Sponsor: Southeastern Universities Research Association

Gielazyn, M.

* Genotoxicity of chromium in *Crassostrea virginica*. II: Oxidative damage and reproductive effects \$600 Sponsor: Slocum-Lunz Foundation

Hall, R.

* The effects of zinc on arm regeneration rates and developmental patterns in the brittlestars *Amphipholis gracillima* and *Ophiothrix* \$800 Sponsor: Slocum-Lunz Foundation

Johnson, W.

* Microbial community responses to eutrophication in a southeastern US salt marsh estuary \$16,500 Sponsor: NOAA/DOC

Lewitus, A.

* A proposed harmful algal bloom initiative for South Carolina: Assessing the potential environmental impacts of red tides, *Pfiesteria*, and toxic algae \$140,060 Sponsor: SC Dept. of Natural Resources/DOC

* ECOHAB: Toxic dinoflagellates and nutrients: A regional comparative study \$89,950 Sponsor: University of Maryland/NOAA

* Urbanization of southeastern estuarine systems \$42,121 Sponsor: SC Sea Grant Consortium/NOAA

Matsui, G.

* The distribution and effects of oxygen on sulfate reducing bacterial populations in the burrows of the marine polychaetes *Diopatra cuprea* and *Chaetopterus variopedatus* \$800 Sponsor: Slocum-Lunz Foundation

Morris, J.

* LTER: Plum Island Sound comparative ecosystem study \$48,161 Sponsor: Marine Biological Laboratory

Murphy, S.

* Long-term sediment dynamics in a tidal salt marsh, North Inlet, South Carolina \$400 Sponsor: Slocum-Lunz Foundation

Noble, P.

* Novel mathematical approaches for determining ecosystem structure and dynamics \$82,521 Sponsor: National Science Foundation Co-PI: J. Almeida, M. Fletcher

Porter, D.

* Assessing community level mapping needs at

McCrary Training Center \$30,000 Sponsor: Office of the Adjutant General

* Continuing support of the NOAA NERRS Centralized Data Management Office \$161,889 Sponsor: SC Dept. of Health & Environmental Control/NOAA

* Development and support of a National Spatial Data Infrastructure (NSDI) node at the Belle W. Baruch Institute for Marine Biology & Coastal Research \$6,000 Sponsor: US Geological Survey/DOI

* SC NASA EPSCoR \$29,577 Sponsor: NASA

* Urbanization of southeastern estuarine systems \$113,130 Sponsor: SC Sea Grant Consortium/NOAA

Schneider, K.

* Differential movement patterns in *Mytilus* as a mechanism of selection \$850 Sponsor: Slocum-Lunz Foundation

Stancyk, S.

* Graduate assistantship \$7,362 Sponsor: SC Department of Natural Resources

* Graduate assistantship \$7,378 Sponsor: SC Department of Natural Resources

Staton, J.

* DNA Analysis of pesticide resistance in marine benthic nematodes \$59,924 Sponsor: SC Sea Grant Consortium/NOAA

Zingmark, R.

* Structure, dynamics and functional relationships between suspended and epiphytic microalgae and food webs in a salt marsh estuarine system \$10,000 Sponsor: SC Sea Grant Consortium/NOAA

* MERP 2001-4; Structure, dynamics and functional relationships (linkages) between phytoplankton, epiphytic microalgae, and food webs in a salt marsh estuarine system \$49,964 Sponsor: New Jersey Marine Sciences Consortium/NOAA Co-PI: A. Lewitus

Private Support

Donors are a vital part of our success, and their generosity has enabled us to improve and expand the research and education programs of the Institute. Our sincere thanks are extended to the friends who supported our efforts through their gifts to the Institute.

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Fiscal Statement

The Belle W. Baruch Institute for Marine Biology & Coastal Research, established in 1969 through the joint efforts of the Belle W. Baruch Foundation and the University of South Carolina, is a free-standing entity within the College of Science and Mathematics. Financial support is provided through South Carolina state appropriations, grant awards from federal, state, and local agencies and nonprofit organizations, and through endowments and private support.

Fiscal Year 2001 (July 1, 2000 - June 30, 2001):

State Appropriation

Columbia Campus	\$ 475,608
Field Laboratory	344,366

Grant Awards \$1,671,671

Endowments and Private Support

Interest income & Gifts	\$ 197,137
Endowment balance*	289,412

* Nonspendable funds that generate spendable interest

Outreach & Education

Research is our foundation, but channeling that research to the public is critical to our mission.

Public educational offerings & outreach activities

In our continuing efforts to link research and education activities at the Baruch Field Lab and North Inlet-Winyah Bay National Estuarine Research Reserve (NI-WB NERR), a variety of outreach and educational programs were offered throughout the year. These programs incorporate current research and interaction with Baruch Institute and Reserve scientists and technical staff to provide engaging learning experiences for all ages. Among the ongoing public programs held in 2001 were the Fishes of North Inlet Estuary (hands-on learning by assisting Reserve scientists collect, sort, identify, and measure fishes, shrimps, and crabs); the Marsh Side Chats series (informal lunchtime lectures on current research by guest speakers with varied research interests); and two perennial favorites, the Oyster & Clam class and the Crab & Shrimp class participants "get to know" these animals and learn how to prepare them with cooking lessons at the local bakery. Summer classes for children highlighted coastal ecology in several unique on-site habitats and the field lab research facilities.

Other outreach programs and events include local festivals, area school career days, science fairs, library summer reading programs, high school job shadowing experiences, and involvement in community programs such as the SC Department of Natural Resources' South Carolina Oyster Reef Enhancement Project, and the annual Beach and River Sweep cleanups. The continuing Estuary-Net project focuses on water quality with a watershed approach and involves area high school students. Students monitor a water body and collect data to share with other schools throughout the state and nation via the Internet. Also this year, the NI-WB Reserve participated in 'Estuary Live!'-an interactive web-based field trip that featured the North Inlet estuary in an hour-long live segment aired via satellite. This event, held as part of the national Estuaries Day celebration, featured live broadcasts from several Reserves across the nation and was an excellent media event for the Institute and Reserve, reaching over 8,000 Internet viewers and school participants.

Coastal Issue Workshops

Another important area for educational opportunities is the ongoing Coastal Issue Workshops for coastal decision-makers. These workshops, co-sponsored by NI-WB NERR, ACE Basin NERR, SC Office of Ocean and Coastal Resource Management, and other agencies, brings together agency management personnel, scientists, and environmental group representatives to share information and perspective on issues of concern. Several timely topics were covered in the workshops during the year: The Health of South Carolina's Coast: Part II, Status, Potential and Planning for Petroleum Contamination in South Carolina's Coastal Environment, and Successful Pond Management: Timely Information and New Research. Each of these coastal issues targeted specific audiences and provided information pertinent to participant's decision-maker roles within our local communities.

National Ocean Sciences Bowl

The annual South Carolina-Georgia Regional Competition of the National Ocean Sciences Bowl (NOSB) once again was organized and hosted by the Institute. This educational program, initiated in 1998 by the Consortium for Oceanographic Research and Education, was developed to stimulate interest among high school students in the ocean sciences and demonstrate to the public the importance of the oceans in our daily lives. One of the long-term goals of the program is to foster the next generation of marine scientists, educators, and policy makers for the ocean sciences. The winning team from our regional competition, Irmo High School (Columbia, SC), went on to place 4th among the 18 teams in the national contest.

Vernbergs Honored for Lifetime Achievement - Fellowships Established

In conjunction with the USC Bicentennial Homecoming celebration, the College of Science and Mathematics and the Norman J. Arnold School of Public Health honored Drs. John and Winona Vernberg for their major contributions to education and research in the marine and health sciences. Faculty, staff, former students, friends, colleagues from the community, and family were on hand to share the toasting and roasting of the Vernbergs.

As part of the October 19, 2001 celebration and as a lasting expression of our appreciation, the Belle W. Baruch Institute for Marine Biology & Coastal Research established the F. John Vernberg Fellowship in Coastal and Ocean Sciences. Likewise, the School of Public Health established a fellowship in recognition of Dr. Winona Vernberg, former dean of the School.

The F. John Vernberg Fellowship will provide support for students pursuing education in the realm of coastal and ocean science—a fitting tribute to Dr. John Vernberg's life's work. Establishing this fellowship was also an opportunity to recognize him for his research and teaching, for starting the Baruch Institute in 1969 and serving as its director for 27 years, and for starting the Marine Science Program at the University.

Academic Support

The Baruch Institute is an integral part of the academic side of USC. By providing infrastructure and resources for conducting environmental research, we support and interact with faculty and students in several academic units, particularly within the College of Science and Mathematics (Marine Science Program, the departments of Biological Sciences and Geological Sciences), the School of Public Health (Department of Environmental Health Sciences), the Department of Geography, and the School of the Environment. Other colleges and universities also make use of these resources throughout the year for field trips, course enhancement, and research. During the year, 43 class groups (total of 493 instructors and students) and 531 individuals made overnight trips to the Institute's field facility; day trips were made by 1,248 individuals throughout the year and visitation overall is heavier during the summer months.

The principal support for USC students is through our field facility, the Baruch Marine Field Laboratory (BMFL). The BMFL provides access to boats, vehicles, dorms, and laboratory space in conjunction with an intensive field-oriented research environment. Research conducted with support from the Institute forms the basis for numerous Master of Science (MS) theses and Doctoral (PhD) dissertations by students, as well as Senior Thesis research projects for undergraduate students in the South Carolina Honors College. In addition, the Institute offers graduate student fellowships.

Theses & Dissertations

Theses and dissertations for degrees awarded in 2001 are illustrative of the work conducted by students using Institute facilities.

Edwards, D.R. The effects of prey density on predator deterrence by haloorganic-containing infauna. (Thesis director: S.A. Woodin) (MS, Marine Science).

Bagwell, C. Physiological microdiversity of rhizoplane diazotrophs of intertidal grasses: Evidence for functional redundancy via niche specialization. (Dissertation director: C.R. Lovell) (PhD, Biological Sciences).

Dang, H. Determination of bacterial primary colonists of surfaces in coastal marine waters by 16S rDNA sequence analyses and fluorescence in situ hybridization. (Dissertation director: C.R. Lovell) (PhD, Marine Science).

Gray, B.R. Modeling nonstationary and spatially-correlated oyster infection prevalence data. (Dissertation director: D. Porter) (PhD, Epidemiology and Biostatistics)

Griffitt, R.J. Isolation of a β -like GABA receptor from an estuarine nematode, *Cylindrotheristus miamiensis*. (Thesis director: B.C. Coull) (MS, Marine Science).

Meyers, S.T. Short-term, small-scale effects of turbulence, flocculation, and meteorological events on sediment transport in the Bly Creek tidal channel, North Inlet, South Carolina.

(Thesis director: G. Voulgaris) (MS, Marine Science)

Mwamba, M.J. Rainfall enhanced sediment entrainment in the intertidal zone North Inlet, South Carolina (Thesis director: R. Torres) (MS, Geological Sciences)

Schill, S.R. Modeling hyperspectral Bidirectional Reflection Distribution Function (BRDF) data of smooth cordgrass (*Spartina alterniflora*) using a sandmeter field goniometer. (PhD, Geography)

Southerland, H.A. Physiological responses of estuarine phytoplankton to photoinduced fluoranthene toxicity. (MS, Environmental Health Sciences)

Stephen, J.A. Gut passage time, nitrogen assimilation efficiency, and growth in the white

Hodge Fellowships

Summer fellowships for students conducting research in coastal geology, coastal sedimentology, or marine geology have been made possible by a generous gift from Marine Science alumnus John Hodge.

Karyn I. Novakowski, Geology MS candidate, Characterization of estuarine channel networks

Joshua Miller, Geology MS candidate, An analysis of surficial Mediterranean Sea paleosalinity and paleotemperature gradients concurrent with the deposition of sapropels S5 through S7

Steppen Murphy, Geology PhD candidate, Long-term sediment dynamics in a tidal salt marsh, North Inlet, South Carolina

John Hodge received a M.S. degree in Marine Science in 1981. He is a practicing attorney in Columbia, SC.

The Baruch Institute continues to be active and visible as a leader in marine education initiatives on local, state, national, and international levels.

shrimp, *Litopenaeus setiferus*. (Thesis director: R.J. Feller) (MS, Marine Science).

Wang, M. Convergence of foliar monoterpenes in plant communities. (Dissertation director: D. Lincoln) (PhD, Biological Sciences)

Willis, Bonnie M. The use of high molecular weight dissolved organic matter by phytoplankton. (Thesis director: A.J. Lewitus) (MS, Marine Science).

Publications

Since 1969, the Institute has published more than 1300 papers, books, and reports resulting from our research efforts.

Gardner, R. & D. Porter. 2001. Stratigraphy and geologic history of a Southeastern salt marsh basin, North Inlet, South Carolina, USA. *Wetlands Ecology and Management* 9(5):371–385.

Viscido, S. V., M. Miller, & D. S. Wethey. 2001. The response of a selfish herd to an attack from outside the group perimeter. *Journal of Theoretical Biology* 208:315–328.

Fielman, K. T., S. A. Woodin, & D. E. Lincoln. 2001. Polychaete indicator species as a source of natural halogenated organic compounds in marine sediments. *Environmental Toxicology and Chemistry* 20(4):738–747.

Staton, J.L., N.V. Schizas, G.T. Chandler, B.C. Coull, & J.M. Quattro. 2001. Ecotoxicology and population genetics: The emergence of 'Phylogeographic and Evolutionary Ecotoxicology.' *Ecotoxicology* 10(4):217–222.

Schizas N.V., G.T. Chandler, B.C. Coull, S.L. Klosterhaus, & J.M. Quattro. 2001. Differential survival of three mitochondrial lineages in a marine copepod exposed to a mixture of pesticides. *Environmental Science and Technology* 35:535–538.

Han, K., S.A. Woodin, D.E. Lincoln, K.T. Fielman, & B. Ely. 2001. *Amphitrite ornata*, a marine worm, contains two dehaloperoxidase genes. *Marine Biotechnology* 3:287–292

Dame, R., D. Bushek, & T. Prins. 2001. Benthic suspension feeders as determinants of ecosystem structure and function in shallow coastal waters, p. 11–37. In K. Reise (ed.), *Ecological*

Comparisons of Sedimentary Shores. *Ecological Studies*, Vol. 151. Springer-Verlag, Berlin.

Fletcher, M. & E.M. Murphy. 2001. Transport of bacteria in subsurface systems, p. 39–68. In J.K. Fredrickson, & M. Fletcher (eds.), *Subsurface Microbiology*. John Wiley, New York.

Fredrickson, J.K. & M. Fletcher (eds.). 2001. *Subsurface Microbiology*. John Wiley, New York.

Almeida, J.S., J.A. Carrico, A. Maretzek, P.A. Noble, & M. Fletcher. 2001. Analysis of genomic sequences by chaos game representation. *Bioinformatics* 17(5):429–437.

Leaphart, A.B. & C.R. Lovell. 2001. Recovery and analysis of formyltetrahydrofolate synthetase gene sequences from natural population of acetogenic bacteria. *Applied and Environmental Microbiology* 67(3):1392–1395.

Heyman, W.D., R.T. Graham, B. Kjerfve, & R.E. Johannes. 2001. Whale sharks, *Rhincodon typus*, aggregate to feed on fish spawn in Belize. *Marine Ecology Progress Series* 215:275–282.

Medeiros, C., B. Kjerfve, M. Araujo, & S. Neumann-Leitão. 2001. The Itamaracá estuarine ecosystem, Brazil. p. 71–81. In *Coastal Marine Ecosystems of Latin America*. *Ecological Studies*, Vol. 144. Springer-Verlag, Heidelberg.

Thompson, J.N., O. Reichman, P. Morin, G. Polis, M. Power, R. Sterner, C. Couch, L. Gough, R. Holt, D. Hooper, F. Keesing, C. Lovell, B. Milne, M. Molles, D. Roberts, & S. Strauss. 2001. *Frontiers of Ecology. BioScience* 51(1):15–24.

Coull, B.C. & G.T. Chandler. 2001. Meiobenthos, p. 1705–1711. In J.H. Steele, S.A. Thorpe, & K. Turekian (eds.), *Encyclopedia of Ocean Sciences*, Academic Press, Orlando, FL.

Lohrer, A.M. 2001. The invasion by *Hemigrapsus sanguineus* in eastern North America: A review. *Aquatic Invaders* 12(3):1–11.

Bagwell, C.E., M. Dantzler, P.W. Bergholz, & C.R. Lovell. 2001. Host specific ecotypic diversity of rhizoplane diazotrophs of the perennial glasswort, *Salicornia virginica* and selected salt marsh grasses. *Aquatic Microbial Ecology* 23:293–300.

Leaphart, A.B. & C.R. Lovell. 2001. Recovery and analysis of formyltetrahydrofolate synthetase gene sequences from natural populations of acetogenic bacteria. *Applied and Environmental Microbiology* 67:1392–1395.

Lovell, C.R., M.J. Friez, J.W. Longshore, & C.E. Bagwell. 2001. Recovery and phylogenetic analysis of nifH sequences from diazotrophic bacteria associated with dead aboveground biomass of *Spartina alterniflora*. *Applied and Environmental Microbiology* 67:5308–5314.

Heyman, W.D. & B. Kjerfve. 2001. Gulf of Honduras, p. 17–32. In U. Seeliger & B. Kjerfve (eds.), *Coastal Marine Ecosystems of Latin America*. *Ecological Studies*, Vol. 144. Springer-Verlag, Heidelberg.

Kjerfve, B., L.D. Lacerda, & G.M.T. Dias. 2001. Baía de Guanabara, Rio de Janeiro, Brazil, p. 107–117. In U. Seeliger & B. Kjerfve (eds.), *Coastal Marine Ecosystems of Latin America*. *Ecological Studies*, Vol. 144. Springer-Verlag, Heidelberg.

Kjerfve, B., U. Seeliger, & L.D. Lacerda. 2001. A summary of natural and human-induced variables in coastal marine ecosystems of Latin America, p. 341–352. In U. Seeliger & B. Kjerfve (eds.), *Coastal Marine Ecosystems of Latin America*. *Ecological Studies*, Vol. 144. Springer-Verlag, Heidelberg.

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Aller, J.Y., S.A. Woodin, & R.C. Aller (eds.). 2001. *Organism-Sediment Interactions*. Belle W. Baruch Library in Marine Science, no. 21. University of South Carolina Press, Columbia, SC.

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- Ritchie, K.B., S.W. Polson, & G.W. Smith. 2001. Microbial disease causation in marine invertebrates: Problems, practices and future prospects. *Hydrobiologia* 460:131–139.
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- Quattro, J.M., W.J. Jones, & K.J. Oswald. 2001. PCR primers for an aldolase-B intron in acanthopterygian fishes. *BMC Evolutionary Biology* 1:9.
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- Dawson, M.N., J.L. Staton, & D.K. Jacobs. 2001. Phylogeography of the endangered tidewater goby, *Eucyclogobius newberryi* (Teleostei, Gobiidae), in coastal California. *Evolution* 55(6):1167–1179.

Facilities & Location

Marine Field Laboratory Complex

The main building (19,872 sq ft) of the complex comprises 18 research laboratories, a computer center, seminar room, conference-dining room, archived-sample room, classroom, technical support and administrative offices, and walk-in refrigerators and freezers. Screened work and storage space adjoin the air-conditioned laboratories. An observation deck, piers, floating docks, boat ramps, and marsh boardwalks provide access to a variety of coastal habitats.



The NI-WB NERR wing provides an additional 4,000 sq ft of air-conditioned space in support of educational programming and research. This wing houses the library and classroom, teaching laboratory, and office space for the NERR.

Two nearby buildings (3,000 sq ft total) are equipped for field-oriented research requiring running seawater. Seawater is also pumped to the main building, enabling investigators to work near analytical equipment. The seawater system provides up to 500 gpm of natural tidal creek water and 50 gpm of 20-um-filtered water. Large replicated mesocosms provide opportunities for manipulative experimental research in intertidal habitats.

Regular communication (including video teleconferencing) and travel between the Field Laboratory and the Columbia campus make it possible for scientists visiting the Field Laboratory to interact with additional researchers and to access a large variety of research resources.

Columbia Campus

Facilities (25,000 sq ft) on the University's main campus in Columbia include the Institute's headquarters, 16 research laboratories, a geographic information processing laboratory, marine culture and aquarium facility (animal, algal, and microorganism culture), and technical support offices. Outstanding library resources and additional equipment are available on the campus.



Location

The Institute has headquarters and laboratory facilities on the University's main campus in Columbia. The Baruch Marine Field Laboratory (BMFL), the Institute's coastal research facility, is located on Hobcaw Barony, near Georgetown. The BMFL provides facilities for research on estuarine, tidal freshwater, and nearshore ocean systems.

Hobcaw Barony, a 17,500-acre reserve dedicated in perpetuity for conservation and research, is owned by the Belle W. Baruch Foundation. Through a long-term agreement with the Foundation, the University oversees research and education activities in the marsh-estuarine area.

People

The Institute's faculty, staff, and Associates are our most valuable asset - each person bringing knowledge, dedication, and expertise to our programs.

Personnel

Many of the Institute's personnel function in multiple capacities and are listed in more than one subdivision. They are located on the USC Columbia campus (CC), at the Field Laboratory (BMFL) in Georgetown, or at the SC Department of Natural Resources (SC DNR) in Charleston.

Administration

Fletcher, Madilyn
Director, CC
Feller, Robert J.
Assoc. Director, CC
Allen, Dennis
BMFL Director, BMFL
Bushek, Dave
BMFL Asst. Director, BMFL

Support

Aguilera, Diana
Administrative Specialist, BMFL
Bergin, Margaret
Business Manager, CC
Blakely, Jan
Receptionist, BMFL
Teresa Donelan
Business Associate, CC
Sawyer, Mary Beth
Administrative Assistant, CC

Research

Allen, Dennis
Professor, BMFL
Almeida, Jonas
Research Asst. Professor, CC
Bashaw, Sarah
Research Specialist, BMFL
Baughman, Samuel
Research Specialist, BMFL
Beales, Carla
Research Specialist, BMFL

Bourgeois, Robert
Research Specialist, CC
Butsic, Emily
Research Specialist, BMFL
Bushek, Dave
Research Asst. Professor, BMFL
Cardinal, Jennifer
Research Specialist, BMFL
Cook, Megan
Research Specialist, SC DNR
Cutter, Leah
Research Asst. Professor
Dean, John Mark
Professor, CC
Epps, Brett
Research Specialist, SC DNR
Feller, Robert J.
Professor, CC
Fletcher, Madilyn
Professor, CC
Hankinson, Warren
Research Specialist, CC
Hayes, Ken
Research Specialist, BMFL
Hernes, Peter
Research Asst. Professor, CC
Kenny, Paul
Research Resource Specialist, BMFL
Kirby, John
Research Specialist, SC DNR
Knowlton, Anne
Research Specialist, SC DNR
Hymel, Sabrina
Research Specialist, SC DNR
Lewitus, Alan
Research Asst. Professor, BMFL
Lohrer, Drew
Research Asst. Professor, BMFL
Metz, Adrienne
Research Specialist, BMFL
Moody, Ian
Research Specialist, SCDNR

Noble, Peter
Research Asst. Professor, CC
Porter, Dwayne E.
Asst. Professor, CC
Potthoff, Michael
Research Specialist, BMFL
Reichert, Marcel
Research Asst. Professor, CC
Shuler, Andrew
Research Specialist, BMFL
Staton, Joseph L.
Research Asst. Professor, CC
Thompson, Audrey
Research Specialist, BMFL
Tymowski, Raphael
Research Specialist II, BMFL
Weingartner, Jason
Research Specialist, CC
Wetz, Michael
Research Specialist, BMFL
Wilde, Susan
Research Asst. Professor, SCDNR
Willman, Amy
Research Specialist, BMFL

Information & Data Management

Jefferson, Jeff
System Administrator, CC
Kelsey, Heath
Research Associate, CC
Miller, Anne B.
Public Information Coord. & Editor, CC
Neet, Matt
GIS Manager, CC
Ogburn-Matthews, Ginger
Statistical & Research Analyst III, BMFL
Porter, Dwayne E.
GIP Lab Director, CC
White, Dave
Research Asst. Professor, CC

Maintenance

Bouey, Joseph
Custodian
Forehand, Stephan
Maintenance, BMFL
Grayson, Willie
Custodian, BMFL
Matthews, Rick
Maintenance, BMFL

North Inlet -Winyah Bay National Estuarine Research Reserve (NERR)

Allen, Wendy
Reserve Manager, BMFL
Haertel, Susanne
Research Asst. Professor
Ide, Melissa
Data Manager, BMFL
Foose, Sarah
Research Specialist, BMFL
Jarrell, Jennifer
Research Specialist, BMFL
Johnson, Bill
Senior Research Specialist, BMFL
Keese, Jennifer
Research Specialist, BMFL
Lohrer, Drew
Research Coordinator, BMFL
Schmidt, Laura
Program Resource Coord., BMFL
Stines, Nick
Information Resource Coord. II, BMFL
Thomas, Beth
Education Coord., BMFL

Centralized Data Management Office for the NERR System

Dowdy, Danna
Statistical & Research Analyst III, BMFL

Ide, Melissa
Data Manager, BMFL

Norman, Ashly
Statistical & Research Analyst II,
BMFL

Porter, Dwayne E.
GIP Lab Director, CC

Small, Tammy
Operations Manager, Information
Technical Coordinator., BMFL

Stines, Nick
Information Resource Coordinator
II, BMFL

Associates

The Baruch Associates comprise scientific and technical personnel from throughout the University and from a wide range of outside universities, colleges, and agencies, as well as researchers employed by the Institute. These diverse professionals are a tremendous asset, contributing their skills to the Institute and/or participating in its research programs. A partial list of Associates, including their research area and affiliation, follows.

M. Aelion, Ph.D., biogeochemistry, bioremediation, microbial ecology, USC

D. M. Allen, Ph.D., marine ecology, estuarine dynamics, predator-prey interactions, USC

R. Benner, Ph.D., biogeochemistry, microbial ecology, C N P cycling, USC

E. Blood, Ph.D., ecology and nutrient decomposition, nutrient dynamics, Jones Ecological Research Center, Newton, GA

L. E. Burnett, Ph.D., invertebrate physiological ecology, University of Charleston, Charleston, SC

D. Bushek, Ph.D., community ecology, shellfish biology, host parasite interactions, USC

J. S. Chandler, Esq., environmental law, SC Environmental Law Project, Pawleys Island, SC

T. Chandler, Ph.D., benthic ecology, USC

D. Childers, Ph.D., ecological modeling, Florida International University, Miami, FL

B. C. Coull, Ph.D., marine biology, meiofauna ecology, USC

C. Curran, Ph.D., fish physiological ecology & behavior, larval & juveniles, marine biology, USC

R. Dame, Ph.D., marine biology, oyster community, ecological modeling, Coastal Carolina University, Conway, SC

M. A. Davidson, MMA, coastal policy, NOAA Coastal Services Center, Charleston, SC

J. M. Dean, Ph.D., marine biology, fish ecology, USC

A. W. Decho, Ph.D., microbial ecology, USC

M. R. DeVoe, MMA, coastal resource management and policy, SC Sea Grant Consortium, Charleston, SC

D. Edwards, Ph.D., mathematics, statistics, USC

R. J. Feller, Ph.D., marine benthic ecology, food web dynamics, USC

M. Fletcher, Ph.D., microbial adhesion, USC

R. Fox, Ph.D., invertebrate ecology and systematics, Lander College, Greenwood, SC

L. R. Gardner, Ph.D., chemistry of marsh water, USC

P. T. Gayes, Ph.D., marine and coastal geology, Coastal Carolina University, Conway, SC

M. A. Goñi, Ph.D., marine organic geochemistry, USC

B. Helmuth, Ph.D., biomechanics, physiological ecology, benthic ecology, coral reef ecology, USC

T. J. Hilbish, Ph.D., ecology geneticist, physiological ecology, USC

A. F. Holland, Ph.D., coastal ecology, SC Department of Natural Resources, Charleston, SC

J. R. Jensen, Ph.D., geography, remote sensing, USC

C. G. Kendall, Ph.D., carbonate sedimentology, USC

B. Kjerfve, Ph.D., physical oceanography, estuarine dynamics, USC

E. T. Koepfler, Ph.D., microbial ecology, Coastal Carolina University, Conway, SC

A. Lewitus, Ph.D., phytoplankton ecology, USC

S. Libes, Ph.D., marine chemistry, nitrogen dynamics, Coastal Carolina University, Conway, SC

D. Lincoln, Ph.D., plant-animal interactions, USC

D. Lohrer, Ph.D., exotic species, invasive species

C. Lovell, Ph.D., microbial ecology, USC

H. N. McKellar, Ph.D., ecological modeling, nutrient dynamics, USC

W. Michener, Ph.D., GIS, data management, LTER Network Office, Albuquerque, NM

R. Moore, Ph.D., distribution and ecology of marine and freshwater fishes, Coastal Carolina University, Conway, SC

W. S. Moore, Ph.D., coastal geology, geochemistry, USC

J. T. Morris, Ph.D., plant ecology, salt marsh dynamics, USC

T. Mousseau, Ph.D., evolutionary population geneticist, USC

D. Nelson, Ph.D., coastal geology, sediments, Coastal Carolina University, Conway, SC

P. Noble, Ph.D., genomes, University of Washington

D. Porter, Ph.D., GIS, coastal zone management, remote sensing, USC

J. Quattro, Ph.D., aquatic ecology, USC

B. Rippeteau, Ph.D., archaeology & anthropology, cultural remains in coastal & offshore zones, USC

E. E. Ruppert, Ph.D., marine invertebrate ecology and systematics, Clemson University, Clemson, SC

P. A. Sandifer, Ph.D., marine resources, SC Department of Natural Resources, Columbia, SC

G. Scott, Ph.D., environmental health, NOAA Coastal Environmental Health and Biomolecular Research, Charleston, SC

T. Shaw, Ph.D., environmental chemistry, USC

R. Showman, Ph.D., marine biology, USC

F. Sklar, Ph.D., modeling and landscape ecology, South Florida Water Management District, West Palm Beach, FL

G. Smith, Ph.D., microbial ecology, seagrass ecosystems, USC

S. E. Stancyk, Ph.D., marine biology, invertebrate reproduction, USC

R. Thunell, Ph.D., marine geology, USC

M. Tompkins, Ph.D., coastal resource policy, USC

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