

Scenes

Newsletter of the Skidaway Marine Science Foundation

July 2003

Skidaway Institute of Oceanography®

Celebrating 35 Years of Discovery
1968 - 2003



Robert Boiler Pauls Granger



Store Smoke House



July 2003

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NEWSLETTER OF THE SKIDAWAY MARINE SCIENCE FOUNDATION

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NEWSLETTER OF
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Skidaway On My Mind

Looking Back at the Beginnings of the Skidaway Institute of Oceanography

By Elizabeth Cooksey, Librarian, and Carol Megathlin, Public Information Officer

What were the ingredients of the success of this project? ...We had a firm *political* background, we had strong *academic* support, we had the support of the governor and the legislature. We had a simply *unassailable* piece of property to build on, we had strong domestic support, and we had environmental acceptance. I think of *Carpe Diem* — seize the day — and I think of putting together this unique thing which was begun in 1967— we seized the day, and I'm so glad we did.



Mr. and Mrs. Robert C. Roebling Photo: SKIO slide collection

Spoken in 1989 by the late John McGowan, one of the men most responsible for "seizing the day" and forming it into the internationally recognized Skidaway Institute of Oceanography, now celebrating its 35th anniversary.

Over the course of the past 35 years, the Skidaway Institute of Oceanography has evolved into a multidisciplinary institute, dedicated to furthering our understanding of marine and environmental sciences. The Institute today hums with the intensity of a dozen-plus scientists and a support staff of 50, absorbed in research funded by agencies like the National Science Foundation, the Office of Naval Research, and the U.S. Department of Energy. Graduate students and college interns come, stay, and go on a dizzyingly fast-paced schedule, mining the intellectual riches offered by the Institute researchers. A spanking new research vessel, the 92-foot R/V *Savannah*, waits at the dock, ready to transport twenty scientists and their state-of-the-art equipment to sea.

Skidaway Institute is a point of integration for the marine programs in the University System. Scientists and staff share the findings of their research with the community, helping to create citizens who are inclined to appreciate and sustain their coastal natural environment, while capitalizing upon coastal economic opportunities.

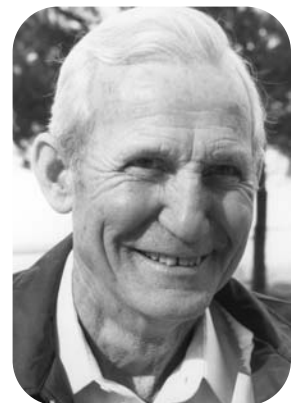
But in gently weathered silence among the hurried comings-and-goings stand the vestiges of a bygone era, tempering science with history, evoking the ghosts of our past. We would be the poorer to forget the people whose generosity and hard work

laid the foundation for our existence.

It took people of real vision - like John McGowan, Henry Levy, and Laurie Abbott - in the Georgia of thirty-five years ago to see the potential in the fledgling Institute. These three men joined forces, and with the support of other forward-looking Savannahians, they were able to nurture the idea of a marine research institution on the Georgia coast and eventually bring it to fruition. State-sponsored study of oceanography in Savannah began with the generosity of the Robert C.

Roebling family, who had raised purebred cattle and hogs on the site now home to SKIO. Robert Roebling, great-grandson of the engineer responsible for the Brooklyn Bridge, had decided to give up the cattle business on his Skidaway "Modena Plantation" in the late 1950's. Wishing to keep the land productive, he and Mrs. Roebling offered it to the University of Georgia for use in the school's agricultural studies program. The University, needing to branch into ocean programs, asked the Roeblings to consider allowing the gift to be used for that purpose instead, and by 1967, the plantation was part of a solid state plan for ocean education and research. Later, the Union Camp Corporation donated some of its island property, and with the successful passing of a \$3.6 million bond issue, Chatham County voters approved plans to build a road and a bridge from the mainland to the island.

To shed light on acronyms and chronology the reader will come across in the rest of this article, a short recitation of legislative actions in connection with our history is in order. In 1964 the Georgia State Legislature formed the Georgia Science Technology Commission¹ with an Oceanographic Task Force. Two years later, this task force proposed to the governor that an



Harry Carpenter
Photo: Suzanne Glasper

oceanographic center be established by the State on the coast. A research institute designed to provide facilities for and offer courses in marine science and engineering was envisioned. That same year, the U.S. Environmental Science Services Agency decided to establish an east coast facility. Wishing to attract the federal facility to Georgia, the State's General Assembly, with the advice of the Oceanographic Task Force, established the Ocean Sciences Center of the Atlantic Commission (OSCA) in 1967.² The availability of two parcels of adjoining property on Skidaway Island (one the gift of the Roebling family, the other from Union Camp) made the island an inviting location for such a facility. Although the federal facility ultimately was located in Miami, Florida, the idea for an oceanographic research center on Skidaway Island was carried forward, and the Skidaway Institute of Oceanography was established in 1968 as an autonomous entity within the University System of Georgia. OSCA was dissolved in 1972, and the Board of Regents took on full responsibility for the property and the Institute.

The Skidaway Institute of Oceanography formally opened on Monday, July 1, 1968. The first scientists had been appointed in April and included the new director, Dr. Thomas Jackson (formerly a dean at Georgia Institute of Technology's Engineering School), Herbert L. Windom, finishing his Ph.D. in oceanography and earth sciences at Scripps Institute/University of California at San Diego, and Howard Yen, finishing up his doctorate in mechanical engineering at Georgia Institute of Technology. Soon to follow was James W. Andrews, Jr.,³ completing his doctoral work in marine nutrition at the University of Georgia. Assisting these first research scientists were Assistant Director Lee Knight, who had worked with Dr. Jackson, Richard Buchner, who was hired to take care of the business affairs of the budding institute, and Bonnie Zeigler, who would start out as bookkeeper and expand her duties to encompass secretarial work as well.

Modena Plantation was ideally suited for a nascent oceanographic research institute. Early SkIO employees depended heavily on the infrastructure inherited from the Roeblings, including a sophisticated fire fighting system, farm buildings and dwellings, and a machine shop with equipment still in use today. Two deep-water docks built by the Roeblings on the Skidaway River are still in use and several of the farm dwellings currently house students and visiting scientists.

Some members of the Modena workforce had been guaranteed a place on the State's payroll by the agreement signed by



(Above) **Dale Henson, first director of OSCA & Lee Knight;** (Below) **John McGowan & David Doddridge, herdsman at Modena Plantation, retired SkIO, June 1980**

Photo: SkIO slide collection



(Above) **The barn under construction** Photo: Permission by Mr. W.R. Roebling

Roebling and the State. One of these was his sheet metal expert, Harry Carpenter, who stayed with the Institute until his retirement in 1993. Credited by the first scientists with providing critical continuity between the plantation and the Institute, Mr. Carpenter recently recounted his days on the island both before and after the Roeblings signed over their property. Arriving in 1951, young Carpenter had honed his skills at Henry Ford's Richmond Hill properties after graduating from Ford's Trade School there.

Mr. Roebling and I had something in common. He was completely honest and I tried to be, too. If somebody ever told me a "story," that was it — he was gone. He respected my work, and I respected his ability.

When I first met him, I was working on the barn. When I first come out here, the barn wasn't finished, especially along the seams. That roof wasn't poured. And the roof is concrete, and you had to mix it up and pour it out of five gallon buckets. He designed this barn. He couldn't get the metal at the time — he designed it during the War. When I came on, I was putting on the flashing on the seams, so it wouldn't leak.

Mr. Carpenter recalls Mr. Roebling's famous Black Angus auctions:

Cattle shows —that was the main thing of the barn. He had very expensive cattle.... he'd have a show and he'd have a bid.

We had the barn fixed! We had built up corrals outside....

fellows came from downtown, Johnny Ganem had that place set up, beer, all kind of stuff, top-notch stuff. When Mr. Roebling did something, he did it first class. Everything all dressed up, all kind of bunting and everything -- beautiful. And they'd bring the cattle in and they'd walk 'em round and they had people sitting around [in] bleachers up top [and bidding] ...and the auctioneer sitting right up above [calling] "bub-bub-bub" you know the way they talk....



Roebling dock at Isle of Hope
Photo: Permission of Mr. W.R. Roebling



Robert Roebling greets President Nixon at new SkI/O campus. Photo: Permission of Mr. W.R. Roebling

When asked about the days before the bridge to the island was built, retired Assistant Director for Business Affairs Dick Buchner said,

Initially we bought a little small boat, a 19-foot AristoCraft. It was fast, it'd run 35 miles per hour, and we outfitted it so it could take about 10 people at a time. Till our capacity was overwhelmed in terms of numbers of people — in other words, as long as we had only 10 employees - we'd all meet at the same time over at the Isle of Hope, board the boat, and zip over here The bad days, one person would be running late so nine people would be sitting there waiting on that other person, and the gnats are biting, and people are ready to go, and you'd be sitting there waiting for this person and finally he'd come and off you'd go. Bad days it would be foggy and you couldn't see one side of the river

Bonnie Zeigler, known as "Miss Bonnie" by everyone who remembers her as the beloved first Institute secretary, remembers a time before the new boat was purchased, when the boat inherited with the property couldn't go fast enough:

Monday, June 1, 1968, I came to work over here, and that Friday we had the first hurricane that I have ever been involved with, the barge tied up down there, and our boat, ... *Uncle Remus* ... was kind of slow getting us back — we'd come in from the Isle of Hope. [My friend] kept calling from downtown and saying, "Y'all get off that island. Get off that island." Well, there was four men on the island, and me — I was the only girl — and they went out trying to stabilize everything and her hollering to me on the phone, "Get off the island!"

The Institute played host to a famous visitor on October 8, 1970. President Richard Nixon landed via helicopter to give a speech dedicating the new campus. What the newspapers

didn't report was the Institute's preparation for the visit, recalled here by Lee Knight:

The Secret Service came in about two days before the landing. Advance men came first, and just looked, and about two days before Nixon came, they came in force. We were still traveling by boat back then, and we had our boat tied up by the dock, and they said we couldn't have that. And we said we had to have that — if somebody gets sick, or gets hurt or something, we have to have that. And they said, "We don't know what you're going to do with them, but you can't have that." So we argued around it for awhile, and finally I said, "Why don't you put one of your men there in the boat, and let him sit there with his weapon. And if we have to have it, he can go with us." "Well, I guess we can do that," they said.

... [T]he helicopter came in, and they brought [the President] over to a dais built outside, with a loud speaker, and chairs lined up all around and people came from all over Savannah.... And he spoke ten,

maybe fifteen minutes ... then got into the 'copter and took off. We went through some tough times for four, maybe five days before, for his thirty minutes.

In the early days, the director and all other staff had offices in the Roeblings' two-story schoolhouse/gymnasium (now called the Roebling House), where the Roeblings had also lived tem-



(Above) **The Dorothy R. Roebling laboratory today** Photo: Anna Boyette
(Right) **Mr. Roebling surveys the construction of the Dorothy R. Roebling Laboratory** Photo: SkI/O slide collection



porarily while their permanent home on the plantation was constructed. Currently, the director's office, business office, many labs and scientists' offices are housed in the Dorothy R. Roebling Laboratory building, designed by the Levy and Kiley architectural

firm. It was the first structure built specifically for Skidaway Institute.

Before the purchase of reliable generators for electrical power to keep experiments literally alive, Lee Knight spent many a night in an activity we current SkIO folk are certainly glad is a thing of the past:

We took the barn, with all those little stalls in there, we put tanks in there with running water and scientist Jim Andrews raised catfish in there for years. There was power over here — there was lights in the barn — this place was not primitive.

When we had storms, Jim [Andrews] always had somebody here on the island, but without running water to aerate the tanks, the fish didn't last long. So any time we had a power outage, we'd get a call — I've come over here many times in the middle of the night, by boat, and three or four of us, with paddles, would get in here and that's how we'd aerate the tanks.

Lee Knight smiles as he reflects on the spirit of the early SkIO community:

We employees were always very close. In the early years, everybody knew what everybody else was doing. It was just a big, nice group of people all working together.

The collegiality described by our "old timers" is reflected on an international basis these days as the Skidaway Institute has grown to encompass the efforts of scientists on an international scale. Working in collaboration with oceanographers from all over the world, Skidaway Institute scientists are actively engaged in deciphering the secrets of the global ocean. With every research project we undertake, every student we teach, and every citizen whom we help to appreciate the ocean, Skidaway Institute fulfills the dream of those who founded it.

1. under Georgia Law 1964, Number 987 (S.B. 283)
2. GL 1967, March 8, 1967
3. Dr. Andrews was at Skidaway from 1968 — 1972

Cover Photos: Top left: Syrup boiler and cane grinder; below: Store room and smokehouse; adjacent: Mr. Robert C. Roebeling and Blackcapmere II; below: Mr. and Mrs. Robert C. Roebeling. At right: Top: Dale Henson and Lee Knight; below: Dr. Jackson, first Director of SkIO, and Dr. Yen, second scientist at SkIO. Bottom row, L-R: Dr. Dick Lee at work at SkIO circa 1989 (Photo: Steve Bisson, Savannah Morning News); Dr. Herb Windom with his research coordinator Ralph Smith and visiting Russian scientists (Photo: Joseph Trotz, Savannah Morning News). Three-legged Navy tower, instrumented by SkIO scientists as part of a large scale ocean observing network. Charles Robertson, research coordinator for Dr. James Nelson, awaiting the retrieval of CTD aboard the R/V *Savannah*, 2002. Back cover: The R/V *Savannah* at the SkIO main dock, 2002 (Photo: Carol Megathlin)

THE FUTURE OF SKIO

By Dr. Jim Sanders, Director

What will the next 35 years hold for Skidaway Institute of Oceanography? Given the rapid changes in ocean science research and education over the past several decades, which are likely to continue, it is very hard to predict what SkIO scientists will be up to in even 10 years, much less in 2038, our 70th anniversary. But we can make a few predictions.

First, coastal Georgia is growing quickly. Careful decisions — based on solid scientific information — must be made by planners in order to ensure that the growth in the coastal region occurs within a framework of clear understanding of coastal natural environments and the conditions required to sustain them. Skidaway scientists can and will play a major role in this process.

Second, water will be an ever more precious commodity for all of the southeastern U.S. Water quality and quantity will drive decisions that must be made. Again, the science being conducted at SkIO will help with these complicated decisions.

Third, we will see the continuing development of linked ocean observing systems along the coast of the U.S. and worldwide. Continuous, reliable information on the coastal oceans is needed to address critical scientific problems and societal issues including commercial, military, and recreational maritime operations. Skidaway scientists are in the forefront of the development of these systems in the Southeast and will continue to lead efforts to produce a mechanism to address scientific, societal, and security issues of the coastal ocean.

Fourth, we will continue our efforts to better understand ecosystem processes and pressures that biological communities are facing. New approaches to understanding the mechanisms of life in the oceans are changing the way we look at marine ecosystems and are influencing our efforts to manage and harvest the ocean's living resources.

And finally, the oceans play a major role in the global biosphere, global climate, and in climate change. The oceans serve as reservoirs for important elements like carbon and gases such as carbon dioxide and oxygen. SkIO scientists will continue their efforts to understand how changes in the ocean will influence life on this planet. SkIO is poised to expand its current role of fostering collaboration in research, education, and public service and policy both in Georgia and throughout the southeastern coastal region.

The Skidaway Institute of Oceanography is committed to its vision of continuing to be an internationally recognized center of marine and coastal science.



St. Catherine's Island: A Haven for Endangered Lemurs

By Robert G. Lessnau,
Armstrong Atlantic State University

The Golden Isles are a collection of barrier islands off our southeastern coast. One such island is St. Catherine's, situated four miles east of the Georgia mainland. The 14,000-acre island is ten miles long and varies in width from one to three miles. Its mosaic forest habitat is dominated by pine and oak and dotted with fresh and salt-water ponds, giving the island a rich and diverse ecosystem.

St. Catherine's is best known as the home of Button Gwinnett, who resided on the island from 1765 until his death in 1777. Gwinnett was one of three Georgians who signed the Declaration of Independence. The island was acquired by the Edward John Noble Foundation and by 1970, it was registered as a National Historic Landmark by the National Park Service. The St. Catherine's Island Foundation, incorpo-



The superintendent's home on St. Catherine's Island.

rated in 1981, now manages the island as a non-profit organization committed to the conservation of the island's natural resources, the propagation of endangered animals, and the preservation of the island's historic sites.

An integral part of the Foundation's effort was to act as a conduit between the American Museum of Natural History and the original Edward John Noble Foundation for the purpose of initiating and supporting scientific research focusing on all aspects of the island. The research program has hosted scientists and students whose research focuses on the natural and cultural history of the island, including archaeology, vegetation, geology, avifauna, insect fauna, reptiles, amphibians,

mollusks, and other invertebrates.

The St. Catherine's Island Foundation continued the tradition of forming productive partnerships when it joined with the Wildlife Conservation Society (WCS), an organization originally founded over 100 years ago as the New York Zoological Society. Its primary objective has been saving wildlife and protecting natural lands across the globe. The WCS was a natural choice as a partner based on its successful worldwide conservation efforts, field research, and educational projects. The nation's largest system of zoological facilities operates under the WCS aegis. Facilities including the Bronx Zoo, the New York Aquarium, the



Tiffany, a black and white ruffed lemur.



Lemurs exhibiting social behavior.



Armstrong Atlantic student intern Nathan Grassi with ring-tailed lemurs.

wildlife centers in Central Park, Queens, and Prospect Park, and the Wildlife Survival Center (WSC) on St. Catherine's Island are all part of this global network of research, education, and conservation.

The mission of the Wildlife Survival Center,

established on St. Catherine's Island in 1974, is to enhance the captive propagation of endangered animals that normally do not breed well in traditional zoo-settings. Beginning with a founder group of ten gemsbok antelope in a five-acre pasture, the survival center has grown in twenty-nine years to include seven species of reptiles, fourteen species of mammals, and twenty-eight species of birds. The staff of ten full-time employees and three interns has made significant contributions to the scientific community in the fields of reproductive physiology, social behavior, and captive husbandry techniques.

WCS has created an internship program for students in partnership with colleges and universities, including Armstrong Atlantic State University. These internships are designed to involve students in active research programs while providing them with "hands-on" experience with the animals. Experiences on St. Catherine's Island have led many of the former interns to pursue graduate education, like veterinary school, or move directly into zoological-oriented careers at other institutions.

The establishment of free-ranging troops of lemurs has been an exciting and successful addition to the WSC's programs on St. Catherine's. In general, lemurs are cat-sized primates closely related to more complex primates like monkeys, apes, and humans. Lemurs are variously herbivorous-frugivorous and primarily diurnal. Endemic only to the island of Madagascar, most of the lemurs today are categorized as either being threatened or endangered, due primarily to habitat destruction and human encroachment on the little habitat that remains. Madagascar, along with its natural flora and fauna, is considered a "high conservation" priority by conservation experts.

Recognizing the severity of the situation in Madagascar, the WCS released six captive-bred ring-tailed lemurs on St. Catherine's in 1985 as the nucleus of a breeding population. The ring-tailed lemur naturally inhabits the southwestern region of Madagascar and is currently list-

ed as a threatened species. This species was ideal for releasing on St. Catherine's because these lemurs are flexible and fairly hardy and there were enough animals in North America to create a new free-ranging population.

The objective was to document how animals born and raised in a zoo setting would adjust to life outside an enclosure. What would happen when they were free to range where they pleased and eat whatever they wanted from the natural habitat? Would they exhibit behaviors like their wild counterparts?

The survival center is answering these complex questions. Now, there are nearly 60 ring-tailed lemurs who have arranged themselves into three free-ranging troops. They feed freely on vegetation and are apparently able to distinguish harmful plants, since none of the lemurs has become ill from feeding on plants they have never seen before. The population has grown and the original group has split into smaller groups, just as has been reported for wild ring-tailed lemurs. Their social relationships mirror patterns reported from groups in Madagascar. They are behaving like wild lemurs in every way.

The ring-tailed lemur troops on St. Catherine's have provided researchers, graduate and undergraduate students with an excellent research tool. Numerous universities including



A female, blue-eyed black lemur.

Armstrong Atlantic State University, the University of Georgia, and Georgia Southern University have conducted research projects over the years. The scientific community has been able to investigate such areas as infant development, feeding ecology, and social and reproductive behaviors. The unique situation on St. Catherine's has allowed researchers to test their field research plans before they leave for Madagascar, preventing costly delays should equipment or data collection plans fail to work as expected. These successes of the ring-tailed lemur troops have paved the way for the establishment of groups of other kinds of lemurs on St. Catherine's. The highly endangered black and white ruffed lemur, a high conservation priority from the eastern coastal rain forests of Madagascar, is one such species. The Madagascar Fauna Group (MFG) (a consortium of zoos and conservation centers in the United States and Europe) began research on this spectacular-looking lemur in the Betampona Natural Reserve in 1990 on a total population of only thirty



Three crowned lemurs; two gray females and an orange male.



Free-ranging ring-tailed lemurs on Catherine's Island.

animals in the entire 5,000-acre reserve. Extinction loomed as a real possibility for ruffed lemurs in this area. New animals needed to be introduced into the reserve to keep the population genetically healthy and to increase the number of breeding adults. Ironically, there are more ruffed lemurs in captivity in North America than there are in the reserve. A ruffed lemur species survival plan was created to help manage both the captive and wild populations. One goal of the management was returning captive ruffed lemurs to their natural habitat in selected sites like Betampona Natural Reserve.

The selection process for candidates to be part of the reintroduction program began in earnest. Lemurs destined to be returned to Madagascar were chosen based on their genes and even their willingness to try new foods. These lemurs had to be willing to explore a whole new world. Special steps were also taken to select animals who were very healthy, so that no diseases would be inadvertently introduced to the wild.

To give the home-bound ruffed lemurs some real-life experience, "boot camps" were established at the Duke University Primate Center and at the Wildlife Survival Center on St. Catherine's Island. These boot camps simulated the challenges they would face when released on the reserve. Every aspect of their boot camp performance was documented and graded. How did they use the novel habitat, what foods did they find, and did they develop social behavior and survival skills? Lemurs that received a passing grade were then sent on the long journey to their native home of Madagascar. After an initial period of acclimation, they were released back into the peril and freedom of the wild.

Since 1997, the MFG has released thirteen zoo-bred ruffed lemurs into the reserve. Project Betampona has demonstrated that these captive-born lemurs can be successfully returned to their native habitat. Lemurs from the boot camps are actually integrating themselves with wild lemurs, as evidence by the babies produced by a captive/wild pair. Reintroduction of zoo-

born lemurs now holds the real promise of bringing wild lemurs back from the brink of extinction, based on the success of the captive breeding programs of North American institutions like the Wildlife Conservation Society.

For nearly twenty years, the Wildlife Survival Center has managed lemurs in a free-ranging situation. The experience and knowledge gained from working with these animals has allowed the WSC to expand its collection to include other lemur species. The crowned lemur is one such species that was brought to St. Catherine's Island in 1997. Located in the

extreme northern territory of Madagascar, this species of lemur is currently listed as being endangered. Only eight institutions, including the WSC, currently manage the forty animals in the North American captive population. A collaborative effort is currently underway between the Bronx Zoo and the survival center to develop better husbandry techniques and genetically diversify the collection by importing animals from European zoos.

The blue-eyed black lemur, or Sclater's lemur, is indigenous to northwest Madagascar. This critically endangered species arrived on St. Catherine's Island also in 1997. Research from the field and zoos provides very little information in regard to its

behavior and ecology. The WSC within the last year released a small bachelor group of blue-eyed black lemurs on the island. The objective of the release was to establish a database and investigate the possibility of a reintroduction program for this species. Wild populations of blue-eyed black lemurs are not found in any protected areas of Madagascar. Having approximately seventy animals in its captive population worldwide, the blue-eyed black lemur is also a high conservation priority.



A mother lemur and her baby.

Entering into its fourth decade, the Wildlife Survival Center remains committed to preserving the earth's vanishing species. The WSC's primary objective is developing and testing field techniques and training others to care for wildlife. St. Catherine's Island provides a unique haven for achieving this objective and ensuring the survival of these endangered animals now and into the next century.

Robert G. Lessnau is a senior zoologist at the Wildlife Survival Center on St. Catherine's Island and an adjunct professor in Armstrong Atlantic State University's Department of Biology. Lessnau can be reached at lessnar@mail.armstrong.edu

Photographs are by Suzanne Kempke, assistant professor in biology at Armstrong Atlantic State University.



Assessing the Impacts of Private Recreational Docks

By Michael Sullivan, Georgia Southern University



The impacts of both individual private docks and the cumulative effects of these docks are being examined in this study.

As a native of coastal Georgia and a self-described naturalist, Mike Robinson has always had a keen interest in our region's environment. The Georgia Southern University student's concern for nature provided part of the impetus for an ongoing project that is measuring the impact of humans on one of our coast's critical habitats.

With the guidance of Dr. Clark Alexander of the Skidaway Institute of Oceanography and Dr. Jim Henry of the Georgia Southern Applied Coastal Research Laboratory, along with the support of the Georgia Coastal Zone Management Program, Robinson is analyzing the effect of recreational docks on the salt marshes that surround Wilmington Island.

Using a state-of-the-art Geographic Information System and old-fashioned field research, Robinson and company have charted the proliferation of docks on the island during the 30-year period beginning in 1970 and the docks' subsequent impact on the ecosystems contained within the marshes.

"The increasing population growth along the coast necessitates the need to obtain baseline and trend data regarding natural resources so that management practices can be both sound and effective," said Robinson, who is a senior geography major at Georgia Southern.

According to Alexander, with the exception of a limited study in South Carolina, there have been no other studies of recreational docks and their effects on salt marshes in the southeastern United States.

"There have been studies in the Northeast," Alexander said, "but the characteristics of insolation and estuarine habitats there are quite different from those found in the Southeast, and thus the conclusions from those studies are not readily transferable."

Robinson's interest in such a project seems only natural. Born in Savannah, he now lives on Tybee Island, and he spent much of the last decade serving as a guide for tours on barrier island and salt marsh ecology. After returning to school, he was

hired by Dr. Henry to work part-time at the Applied Coastal Research Laboratory on the Skidaway Institute campus.

"I have always been interested in human interactions and impacts with the coastal environment," Robinson said.

"Dr. Alexander presented the opportunity for me to work on this project and to submit my work to the Department of Geology and Geography at Georgia Southern in fulfillment of a senior thesis requirement for graduation.

"The combined factors of my interest in coastal processes, living here on the coast, the opportunity to work with

Dr. Alexander and Dr. Henry, and completing an undergraduate thesis formed a great situation."

Salt marshes are transitional areas between land and water. They are found along the intertidal shore of estuaries and sounds, and the salinity of their waters can range from near-ocean strength to almost fresh. Approximately 40 percent of all the salt marshes on the eastern seaboard of the United States are located on the coasts of Georgia and South Carolina.

Salt marshes are covered by salt-tolerant plants, primarily *Spartina alterniflora*, or salt marsh cord grass. The various plants provide food and shelter for a number of

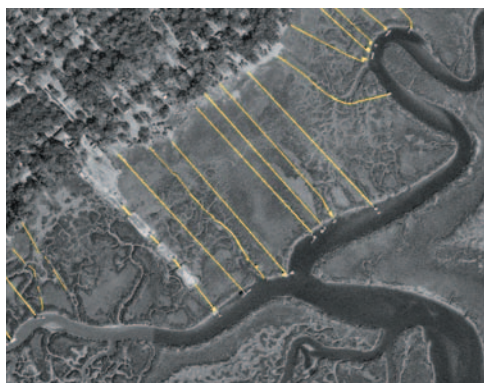
full- and part-time residents, including the marsh periwinkle, the mud snail, the Atlantic ribbed mussel, and the juveniles of many of our important commercial species.

In addition to the indigenous plant and animal life, the salt marshes of Wilmington Island contain an increasing number of docks, as evidenced by Robinson's research, which was conducted with the aid of a Geographic Information System (GIS) and aerial photographs.

"A GIS is a computer-based mapping program that allows spatial objects in the map to be associated with a related database," Robinson said. "Information about those objects is recorded in the database and can be accessed for spatial analysis. Map objects are organized into groups referred to as layers and may be placed above or below other layers to establish and



Location of study site in Chatham County.



Spatial information about dock structures was entered into the GIS from aerial photography.

together at once to examine dock proliferation patterns and characteristics over time."

The research revealed that there were 174 docks on Wilmington Island in 1970, but there were 301 in 2000. That represents an increase of 74 percent.

According to Robinson, all of the docks in this study are private recreational docks that are typically used for boating and fishing. The majority of the docks are of wood construction with wood pilings, and the mean size is 1,518 square feet, including the walkway, terminal platform and floats. However, the size of the docks runs the gamut: the smallest is just 37 square feet while the largest is 1,157 feet long and covers 7,405 square feet.

"On average, the newer docks appear to be larger than the older docks and have a larger footprint shading the marsh," Robinson said.

Indeed, while the number of docks increased 74 percent during the 30-year period covered by the study, the total area of the docks increased by 89 percent. About 53 percent of the total area of the dock structures is presently built over marsh, shading the underlying vegetation — an increase from 48 percent in 1975.

It is this "shading" and its impact on the vegetation of the salt marsh that is the primary focus of the study. Using a 0.1 square meter sampling area, plant height and stem density are being measured at locations directly beneath the center of the dock and at locations five meters on either side of the structure.

"Examining vegetation stem density is an effective way to assess and compare the associated productivity of a given area of salt marsh and quickly indicates the effects of a structure over vegetation," Robinson said.

Preliminary results of the study show that the docks have had an undeniable effect on vegetation.

"The average stem density is 53 percent lower beneath the

analyze relationships.

"In this project, a GIS is being used as a way to map recreational docks of the study area, group docks into layers that represent the year they were constructed, record data about each dock, and compare all layers

docks than adjacent to the docks," Robinson said. "Other factors being examined include how stem density is related to the height and width of the dock, and how the directional orientation of the dock affects the stem density."

The significance of the change in stem density remains to be quantified.

"We know that stem density is decreased by half under the docks, but is that important for salt marsh ecosystems in the Southeast?" Alexander asked. "Because salt marsh grasses are the major carbon source to our estuarine system, the quantitative relationship between the observed decrease in stem density and any decrease in carbon productivity needs to be established."

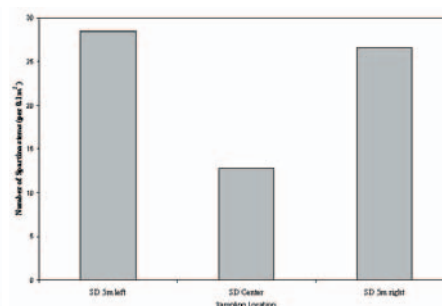
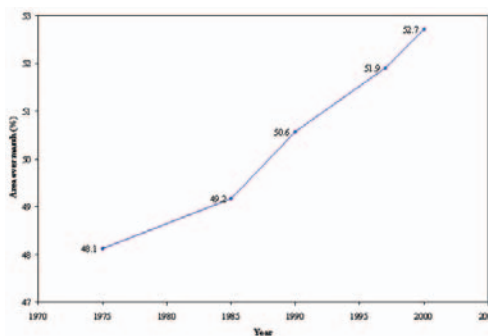
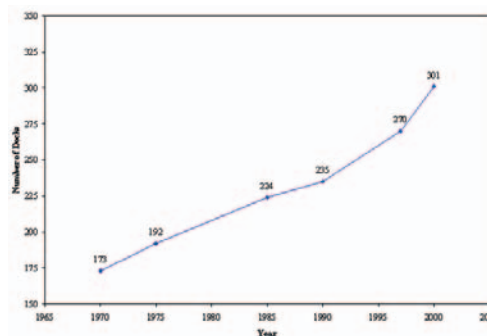
The proliferation of docks on Wilmington Island is expected to continue. According to the SAGIS Chatham County parcel database, approximately 610 lots on the island have riparian rights, which means almost 50 percent of these lots already have docks. Estimates based on the present proliferation rate suggest that by the year 2025 Wilmington Island could contain 460 docks that cover approximately one million square feet.

The study will conclude this summer, but Robinson is hopeful that the final results will lay the groundwork for more research.

"The ability to quantify the impacts associated with recreational dock structures will allow for future studies to evaluate changes and trends in the environmental conditions of salt marsh habitats," he said. "More detailed data collection, including above-ground vegetation biomass and sediment samples, will add valuable data towards understanding how these structures cumulatively affect the overall production of salt marshes."



(Top) Field data collection sites were accessed from both land and water as appropriate. (Bottom) Field data were collected under each dock and 5 meters to either side.

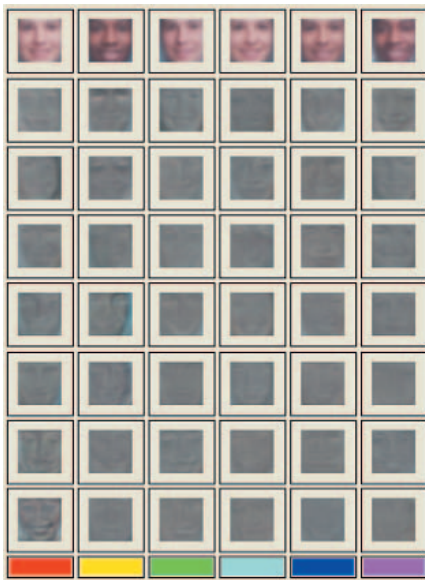


(Left) Number of docks on Wilmington Island; (Middle) Percentage of total dock area over marsh, which has been increasing at about 1 percent per year; (Right) Private recreational docks cause an average decrease in stem density beneath the dock when compared to stations 5 meters to either side.

A Picture is Worth a Thousand Words - Even More, When Computers Have Vision and Voice

New Tools for Marine Environment Monitoring

By Christopher F. Barnes, Ph.D., Associate Professor of Electrical and Computer Engineering, Georgia Tech Savannah



(Figure 1) Image data mining "potato head" parts for constructing human faces (a set of choices exist at each layer, top to bottom).

Mining Laboratory (MDML) of Georgia Tech Savannah is giving computers both vision and voice: MDML research is giving computers the software tools to "understand" the content and context of images and to easily communicate that understanding to humans.

MDML's technology breakthroughs for computer-based vision and computer-based image understanding are in the mathematical and software research area called image data mining.

Conventional data mining has been used for many years in business areas such as marketing. Data mining helps business decision makers allocate marketing resources in ways that maximize expected return on advertising investments. Businesses collect massive amounts of data related to product sales, and many companies are willing to make additional investments to learn "attributes" of their customers and their buying habits. For example, the use of "discount" cards at community grocery stores is one way for companies to obtain information about buyers and to associate that information with their buying decisions. But simply collecting raw customer sales data is not enough. Experience has shown that a company can be easily overwhelmed with such raw data.

Data mining is a process that discovers refined and useful information in massive amounts of raw data. Data mined information is often in the form of easily understood statistics, associations and trends. For example, data mining may reveal that grocery store customers that buy product A from Company

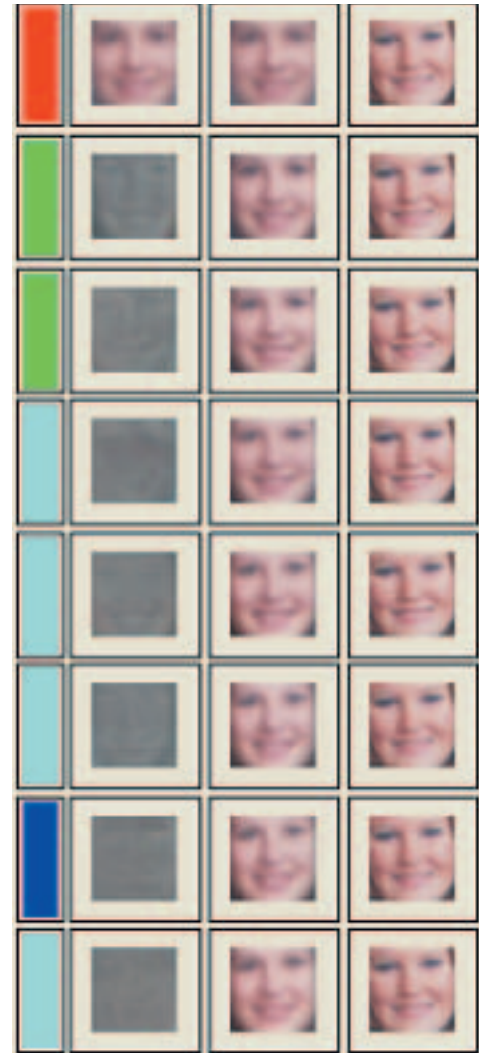
Human eyesight and the human ability to quickly understand visual information are truly remarkable. Computers, on the other hand, have had almost no ability to "understand" visual information, nor do they have a natural ability to extract information from images and convey it to human users in another form such as text or speech. However, research being conducted at the Multimedia Data Mining Laboratory

A are also likely to buy product B from Company B when they receive a certain snail-mail advertisement.

Researchers at Georgia Tech Savannah have invented a powerful extension of data mining that can discover information buried in images. Like conventional data mining, image data mining requires an extensive database of raw data. But unlike conventional data mining, an image data mining database may include both archived images and raw data about the content of archived images. For example, a database of aerial and satellite images of various pollution and other environmental factors related to marine environmental health could be used for coastal and marine monitoring.

As another example, a medical image database of mammograms would have both mammograms and the raw data of medical histories and outcomes associated with those images. Mammogram data mining could use such a medical archive to help doctors understand tumor images they find in new mammograms.

Image data mining is a process that finds information with images. The core technologies of Georgia Tech's image data



(Figure 2) The construction of a progressive sequence of face facsimiles (center column) from image data mining "potato head" parts (left column) that approximate a specific individual (right column). (Look closely to see facial features in gray boxes.)

mining approach are innovative and theoretically sound and have been under basic and applied research for more than a decade. The research reached a milestone in the spring of 2002 with the development of fully functional software prototypes that run on personal computers.

Modern computers have always excelled at transmitting and displaying images. But now, with the addition of image data mining software, computers will also aid humans in finding and understanding information buried in images.

Image Data Mining Applications

Georgia Tech's image data mining tools can be easily tailored to support various applications. For example, image data mining can be used in the following areas:

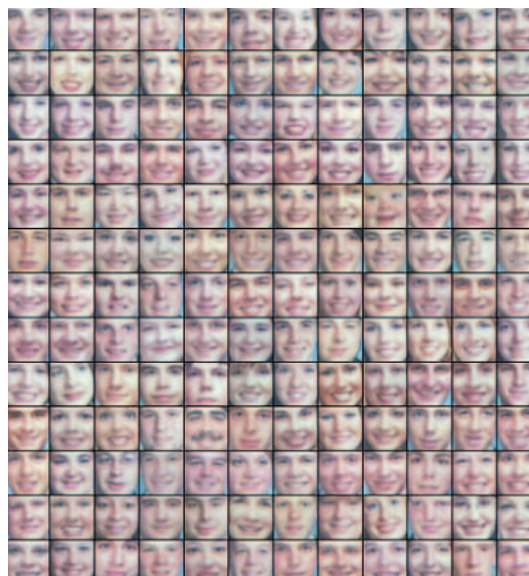
- **Remote Sensing** (e.g., Aerial & Satellite Image Understanding)
- **Biometrics** (e.g., Human Feature (etc.) Recognition for Homeland Security, etc.)
- **Medical Imaging** (e.g., Mammograms, X-Rays, MRI (etc.) Image Interpretation)
- **Machine Vision** (e.g., Manufacturing (etc.) Inspection and Defect Detection)

Research is currently being conducted in a variety of application domains. Some of this research is described next in the area of face recognition, mammogram data mining, and remote sensing data mining for agriculture. Possible future research in the area of marine environment monitoring and assessments is also described.

Face Image Data Mining for Biometrics

As a child, did you ever play with a Mister Potato Head toy? If so, it is not hard to understand how image data mining can

work to find similar images in a database. There exists a library of heads, eyes, noses, mouths, etc., as shown in Figure 1 that can be pieced together to form a large number of faces to help identify individuals. The face "parts" on the left side of Figure 2 (which were selected from the choices at each layer of the library shown in Figure 1) are added pixel-by-pixel to form the sequence of face composites (center) that represents the best possible "potato head" match to the specific individual shown repeatedly on the right column of Figure 1.



(Figure 3) **Given this collection of faces, how should a collection of "potato head" parts such as those shown in Figure 1 be constructed to provide a good representation of each individual face?**

The trick to making all of this work is to play the role of the toy company and assemble a good library of face parts that provides good matches to a large collection of individuals, for example, those individuals shown in Figure 3. Once such a collection of parts exist, it is possible to take an image and find all those in individuals who look like this individual as shown in Figure 4.

But simply finding images that look like other images is just the starting point. If the face image archive has various attribute information and data stored along with the images, then inferences can be made between the sets of matches from the database and the individual. The value of this capability can be appreciated in the medical application of mammogram data mining.

Mammogram Data Mining

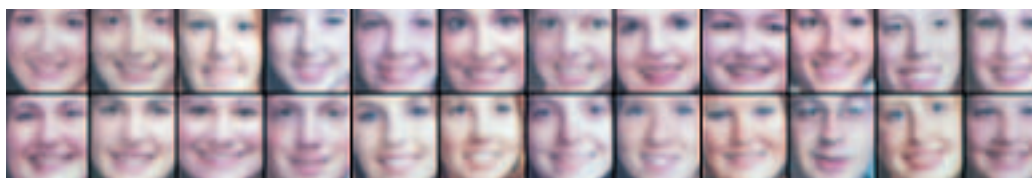
Georgia Tech believes image data mining can find information beyond the capabilities of un-aided humans to analyze and understand medical images. Image data mining should increase the efficiency at which application experts are able to glean information from images, for example, provide additional information to radiologists to support diagnosis (increased accuracy rate) of suspected cancers by comparing a patient's mammogram with the most similar patient cases extracted from an archive of past mammograms.

One scenario of applied mammogram data mining supposes that a large medical insurance company (or medical consortium) builds a mammogram "data warehouse."

The company makes the warehouse available to member radiologists. A clinical member

radiologist uses the warehouse to help screen digital mammograms with mammogram data mining. The computers discover "data gems" that link similar cases in a database of cancer images, recorded patient histories, recorded health care decisions and outcomes to a new patient's mammogram. The radiologist uses this information to help assess the current mammogram.

Data mining could also discover for a particular patient over 6,000 similar archived images with relevant metadata. If for these 6,000+ cases, fewer than 0.1 percent indicate

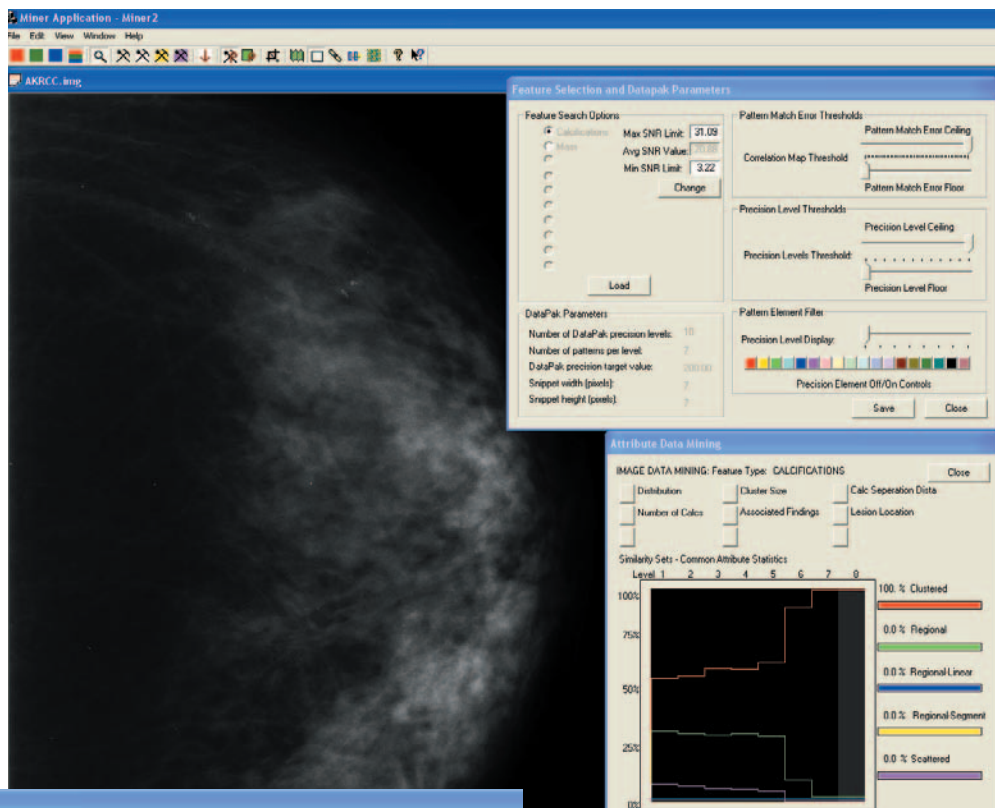


(Figure 4) **Progressive search of the image archive for face images that look like a particular individual.**

malignancy, should the radiologist order a biopsy? From a health care cost perspective, probably not. (Currently, only one in five biopsies actually proves positive — leading to high expense for mammogram screening and undue emotional trauma in patients.) Research is ongoing to see if image data mining can reduce the false positive biopsy rate from one-in-five to below one-in-two.

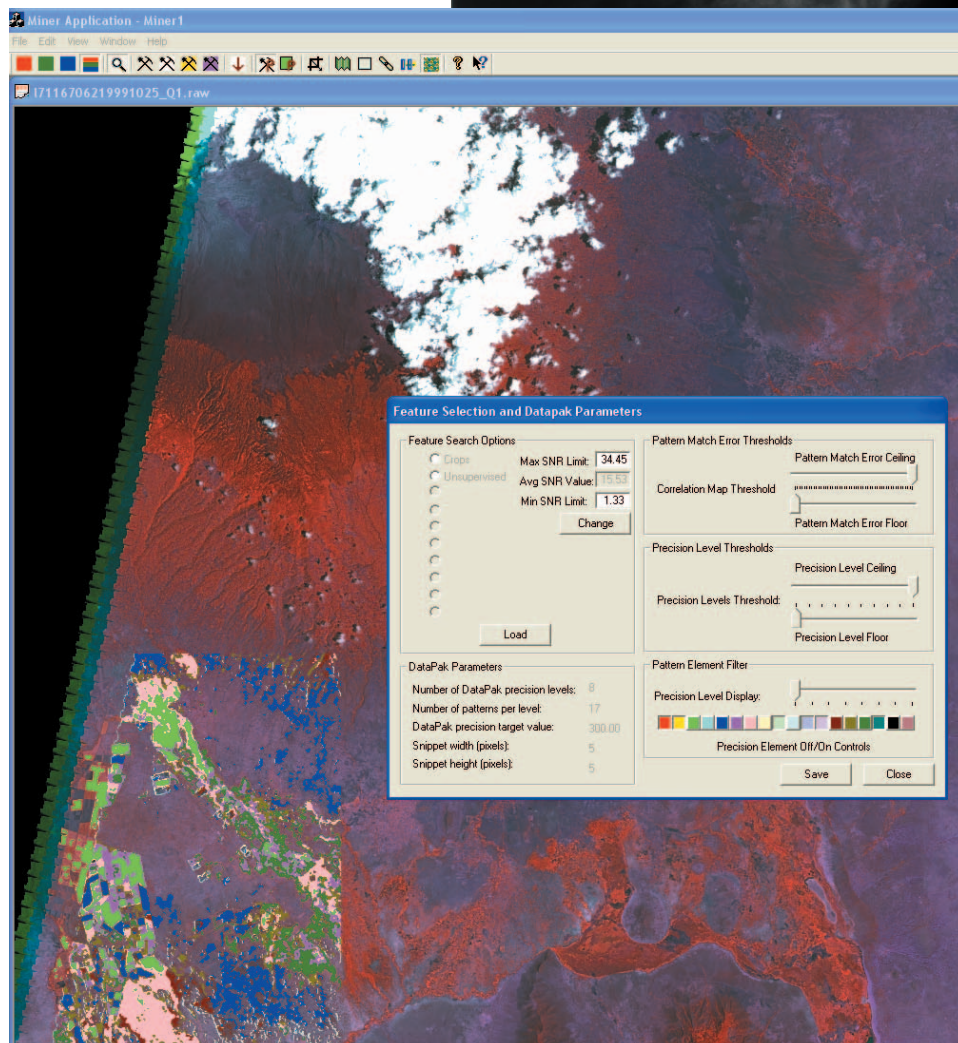
As another benefit, data mining should lower the time required to review images and simultaneously increase diagnosis accuracy — thus increasing the physician's patient case load and the profitability of the radiology business center.

In addition, mammogram data mining should make the quality of delivered health care more consistent as relatively inexperienced radiologists can make comparative assessments



(Above, Figure 5) **Mammogram data mining searching for cancer clues.**

(Left, Figure 6) **Image data mining of remotely sensed satellite or aerial images for environment monitoring.**



against their diagnosis and the diagnoses of similar cases made by highly qualified and experienced radiologists.

Another longer-term potential payoff of mammogram data mining is the possibility of detecting patient risk factors that lead to increased breast cancer occurrence by “deep” data mining of patient health information with the mammogram data mining system. Figure 5 shows an example of the mammogram data mining system at work.

Remote Sensing Data Mining for Environment Monitoring

Image data mining has uses in monitoring our environment and natural world through the use of remotely sensed satellite and aerial images. Research is being conducted on precision agriculture applications and forestry applications. Research is also planned to explore what can be learned about coastal and marine environments with the new and powerful tools of image data mining.

Counting Fish at Gray's Reef

By Gail Krueger

How many fish are in the sea?

It's a simple question with no simple answer. Yet knowing how many and what kind of fish are present is an issue that the managers of the nation's 13 marine sanctuaries must grapple with every day.

In April, Gray's Reef National Marine Sanctuary convened a first-of-its-kind workshop on the various methods used to count fish. Twenty-six participants, most of them scientists, met for three days to talk about tried-and-true fish count technologies in use today and technologies that might prove useful in the future. Subsequent workshops will address socioeconomic and management perspectives on fisheries monitoring.

The goal for Gray's Reef is to be able to find ways of measuring how fishing, the only extractable activity allowed in the Sanctuary, is affecting the complex of managed fish species. Knowing what the effect is will help managers develop the best management plan for the Sanctuary. Designing a consistent monitoring system should help answer that question, said Reed Bohné, GRNMS manager.

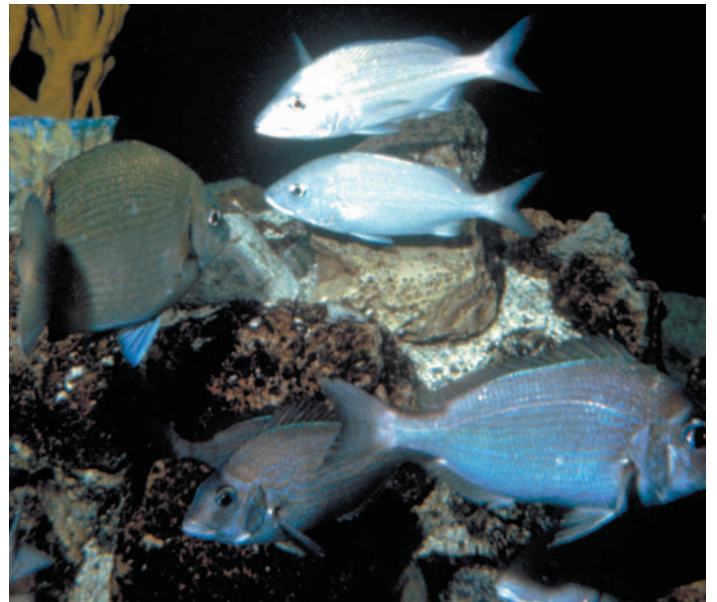
The nation's other National Marine Sanctuaries are also trying to answer the "how many fish" question. And more and more, the Marine Sanctuary System is being asked to answer ecosystem-wide questions on a national, even worldwide scale, said Paul Orlando, with the National Marine Sanctuary Program's science team. Orlando acted as the facilitator for the meeting. "Monitoring protocols developed at Gray's Reef National Marine Sanctuary may someday serve as basis for system-wide monitoring at all marine sanctuaries," he said.

And it all starts with counting fish.

There are about 300 species of marine fish in Georgia's coastal waters and about 100 species have been observed within the Sanctuary where various fish census efforts have been going on for years. Much of the fish count focus at Gray's Reef has been centered on the managed snapper-grouper complex. Many species of fish in this complex in the Atlantic are classified as overfished. Management strategies for these fish need to be augmented with the best available science.

Gray's Reef National Marine Sanctuary is one of the largest nearshore live bottom reefs in the Southeast and is a popular recreational fishing and sport diving destination. It is located 17.5 nautical miles off Sapelo Island and encompasses 17 square nautical miles. It is the only protected offshore area in the South Atlantic Bight.

The programs and projects of Gray's Reef are designed to address the fundamental goals of the National Marine Sanctuary Program. As part of the National Marine Sanctuary System, Gray's Reef is defined as an area of the marine environment of special national, and international, significance warranting protection and management under the National Marine Sanctuaries



Act. As stewards of coastal and ocean resources, the National Oceanic and Atmospheric Administration (NOAA) protects and manages 13 sanctuaries in the National Marine Sanctuary System. Gray's Reef became the nation's fourth National Marine Sanctuary in 1981 and is one of four sanctuaries on the east coast.

Some of the scientists attending the workshop have already been monitoring fish populations at Gray's Reef and discussed their techniques for conducting fish censuses. Others are using different techniques at other places ranging from the Bay of Biscayne, to the Flower Garden Banks National Marine Sanctuary in the northern Gulf of Mexico, to the Altamaha Estuary.

What became clear early on in the workshop is that there is certainly more than one way to count fish.

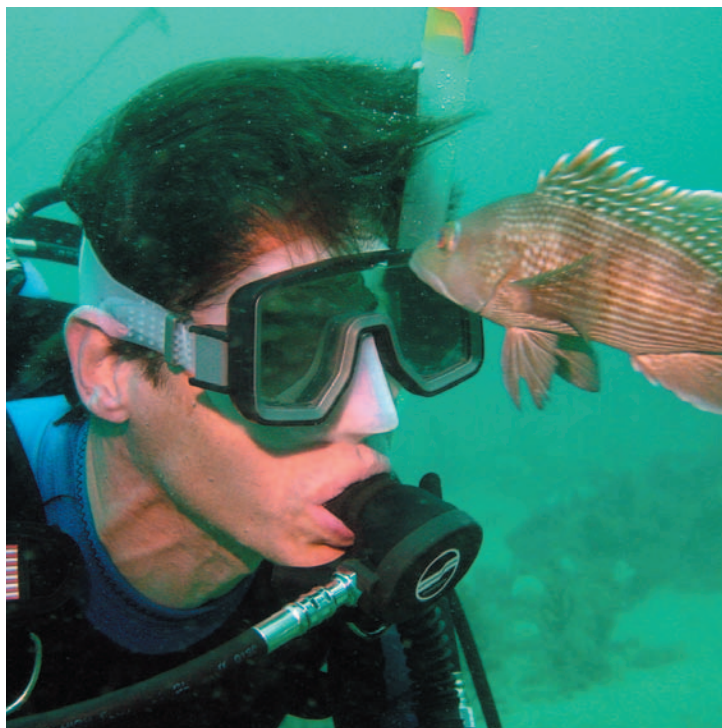
For instance, the National Marine Fisheries MARMAP program (Marine Resources Monitoring Assessment and Prediction) uses fish traps to look at fish abundance and diversity. Gray's Reef is a MARMAP monitoring site. Through the MARMAP work, Dr. George Sedberry of the South Carolina Department of Natural Resources and others have developed a long-term history of black sea bass, in part, by comparing black sea bass caught at Gray's Reef to fish caught at sites of similar depths along the South Carolina coast.

Tagging black sea bass under the MARMAP program has given scientists estimates of size and indications of how the black sea bass population moves. Sedberry and colleagues estimate that as many as 50,000 black sea bass move out of the Sanctuary area each year.

While Sedberry looks at adults, John Hare, of NOAA's Center for Coastal Fisheries and Habitat Research in Beaufort, South Carolina, is looking at larval and juvenile fish of all species. He is trying to find out how the tiny fish move into and out of Gray's Reef and how they use the habitat. Larval fish, captured at mid-water depths, are identified and point of origin determined. Data indicate that most of the larvae seem to be coming from sources farther south and arrive at the reef and adjacent waters via the Gulf Stream and associated currents.

Hare's work has added 60 species to the list of fish known to use Gray's Reef at some point in their lifecycle.

Chris Gledhill, out of the National Marine Fisheries lab in Pascagoula, Mississippi, uses an array of cameras to videotape fish in the Gulf of Mexico. The program, started with one



mounted camera looking into a fish trap, has evolved to an array of five digital camcorders in a pod array baited with squid. Tapes are taken back to the lab to be reviewed by trained observers who count the filmed fish. The method helps Gledhill measure abundance by giving him counts based on the presence or absence of fish species and minimum and maximum counts.

Having an archive of taped material is one of the highlights of this method. In fact, reviews of early videotape records revealed that a recently described species of fish had actually been caught on tape years ago and simply not correctly identified.

Doran Mason, of NOAA's Great Lakes Environmental Research Laboratory, used pas-

sive acoustic methods to listen for fish in a project conducted jointly with the University of Florida. Hydro-acoustic arrays can either be towed through the water by ships or mounted on buoys at fixed locations. Listening for fish can give estimates on fish abundance, biomass, and size, as well as the spatial and temporal location of fish. Such data can be interpreted into management actions by looking at predator-prey relationships, ecology, and population density and location.

Each of these, and the many other fish counting methods described at the workshop, has its pros and cons (none of them alone will give a complete picture of the fish population at Gray's Reef). It will take a range of methodologies to answer the questions of how fishing affects the managed fish species at Gray's Reef and how to design a monitoring program to detect differences in abundance, diversity, and size class distribution.

Gray's Reef is moving toward an allowable gear regulation that will limit fishing in the Sanctuary to rod and reel and hand line only. The goal of the workshop is to produce a peer-reviewed fisheries monitoring program, to be implemented in spring 2004, that will be able to adequately measure the impact of fishing on the fish.





Rose snapper, *Lutjanus guttatus*, with a cymothoid isopod crustacean that has replaced its tongue.

Photo: M. Gilligan (copyright)

Isopod Got Your Tongue?

A Bizarre Story Takes a Strange Turn

By Matt Gilligan, Ph.D., Professor and Coordinator,
Marine Sciences, Savannah State University

It began with one of the last research trips that I made to the Sea of Cortez (Gulf of California), Mexico, in November 1979 while a graduate student in the Department of Ecology and Evolutionary Biology at the University of Arizona (that's another story). At the San Carlos Marina in Sonora, Mexico, I was inspecting a recreational fish catch, looking for potential purchases of unusual fishes as additions to a world-class systematics collection of eastern tropical Pacific fishes at the University where I served as assistant curator for several years. My colleague, companion, and now wife of 22 years, Heidi, asked me, "Matt, what's that in the fish's mouth?" I said, "It's just a cymothoid isopod (*Cymothoa exigua*).....that's eaten the tongue of a rose snapper clean off!"

Isopods are little crustaceans that may be free-living or parasitic or both. Most are marine (live in the ocean) but there are a couple of notable exceptions. The familiar "pill bugs," which live on land in damp places (they breathe by gills which must remain moist to function) and roll up into little armored spheres for protection when disturbed, are isopods. Also, there is relict species/population living in fresh water at the Socorro hot spring in New Mexico that has been isolated there since the ocean receded from the Rio Grande valley over 30 million years ago. Students, colleagues and I saw them in person during a field trip offered as part of the American Society of Limnology and Oceanography (ASLO) meeting in Albuquerque in February 2001.

I had seen a lot of these little external parasites on marine fishes (often called "fish lice") over the years in the Sea of Cortez (they are not uncommon on fishes in Georgia's coastal waters) but I had never seen one destroy the tongue of its host. Most often they attached to the outside, gill chamber or mouth of their host fish, grazing on mucous, skin, gills, blood or whatever tissue is available. All cymothoids appear to be protandrous hermaphrodites (start life as males and then transform to females). They enter the mouth or gills of the host fish after a short free-living juvenile stage then become females. They mate while attached to the host and the female broods dozens of young in a pouch on her abdomen until they are ready to be released to search for their own host. Other studies have suggested that

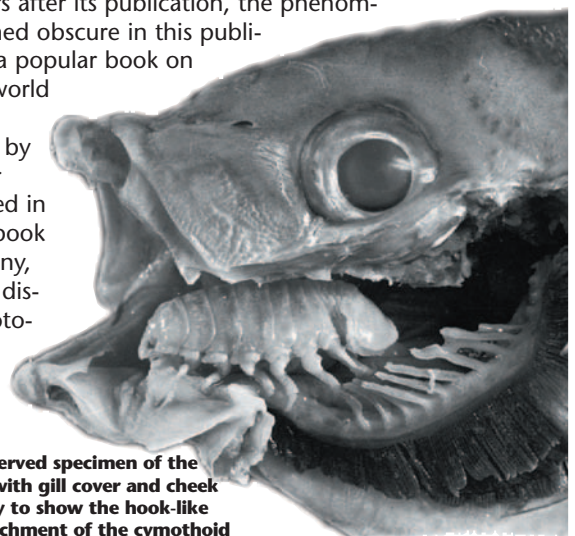
tongue degeneration (regression of tongue connective tissue and cartilage) is maintained by constant hematophagy (blood-feeding) by the isopod at the site of former tongue attachment.

Parasitism is that sort of living together relationship among unrelated organisms (symbiosis) in which one species benefits and the other is harmed. In the case of mutualism, both benefit, and in the case of commensalisms, one benefits and the other is unaffected. Though the isopod clearly did significant damage to the fish by chewing away its tongue and firmly attaching in its place by hook-like pereopods, the fish looked healthy and, at first glance, the isopod actually looked like the fish's tongue. Did it function like a tongue, though? It would be remarkable if it did because, though there were examples in nature of parasites removing and displacing body parts of their hosts internally (e.g., gonads), functional host part replacement in animals had never been reported in the scientific literature. I teamed up with a colleague and isopod expert at the University, Dr. Rick Brusca, to investigate. Our conclusion (Brusca and Gilligan, 1983) was that, based on the evidence, the isopod did appear to replace to a significant degree the function of the tongue, a bony extension of the lower gill bar apparatus which, in fishes, is used principally to hold and process prey.

Another study showed that fish with mouth isopods grow larger than normal vomerine (roof of the mouth) teeth, possibly a response to irritation that, in spite of the bulk of isopod attached in its mouth and loss of tongue, enables effective prey processing. As a functional replacement of a host body part by parasite, the phenomenon leans closer to commensalisms than to parasitism since, as ugly and damaging as it looks, the host may suffer little real harm in terms of making a living. To make the case that it is true commensalism rather than parasitism, though, it would have been necessary to measure and compare the fitness (survivorship and reproductive output) of tongue-replaced fishes in relation to un-parasitized ones.

For years after its publication, the phenomenon remained obscure in this publication until a popular book on the bizarre world of parasites, *Parasite Rex*, by Carl Zimmer was published in 2000. The book included many, occasionally disturbing, photographs of parasites - mine of the

Cutaway: preserved specimen of the rose snapper with gill cover and cheek dissected away to show the hook-like pereopod attachment of the cymothoid isopod crustacean in the fish's mouth.



fish with isopod tongue. As a result of wide distribution and popularity of the book, other books and nearly a dozen nature magazines in the U.S. (*Natural History*, *Discovery*), Canada, U.K., Denmark, France, Italy, and Brazil have contacted me and used the photos and story in their publications. Just how widely known it has become came home recently when students in architecture class visiting SSU from the Savannah College of Art and Design brought it up.

But that's not where it ends. New Orleans playwright, Robert Tsarov, recently wrote and produced a play, *Tennessee Speaks in Tongues for You*, about it. The reason that I know is that Mr. Tsarov contacted me wanting to use my photos in the play and has shared with me a lot of details. The premise of the play is this: Tennessee Williams awakes one morning to find that his tongue has been devoured and replaced by the tongue-eating parasite. After substituting itself for the playwright's tongue, the parasite goes on to dictate a new play to him called *The 3-1/2 Character Play* and then coerces him to embark on a nationwide lecture tour (with slide presentation) to promote the show. Tennessee's first stop is New Orleans, just in time for the Tennessee Williams Festival.

According to Tsarov, Tennessee Williams time and time again



Side by side: Rose snapper, with normal tongue (R) and one with the cymothoid isopod crustacean that has eroded the tongue and taken its place.
Photo: M. Gilligan (copyright)

employed the symbol of the rose in his plays (e.g., the rose tattoo) and by coincidence the host of *Cymothoa exigua* is the rose snapper. The play opened March 14th at the festival to good reviews. He sent me a hilarious playbill and a couple of reviews that suggested it is his best work yet!

What a long strange trip it's been: from casual observation to scientific discovery to popular press to theater. If there are lessons here, they are these: Since we never know what we might find in a fish's mouth, we should always look. Discovery is often the result of exploring things that we find when we're looking for something else. And we should always listen to our partners. Curiosity and formal investigations of nature may yield unexpected results as well as contributions to understanding the natural world. More broadly, the future and vitality of science in the U.S. depends upon igniting and fanning the flames of intellectual curiosity in everyone so that we will always have the human resources and perspectives needed to rationally approach solving problems that arise in our society and world.

Literature cited: Brusca, R.C. and M.R. Gilligan. 1983. Tongue Replacement in a Fish by a Parasitic Isopod. Copeia. 1983(3):813-816.

News from the Marine Sciences at SSU

Five students received their B.S. degrees in Marine Science at the 162nd commencement of SSU on May 10, 2003, at the Tiger Arena. Congratulations and best wishes to **Ms. Kym Brown, Mr. Greg Hunter, Ms. Marina Nimrod, Ms. Robin Rahn, and Mr. Ranaldo Smith!** This brings the total number of Marine Biology and Marine Science degrees conferred by SSU since 1985 to 100, a milestone. Kudos is also extended to **Ms. Nimrod** for having been accepted to the Ph.D. program in marine sciences at the University of Georgia.

During the spring semester eight students and two faculty attended the Fourth NOAA Expanding Opportunities in Ocean and Atmospheric Sciences conference. **Mr. Steward James, Mr. Richard Hodges, Mr. Brian Williams** (back row in photo), **Ms. Ebony Henderson, Mr. Ranaldo Smith, Mr. John Braxton**, (middle row), **Ms. Kymberly Brown** (left front), and **Ms. Nena Strachan** (right front) traveled with **Dr. Dionne Hoskins** (middle front) and **Dr. Matt Gilligan** to the meeting hosted by Florida A&M University in Tallahassee, Florida, on March 30, 31 and April 1, 2003. The trip was sponsored by the SSU component of the NOAA/UMES Living Marine Resources Collaborative Science Center which Dr. Hoskins, a NOAA Fishery Biologist and Assistant Research Professor, directs at SSU. There were seven panels and sessions (Dr. Gilligan was moderator for Technical Session III: Living Marine Resources in which Dr. Hoskins was a presenter), over 80 research posters,



Mr. Steward James, Mr. Richard Hodges, Mr. Brian Williams (Back row, Left to Right); **Ms. Ebony Henderson, Mr. Ranaldo Smith, Mr. John Braxton**, (Middle row, Left to Right); **Ms. Kymberly Brown** (Left Front); **Ms. Nena Strachan** (Right Front); **Dr. Dionne Hoskins** (Middle Front)

and a number of vendor/organization booths at the meeting. Meetings such as this are important learning, networking and development opportunities for both students and faculty.

SSU undergraduate students serving as CIRE Program research interns at SkIO this summer are **Mr. John Braxton, Ms. Linda Dave, Ms. Takesia Grant, Ms. Alexis Green, Ms. Ladena Holley, and Mr. Keith McCullough**. Other SSU undergraduates engaged in research during the summer at SSU through the NOAA, Living Marine Resources Collaborative Science Center, and Title III Math and Science Activity are **Ms. Erika Adkinson, Mr. Clement Bolden, Mr. Ronald Dow, Mr. Chris Corinthian, Ms. Dori-Lynn Coburn, Ms. Ebony Henderson, Ms. Jamila Jenkins and Ms. Cherita Nix**.



Elderhostel Programs at the Marine Education Center and Aquarium

By Edith Schmidt

If you happen to be working on Skidaway Island during the fall or winter months, you might see a group of active adults heading out on the R/V *Sea Dawg*, taking a walking tour with Carol Megathlin, touring the R/V *Savannah* or walking the nature trail. Chances are these folks are Elderhostel participants and if you are lucky enough to interact with them on a casual or classroom basis, you'll find them to be pretty interesting people.

For those of you who aren't familiar with the Elderhostel Program, it has been around since the 1970s. Based in Boston, it is the first and largest travel organization founded for adults ages 55 and older. The average participant is usually retired and over 60. As our population of active older Americans has grown, this non-profit organization also has grown so that it now offers more than 10,000 programs yearly in over 100 countries. Elderhostel fosters lifelong learning at national and international locations, many of them affiliated with colleges and universities.

At the Marine Education Center and Aquarium (MECA), we have been offering week-long Elderhostel programs since the 1980s. At that time Will Hon, our first marine educator, was involved in coordinating and teaching about eight programs per year, focusing mainly on the coastal environment. Along with



Elderhostel group at Grove's Creek dig site, Skidaway Island. Photo: Edie Schmidt

Will, former MECA educator Anne Donnelly also was involved in both program coordination and teaching. In 1986 we added a coastal archaeology program based at the Skidaway Island Grove's Creek site, with supervision by former Armstrong State College anthropology professor Dr. Larry Babbitts. Dr. Babbitts was already excavating the Gule Indian village at Grove's Creek on Skidaway Island with the help of Armstrong students and local volunteers. Carol Johnson, a former art supervisor and educator at the Marine Education Center, worked closely with Dr. Babbitts and coordinated the archaeology program. After both Anne and Carol left, Will continued to coordinate the programs until his retirement in 1994, at which time Edie Schmidt took over as Elderhostel coordinator.

As we have increased the types of programs we offer at MECA, focusing more on school groups, we have cut back on the number of Elderhostel program offerings. We also have found that there is a lot more competition from other coastal Georgia sites that offer Elderhostel programs of their own. Currently, we offer two programs a year: an archaeology service program and an active outdoor program on the marine environment. Both programs attract locals and visitors from all over the U.S. This year we had our first international hosteler, Ulla Jensen from Denmark. When we first started doing these programs, we would often have up to forty participants, which was rather daunting. We've found that it is easier to interact with twenty to twenty-five adults per program. Program participants stay in our dorm, eat in our cafeteria, walk the nature trail, and use our labs and boats.



Elderhostelers take trip on the University of Georgia's R/V *Sea Dawg*. Photo: Edie Schmidt



Darrell Maddock and Dr. Hilda Knobloch working in archaeology lab.
Photo: Karen Roeder

Of the two programs that we offer, the archaeology program, which is now in its seventeenth year, is more intense because it is a service program. The hostellers are the “diggers” at the Guale Indian village site on Grove’s Creek, which is about a mile and a half from the aquarium. Aided by volunteers and Dr. Ervan Garrison of the University of Georgia, Elderhostellers have been involved in all aspects of the project. The work is done mainly in the month of December as the weather is more moderate and we are able to get Dr. Garrison here for supervision. A program of evening lectures by experts in the field has been an important part of the week’s experience. The Coastal Georgia Archeological Society has provided volunteers over the years and has sponsored a Christmas party at MECA during the Elderhostel week, giving both visitors and locals a chance to interact with each other. Over the years students and professors from both the University of Georgia and Georgia Southern University have worked side by side with Elderhostel participants at the site and in the lab.

The Aboriginal village site dates back to the 1500s. The Guale Indians were a coastal people, skilled in agriculture. Much is known about the historic Colonial Period in Georgia, but a lot less is known about these early prehistoric inhabitants. We are fortunate to have found five of the eleven Irene period (1300-1550 AD) houses which have been found in Georgia. Seventeen years of excavating has revealed burned houses, walls, floor and wooden beams, as well as thousands of pieces of pottery, clay pipes, shell beads, tools and other artifacts. Some of these finds are on display in the aquarium exhibit area. Shell middens or refuse heaps abound on this island and examples can be seen on the MECA nature trail. Even after seventeen years of excavation,

the site continues to yield information and artifacts. This past year Deborah Keene, one of Dr. Garrison’s graduate students, received her doctoral degree from the University of Georgia using the site as the basis for her thesis and was able to present her findings to the Elderhostel group. Students from the University and Elderhostel volunteers helped her with her field-work. A number of the Elderhostel participants have come back year after year so that they can keep up with their pits!

During the year, three of our Elderhostel volunteers (Dr. Hilda Knobloch, Betty Banghart, and Darrell Maddock) continue to work on cataloging and curating our growing archives. Dr. Knobloch was in our first archaeology Elderhostel program in 1986 and has been donating both her time and money to help keep the program going ever since. Donations to our program have also come from Elderhostel participants Betty Banghart and William Sutton. Some of the money from these donations has gone for carbon dating for the site. Without the participation of the Elderhostellers, we would not be able to continue this work.

Our second Elderhostel program is an active outdoor program which, for the past two years, we have co-sponsored with the Skidaway Island State Park. Participants may stay in our dorm or bring their recreational vehicles and stay at the park. We oversee the program, which focuses on the coastal environment of Georgia. Staff members from MECA, the Skidaway Institute of Oceanography, and the Skidaway Island State Park get involved in teaching and interacting with the program participants. We include a program with park naturalist Eda Kenney and a Skidaway Institute tour with Carol Megathlin. Over the years, Dr. Clark Alexander of the Skidaway Institute has favored us with excellent talks on coastal geology. The crew of the R/V *Savannah* has been happy to give us tours of the research



UGA research assistant Rebecca Green shows shellfish to Elderhostel participant, Henry Croci.
Photo: Edie Schmidt

vessel and Dr. Dick Lee has given us tours of the SKIO sea bass project. The participants get to see the coastal environment “up close and personal,” viewing microscopic animals in the labs, getting out in boats, walking to the marsh, and visiting barrier islands. Elderhostelers get to do a lot of the same things that our visiting college and high school groups do, but since they are here longer, they have more time for participation and discovery.

What do we get out of these programs? We get to work with interested and educated adults from all parts of the world. The average Elderhostel participant is college educated and usually has a strong professional background. Not only are they well traveled and physically fit, many of them have participated in numerous Elderhostel programs over the years. We get invaluable help in excavating and curating the Grove’s Creek site. Elderhostel participants have contributed time and money to our programs. Teaching these students is both challenging and rewarding. The first night they arrive we do a “getting to know you” session and it’s



Second Mate Todd Recicar gives Elderhostelers a tour of the Skidaway Institute of Oceanography’s research vessel *Savannah*. Photo: Edie Schmidt

lar programs. Then there is the larger educational impact: the participants go back to their own communities with new knowledge of the environmental challenges facing those who live on

the coast. The average Elderhosteler is very involved in community affairs. They volunteer and vote in large numbers so we hope that what they learned here about our environment makes a lasting impression on them.

Here are some quotes from past program evaluations:

“For much of this session I felt as if I were discovering for the first time a whole new world—one that I’ve lived in for a year but not understood. Thank you very much.”

“The entire program was stimulating and effective in exciting what for many of us were long dormant curiosities.”

“This is a good start of a life-long pursuit.”

Elderhostel is a great program and I’m looking forward to the day when I can

participate as a student rather than a teacher. Our next Elderhostel program (the Archaeology Service Program) is scheduled for the first week in December 2003. The Active Outdoor Program is scheduled for February 2004. For more information on these local programs, contact Edie Schmidt, Elderhostel coordinator, at 598-2447. For more information on Elderhostel, check the web site at: www.elderhostel.org.



Park interpreter Eda Kenney takes Elderhostel group on Skidaway State Park trail. File Photo

fascinating to learn about the people that you’ll be with for the better part of a week. They have also shared their talents with us. A few years ago one of our participants put on a slide show for the group and treated us to some of the best nature photography I’ve ever seen. We also get to know local Skidaway and Savannah folks who join the program as commuting students and often end up as volunteers in both our Elderhostel and regu-

upcoming events...



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