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Marine Exploration

Discovery On Sapelo Island

Story: Lauren Barron

Sapelo Island, a scientific research center and a state-owned wildlife reserve, is known for its bountiful game, undisturbed salt marshes and beautiful, shell-filled beaches. Rich in history, the island has been known to Native Americans, Spanish, French, slaves, millionaires and now researchers. Georgia's fourth largest island is located 60 miles south of Savannah and retains many natural features despite its long history of human activity. The nearly 18,000 acre island is divided into four components: the University of Georgia Marine Institute, the Sapelo Island National Estuarine Research Reserve, the R.J. Reynolds Wildlife Refuge and the Hog Hammock Community. Also associated with the island are the Sapelo Island Microbial Observatory and the Gray's Reef National Marine Sanctuary.

UGA Marine Institute

Founded in 1953 by R.J. Reynolds, the owner of Reynolds Tobacco Company, the UGA Marine Institute, or UGAMI, provides UGA's Department of Marine Sciences and several other departments access to a remarkable field site for research and teaching. UGAMI has an international reputation as one of the major contributors to the scientific understanding of the complex interactions of the coastal ocean: the flow of energy, nutri-

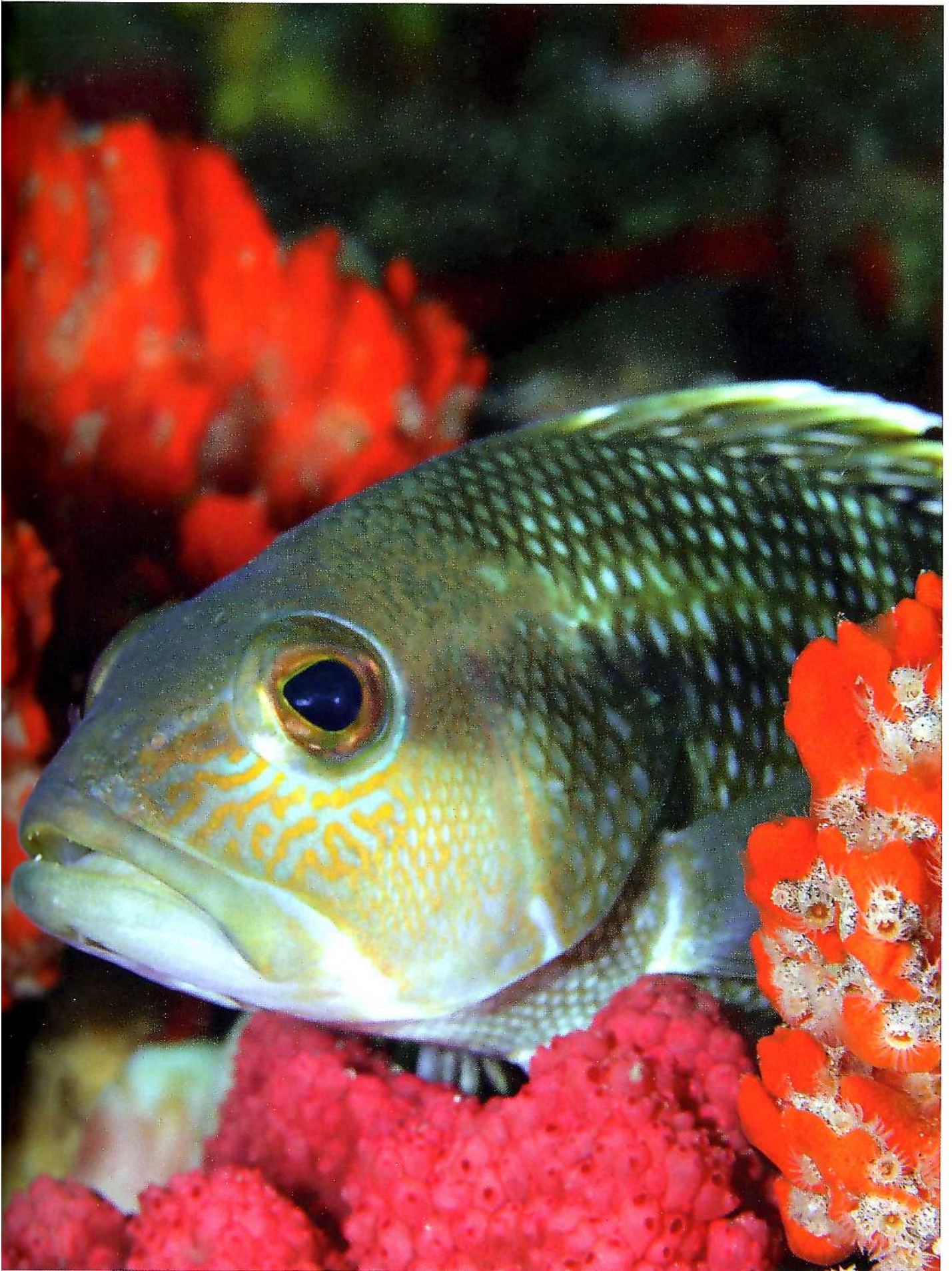
ents, and minerals; and the role of microbial processes through the land-sea interface. In addition to its research mission, UGAMI has also served an important role in undergraduate and graduate education for students from UGA and around the world.

The land that UGAMI occupies used to be a farm complex, and the 80 to 90-year-old buildings, such as the dairy barn and carriage houses, have been converted into research labs. Bill Miller, Director of UGAMI, travels to Sapelo Island every two to three weeks to study the role of sunlight and energy on organic material in the ocean. "The island is a very natural coastal ecosystem," Miller says. "It's completely underdeveloped." Instead of golf courses and hotels, one comes across alligators, sea turtle nests and white sandy beaches covered in shells and sand dollars.

Because the marshes are federally protected, the government regulates access to the island. Guests must be approved ahead of time by either Miller or the visitor coordinator. Most people who travel to the island are students or researchers. Georgia's Department of Natural Resources sponsors K-12 educational trips several times a year. Miller believes it is important for students to understand Georgia's coast, and Sapelo Island provides a perfect example of the way an ecosystem is supposed to work. "To understand the impact of something, you have to know the baseline,"

Greg McFall





Miller says. "And since Sapelo Island is un-impacted, it's a great baseline."

Researchers at UGAMI study everything from microbes to alligators to invasive tree species to insects. Having already studied the basic processes of certain plants, animals and bacteria, researchers are moving towards quantifying their work, examining how much and to what extent certain incidents occur. In one study, for example, researchers blocked off a particular area with chicken wire to keep large crabs out. The researchers then observed the sample ecosystem without the crabs and were able to determine what the crabs ate and which organisms depended on the crabs for survival.

Sapelo Island National Estuarine Research Reserve

The Sapelo Island National Estuarine Research Reserve, or SINERR, is one of 27 reserves around the country and is a network of living laboratories and classrooms where scientists, students and the general public can explore biological, physical and social issues of

coastal communities and habitats. Pioneering scientific research conducted here has revealed the critical importance of the salt marsh ecosystem as a provider of basic nutrients to young marine creatures as the tides pulse and wash nutrients twice daily through the estuary.

SINERR is administered by the National Oceanic and Atmospheric Administration (NOAA) and managed by the Georgia Department of Natural Resources (DNR). These agencies protect the island for long-term research, water-quality monitoring, education and coastal stewardship.

R. J. Reynolds Wildlife Refuge and Hog Hammock Community

The R. J. Reynolds Wildlife Refuge, sold to the state in 1969 by Reynolds' wife, occupies more than 10,000 acres and is operated by the DNR. Its primary purpose is to manage the populations within its boundaries with an emphasis on deer and turkeys. Old pine forests are being thinned to allow light to penetrate to the forest floor, enhancing the wildlife habitat.

Hog Hammock is the only privately owned property on Sapelo Island, and it is made up of descendents of African-American plantation workers, many of whom are employed by UGAMI. Hog Hammock was created in the early 1940s when Reynolds consolidated the scattered black land holdings around the island. The community includes a general store, bar and other small businesses.

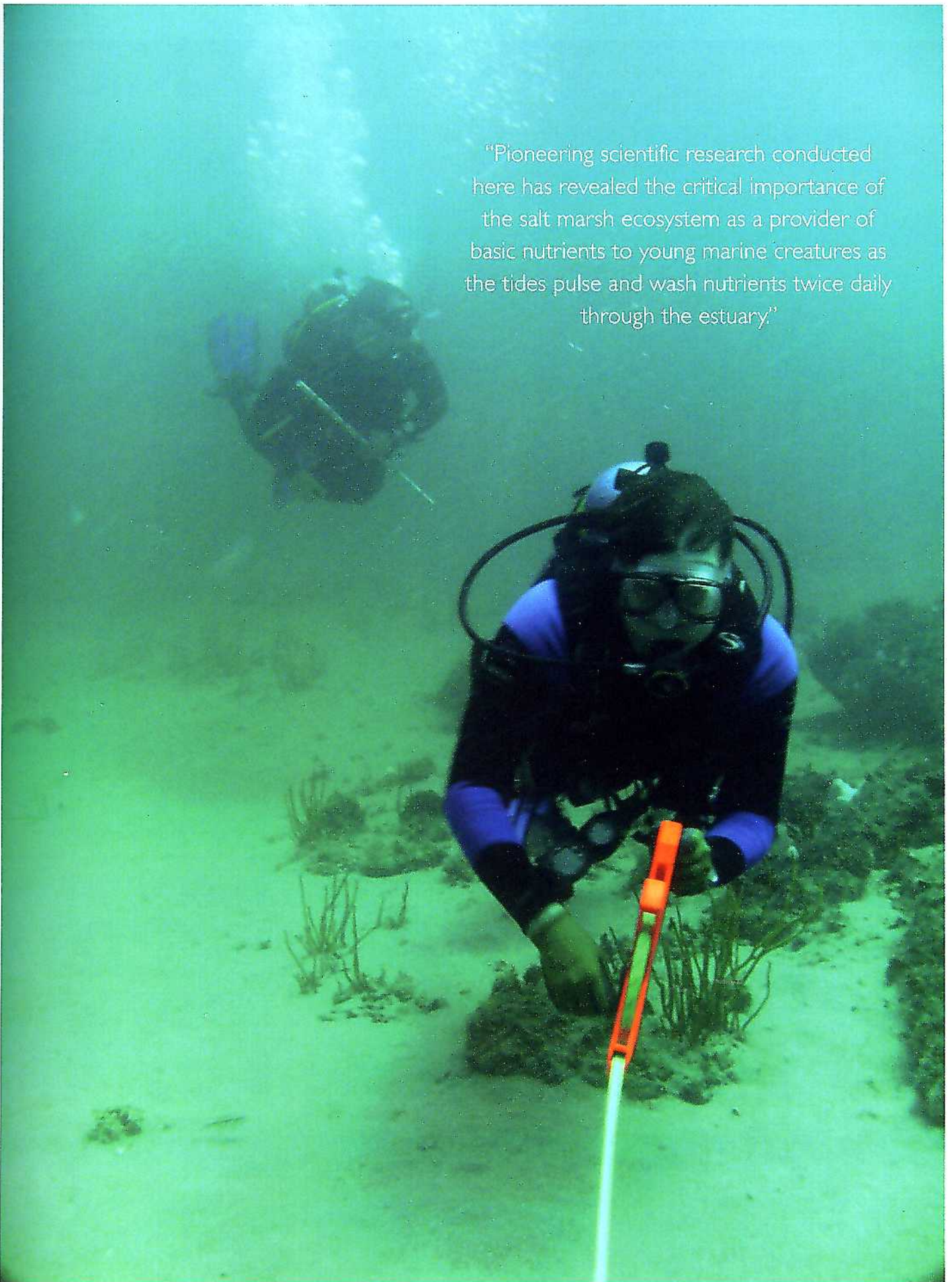
Gray's Reef National Marine Sanctuary

Gray's Reef, located almost 20 miles off Sapelo Island, is millions of years old and provides an important home and feeding ground to many marine species that would otherwise struggle in the



Scott Gifford

"Pioneering scientific research conducted here has revealed the critical importance of the salt marsh ecosystem as a provider of basic nutrients to young marine creatures as the tides pulse and wash nutrients twice daily through the estuary."



L. Barrow



sandy bottoms that make up a majority of Georgia's coast. "Gray's Reef is like a national park," says Scott Noakes, a UGA research scientist at the Center for Applied Isotopes Studies. "However, unlike national parks on land, you can't see Gray's Reef because it's underwater." Although not visible to most, life underwater is an entirely different story than life above. The reef is a "live bottom" area, filled with sponges, corals, invertebrates, many different types of fish and sea turtles.

Noakes travels to the reef every month to study ocean acidification and carbon dioxide monitoring. Researchers hope to discover how carbon dioxide is related to global warming and how it affects different organisms. Already, research has found that big swings in the amount of carbon dioxide present in the water alter the pH of the water. "The ocean isn't just a big

sink," says Noakes. Things come out of the ocean just as much as the things going into the ocean.

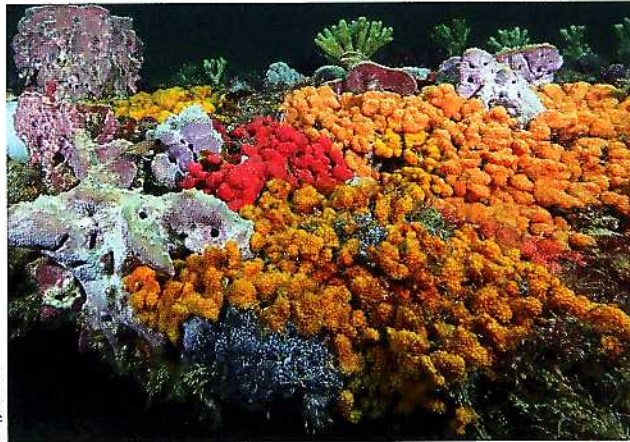
Gray's Reef is also the site of an important 2006 discovery: a 36,000-year-old gray whale bone. Since the discovery, Noake and other researchers have found more remnants of the gray whale, and they have been studying them to discover the past. Today, the gray whale is extinct. The bone is so rare that the researchers didn't know what they had found until a curator at the Smithsonian Institution saw a picture of the bone online. Several casts have been made of the original bone and sent to museums across the nation.

Sapelo Island Microbial Observatory

The Sapelo Island Microbial Observatory, or SIMO, is a project funded by the National Science Foundation and is dedicated to the understanding of the

faté of terrestrial and marine-derived organic matter in the coastal ocean. Researchers focus specifically on bacteria and gene expression patterns. "SIMO was created because we know very little about ecology for microorganisms," says Mary Ann Moran, a research professor in UGA's Department of Marine Sciences. "Now we can eavesdrop on microbial communities and learn basic fundamental information."

Researchers are currently working to understand the role of marine bacteria in the coastal ocean carbon cycle, and they can spend 18-hour days collecting samples directly from the ocean, where the cells are filtered out of the water and dropped into liquid nitrogen, which freezes them so they can be studied later under a microscope. Melissa Booth, the only full-time research scientist living on Sapelo Island, studies the effect of viruses on bacterial function. "There are more viruses for bacteria than for anything else," she says. "The presence of these viruses affects the carbon balance in aquatic environments." One theory as to why the viruses are thriving in bacteria is that they may be



Gregg McFall

driving some evolutionary processes, helping certain kinds of bacteria become resistant to infection.

In SIMO and in several other research facilities associated with Sapelo Island, the big interest is carbon cycling. How much is coming into the ocean, and how much is going out? Results can change depending on many different factors, such as day versus night, the tide and season changes. "The big question hasn't changed much," Moran says. "We've learned a lot, but the coast is always changing." One important thing researchers have discovered is the amazing work microbes have been doing since the April 2010 BP oil spill. Some microbes "eat" the diluted oil without sustaining any damage. With all of the research being done

off of Georgia's coast, the hope is that high school curriculums will soon implement the subject. "Part of living on Sapelo Island is that you are immersed in the ecosystem," Booth says. "It allows you to know your surroundings and understand how everything comes together. This makes better researchers, and in turn, better teachers." □

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