Monitoring the Muck

Smithsonian scientists look into the mud for ecosystem answers

Scott Jones, Research Technician & Laura Diederick, Marine Biology Educator

Estuaries and coasts around the world are approaching critical levels of degradation and ecosystem-wide failure, and the southern Indian River Lagoon (IRL) watershed is no exception. Large-scale, collaborative efforts are underway to restore biodiversity and the vital ecological functions these ecosystems provide. The staff in the Benthic Ecology Lab at the Smithsonian Marine Station (SMS), led by Dr. Bjorn Tunberg, is involved in one of the most ambitious of these projects, the Comprehensive Everglades Restoration Plan (CERP). The many dimensions of CERP, under the direction of South Florida Water Management District and the U.S. Army Corps of Engineers, include restoring wetlands and building flood control structures, water treatment areas, and storage basins.

Historically, the slow, downslope flow of freshwater across the IRL watershed meant it was available during both dry and wet seasons, thus providing stability to the ecosystem despite South Florida’s variable rainfall patterns. This natural flow also allowed for stable salinity gradients, with salinity increasing as water moved towards the coasts and decreasing throughout the watershed during the heavy rains of the wet season.

The extensive modification to the southern IRL watershed over the past 100 years, most notably the drainage canals created in an effort to convert wetlands and watercourses for urban and agricultural uses, has decreased the system’s ability to store water and has increased nutrient-rich stormwater runoff. Additionally, large episodic freshwater canal flows now occur in the wet seasons while there is very low flow during dry seasons. These changes have led to a less diverse, increasingly compromised benthic community – all the life found in or on the sediment bottoms of water bodies like the St. Lucie Estuary (SLE) and the Indian River Lagoon.

Benthic organisms, such as clams, snails, polychaete worms, amphipod crustaceans and shrimp, are critical components of a healthy estuary. Because their responses to various environmental changes such as an increase or decrease in salinity, low dissolved oxygen, and sedimentation are so predictable, benthic organisms are reliable indicators of habitat quality and can reflect environmental conditions over time.

Dr. Tunberg and his team set up a benthic monitoring program in the early phases of CERP, which provides a baseline data set. This information will allow them to detect and predict changes system-wide. Thirteen fixed stations have been sampled on a quarterly basis since 2005. As the different phases of the hydrology projects come online, the benthic data will reflect changes in discrete areas of the estuary. Such feedback is crucial for water managers to confirm that their efforts are having the desired effects.

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You Can’t Name a Fish by Its Color

Laura Diederick, Marine Biology Educator

If you are unable to tell the difference between *Lythrypnus elasson* and *Lythrypnus minimus*, you're not the only one. Even the most trained eye will find the task difficult, which makes sense, since they are actually just one species with two names. This isn’t the only example in which multiple color morphs have been described separately, which is just one reason Smithsonian scientist, Carole Baldwin, and her team of researchers are collecting genetic data from fishes in the Indian River Lagoon (IRL).

For many years, taxonomists have classified organisms based on morphological characteristics – physical traits that can be seen and described. But just as all that glitters is not gold, every black and white striped fish in the IRL is not a sheepshead. Many families of fishes, such as parrotfish and gobies, have members that look so similar they are virtually indistinguishable without examining the genetic material. Conversely, some species that are currently described as separate species based on morphology are actually one in the same according to genetic data. One reliable way to determine relationships between organisms is to compare their DNA, which is exactly what Baldwin plans to do.

In April, Baldwin spent two weeks at SMS, cruising the IRL in an effort to collect and catalogue over 200 fish species. Tissue samples from each specimen’s eye will be analyzed and used to create a DNA barcode. Just like the combination of black lines found on every item on a store shelf, the DNA barcode is unique to the individual fish species and can be used for identification purposes. The barcode can also be used to match fish larvae to the adult form.

Not only will Dr. Baldwin’s work be used to establish a database of DNA barcodes for the fishes of the Indian River Lagoon, ultimately it will increase the current understanding of shorefish diversity. And the better these patterns of diversity are understood, the better these vital natural resources can be managed. 

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Pest Control at SMEE

Holly Sweat, Marine Ecosystems Technician

From the weeds that overrun all but the most well-manicured lawns to the creepy-crawlies that invade our homes and peace of mind, everyone has dealt with at least one nuisance species in a lifetime. The complex habitats at the Smithsonian Marine Ecosystems Exhibit (SMEE) are no exception. Climbing high on the list of undesirables at SMEE, and amongst the rest of the aquarium community, are sea anemones of the genus *Aiptasia*. These anemones reproduce quickly under most aquarium conditions, stinging and crowding out tankmates within a matter of weeks. Several extermination methods have been attempted by hobbyists, using everything from costly chemicals to boiling water to hot sauce!

Recently, SMEE staff have been battling these “weeds” by culturing and innoculating the model ecosystems with one of the anemones’ inherent enemies, the native Florida nudibranch, *Aeolidiella stephanieae*. Although they only grow to about an inch in length, the size of these shell-less snails shouldn’t fool anyone. They are hearty, voracious predators that can give rise to a new generation of hungry adults in less than six weeks. At a retail price of up to $30 per specimen, raising *Aeolidiella* in the lab is an economical and effective way to safely control the annoying anemones while maintaining the natural integrity of SMEE’s model ecosystems.
Smithsonian Marine Station Welcomes New “Friends”

The Friends of the Smithsonian Marine Station was initiated by a group of long-time supporters of SMS. This annual membership program encourages community members to become more familiar with the activities of the Marine Station, while providing critical support for research and educational programs. Members receive SMS News, invitations to lectures and other special events, as well as additional benefits. For information on how to become a “Friend”, call (772)465-6630x100.

New Intern
Caroline Capobianco is SMEE’s newest intern. A recent graduate of Florida Institute of Technology where she received her B.S. in Marine Biology, Caroline will be attending graduate school at Northeastern University outside of Boston this fall.

New Grants
Bjorn Tunberg received an award of $14,151.20 from St. Lucie County Mosquito Control District for the project, “Benthic Studies for Little Mud Creek.”

Selected Publications


Marine Science Lecture Series
The Smithsonian Marine Station and the Pelican Yacht Club hosted a marine science lecture series in February and March featuring presentations by distinguished Smithsonian researchers. On February 8, Dr. David Pawson shared personal stories and entertaining video footage of recent deep-sea discoveries, proving that fact really can be stranger than fiction! On March 15, Dr. Carole Baldwin (pictured above, center, with Dr. Valerie Paul, left, and Dr. Mary Rice, right, both of SMS) took the audience on a voyage from the ocean’s surface down to depths of over 3,000 feet with video images recorded during her submersible dives around the Galapagos.

Florida Oceans Day
For the fifth consecutive year, SMS was part of this noteworthy event held annually at the Capitol Building in Tallahassee. On April 18, education staff were available to Florida’s legislators and the public to answer questions, share current research, and communicate the importance of a healthy ocean.

Making Waves at SMEE
Thanks to a generous donation from the Myers family of Jupiter, Florida, the organisms living in the Coral Reef Ecosystem at SMEE can breathe a bit easier. Literally. The support provided by the Myers funded the design and installation of a custom-built wave generator. Water movement in a natural reef environment is created by waves, currents and tidal surges. This natural flow of water over the surface of corals and other reef critters is crucial for gas exchange, bringing oxygen to the organisms and carrying away waste. Additionally, regular movement of the water prevents particulate matter from settling out on the coral colonies, which can suffocate the polyps underneath. The very same suspended particles also provide food for a menagerie of fishes, crabs, worms, corals, sponges and other reef dwellers.

Flotsam and Jetsam

Alto & Dorothy Adams, Jr
Robert & Frances Bangert
Sally & Jack Chapman
Elizabeth Duggal
Jon & Gwendolyn Fichtelman
James & Joanne Gaines
Marilyn C. Link
Edward & Jennifer Ruppert
Eleanor G. Sexton

Marine Science Lecture Series

Florida Oceans Day

Making Waves at SMEE
School is Out and Camp is in Session!

Smithsonian expands summer offerings and continues to grow

Laura Diederick, Marine Biology Educator

Ask and you shall receive. It seems that is a lesson the participants in last summer’s first-ever Smithsonian Marine Science Camp learned at an early age. Campers and parents alike told Smithsonian education staff they wanted more and staff responded by increasing the number of weeks offered and expanding the program’s age range. Now children ages 6 to 15 are invited to dive in to marine science this summer with programs tailored to specific age groups.

Ocean Discovery Camp (June 18-22) introduces 6 to 8 year olds to life in the ocean and why this vast, watery world is so important to everything on Earth. Campers will have hands-on experiences with marine life of all shapes (sometimes alien-looking!) and sizes (who knew life was so small?) in, out of and on the water.

Marine-life-loving 9 to 12 year olds will hate to miss Ocean Adventures Camp (June 25-29). Campers will learn about marine ecosystems by directly interacting with the many diverse habitats located along the Treasure Coast.

Kayaking on the Indian River Lagoon, seining in the seagrasses and mucking about in the mangroves are just a few of the activities awaiting participants.

Ocean Explorers Camp is the perfect place for science savvy teens ages 13 to 15 to spend the week of July 9-13. Campers will get a taste of what scientists do to study the ocean - which means spending time in, on and under the water. Activities like snorkeling and kayaking will highlight topics that include sea turtle ecology, field study methods, and marine conservation.

And camp isn’t the only area of summer programming that has grown. In addition to SMEE’s 2nd Annual World Oceans Day on Friday June 8, families can register for one of several guided kayak trips on the Lagoon in July and August. No matter how old or young you are (or feel), the Smithsonian has something to offer you this summer! For more information on all these opportunities, visit www.sms.si.edu/calendar/htm or call Laura Diederick at (772)465-3271. 

SMS