The biodiversity of the Indian River Lagoon (IRL) is widely touted as being the highest of any estuarine system in North America. Almost 900 invertebrate species, well over half of the total number of animals in the IRL, have been recorded in the 156-mile stretch of water. But having a “list” of animals that are present is far different than understanding the species distribution and abundance, so Smithsonian researchers set out to accomplish the latter by conducting a year-long IRL Invertebrate Inventory with funding from the Disney Worldwide Conservation Fund.

In December 2009, researchers deployed Autonomous Reef Monitoring Structures (ARMS) at eight sites along the IRL, spanning 120 miles from Ponce Inlet to Jupiter Inlet. The ARMS, pictured at right, were specifically designed to provide appropriate hiding and/or settling space for different types of invertebrates – hard surface for barnacles, crevices for crabs, and mesh into which worms and larvae can nestle, for example. Six ARMS were deployed at each site; three units were collected after six months in the water, the remaining units were collected after twelve months. Environmental conditions, such as water temperature and salinity, were recorded at each deployment site at the time the units were deployed and collected.

Dr. Valerie Paul, director of the Smithsonian Marine Station (SMS) and Dr. Christopher Meyer, Research Zoologist at the National Museum of Natural History (NMNH), headed up a team of researchers that included scientists, postdoctoral fellows and students from Florida Museum of Natural History, Virginia Museum of Natural History, and University of Louisiana at Lafayette, as well as Smithsonian scientists from SMS, NMNH and the Smithsonian Environmental Research Center. Their task was to disassemble the ARMS and then separate, identify, count, photograph and catalog what would eventually number over 1200 specimens representing more than 300 species across 12 phyla. Researchers also preserved voucher specimens for each unique species, representative organisms used for taxonomic identification and DNA barcoding.

With such a wealth of information, scientists and resource managers now have a baseline of data that outlines broad-scale patterns across the IRL. The study will allow researchers to use the ARMS in the future to identify shifts in overall diversity or in an individual species’ distribution and abundance over time. Additionally, the Invertebrate Inventory may act as an early detection system for invasive species. During the course of the project, two invasive bryozoans, also known as “moss animals”, were recorded for the first time in the IRL.

Perhaps most importantly, the method of collection using ARMS follows a standardized protocol, which allows researchers to compare the diversity and abundance of IRL invertebrate species with those of marine and estuarine sites around the world, including Australia, Hawaii, and on the South Pacific island of Moorea. Such cross-comparisons may one day provide critical insights for conservation, policymaking and management activities.

For more information on the invertebrates of the Indian River Lagoon, visit the IRL Field Guide online at www.sms.si.edu.
Bringing scientists and educators together is just one goal of COSEE Florida (Centers for Ocean Sciences Education Excellence), a regional collaboration in which the Smithsonian Marine Station (SMS) is a lead partner. This summer’s launch of the Research Experience for Pre-service Teachers (REPT) program is one way COSEE Florida is meeting this goal. The REPT program gave six students enrolled in Indian River State College’s Middle School Science Education program an opportunity to experience scientific research firsthand through a seven week internship. Students worked in pairs at one of three local research facilities, including SMS, to complete a short research project in collaboration with mentor scientists.

Kim Demet and Lisa Kelly were selected to work at the Smithsonian Marine Station with Dr. Theresa Meickle, Dr. Jennifer Sneed, and Dr. Valerie Paul on their continuing project monitoring cyanobacterial abundance and formation of blooms (large population increases that can be environmentally harmful) in the Indian River Lagoon (IRL). As part of their internship, Kim and Lisa assisted with measurements of the size and density of the blooms at four sites in the IRL to determine the extent of each bloom. Additionally, they investigated the impact these blooms may have on lagoon organisms by extracting chemical compounds from one type of cyanobacteria, Lyngbya majuscula, and testing various concentrations of the compounds in herbivore feeding experiments and antimicrobial and antifungal experiments. The students were trying to determine if higher concentrations of the chemical extracts would reduce the feeding rate of the sea urchin, Lytechinus variegatus, or affect the growth of bacteria and fungi found at the sites from which the cyanobacterium was collected.

At the conclusion of the program, participants presented a scientific poster of their research to an audience that included both scientists and educators. They also created a short video presentation addressing a common misconception about science.

“I remember being young and thinking scientists were old guys in lab coats,” said Lisa. “This summer... changed everything I thought I knew about scientists.” To learn more about this program or to view the students’ videos, visit www.coseeflorida.org.

Smithsonian Scientists Discover New Species

M. Scott Jones, CCRE Program Coordinator

There is often more than meets the eye when it comes to fish—something that Dr. Carole Baldwin, a researcher at the Smithsonian National Museum of Natural History, and her colleagues discovered firsthand while conducting research at the Smithsonian’s Carrie Bow Cay field station in Belize. They combined modern genetic analysis with traditional morphological comparisons to re-examine fish species that were, in some cases, originally described over 100 years ago and found what were once thought to be three species of Starksia sp. blennies, were actually ten distinct species.

Starksia blennies are small fish with elongated bodies, found on rocky and coral reefs in the western Atlantic and eastern Pacific oceans. While using DNA barcoding to match larval fish to their adult forms, Baldwin’s team noticed contradictions between the preliminary genetic data and the current species classification. Further investigation revealed new species in numerous groups of fishes, including Starksia blennies.

“DNA analysis has offered science a great new resource to examine old questions,” said Dr. Baldwin. “This discovery is a perfect example of how DNA barcoding is illuminating species that we’ve missed before, particularly small cryptic reef fishes like Starksia blennies. We don’t know where we stand in terms of understanding species diversity, and our work suggests that current concepts may be surprisingly incomplete.”

Their paper examines the genetic lineages within each of the three original blenny species. Only when diagnostic morphological features supported the genetic data did they recognize them as a new species. Traditional morphological analysis, such as comparing patterns of pigmentation and numbers of fin rays, were used to solidify their findings. The team’s DNA data already suggests that other types of Caribbean fish may also represent species complexes that break into multiple, geographically distinct species after further study and force re-examination of traditional concepts of speciation in the Caribbean.

The team’s combined molecular and morphological approach has not only increased the number of currently recognized species, it serves as an example of the continuing nature of scientific discovery. Because the resiliency of marine ecosystems to human exploitation may be linked to species richness, an improved understanding of the diversity and distribution of reef life is necessary for conservation and management of reef resources.

Pictured above are three of the seven species of blenny “discovered” by Dr. Carole Baldwin and her team.
New Faces at SMS and SMEE

Dr. Jennifer Sneed received her Ph.D. in Chemistry from the Friedrich Schiller University in Jena, Germany. Previously an SMS/Link Fellow, Jennifer returned in February as a Postdoctoral Fellow to study settlement of coral larvae.

Benjamin Sollins is an SMS/Link Fellow and a student at Florida Atlantic University, working towards his M.S. in Environmental Science. He is investigating chemical responses in red mangroves to invasion by a parasitic fungus. His current project involves examining the trophic interactions that influence the establishment and persistence of invasive species in the Indian River Lagoon.

Julian Prato is visiting SMS from Bogota, Colombia, where he is working on his M.S. at the Universidad Nacional de Colombia. While in Fort Pierce, he is studying the chemical compounds produced by cyanobacteria and the effects they have on marine organisms.

Katherine Papacostas is a Ph.D. student at Temple University in Philadelphia working towards her degree in Biology. As an SMS/Link Graduate Fellow she is examining the trophic interactions that influence the establishment of invasive species in the Indian River Lagoon.

Chelle King joined the education staff at SMEE as an intern in February. She received her M.S. in Biology from Truman State University in Missouri in 2010, where she researched developmental genetics. While at SMEE, she has developed a number of new hands-on displays.

Many Thanks to Our Friends

The staff of SMS extends a warm welcome and a big “thank you” to new and renewing members of Friends of the Smithsonian Marine Station who provide critical support for research and educational programs. For information on how to become a Friend, call 772.462.0977.


New Grants

Valerie Paul received an award of $32,984 from Mote Marine Laboratory for the project entitled, “Influence of marine microbes on coral recruitment in the Florida Keys”.

Valerie Paul received an award of $15,000 from the Link Foundation for the project entitled, “Graduate student training in marine sciences FY 2011-2012”.

Valerie Paul, Raphael Ritson-Williams, Scott Jones and Nicole Fogarty received an award of $21,500 from the Smithsonian FY11 Endowment Program for the project entitled, “Population dynamics of threatened Caribbean acroporid corals at Carrie Bow Cay, Belize”.

Bjorn Tunberg received an award of $148,586 from The Department of the Army, U.S. Army Corps of Engineers, for the project titled, “CERP: Benthic Infaunal Monitoring of the St. Lucie Estuary and the Southern Indian River Lagoon”.

Selected Publications


There is Always Something New at SMEE

Chelle King, Marine Education Intern

Spring was action-packed, and summer is shaping up to be the same at the Smithsonian Marine Ecosystems Exhibit (SMEE)! In February, we kicked-off our tenth anniversary year with a celebration of our successful partnership with St. Lucie County that included a name-change. The facility housing SMEE was officially renamed the St. Lucie County Aquarium in an effort to more accurately reflect this community resource. During the anniversary kickoff event, visitors participated in seining demonstrations, as well as tours through the Exhibit and Behind-the-Scenes. On June 4, we held our sixth annual World Ocean Day celebration with seining demonstrations, face painting, crafts, and lots of fun.

Thanks to everyone who came out to both events and made them such great successes!

Spring was also a time for us to thank our volunteers during Volunteer Appreciation Week. The Aquarium hosted volunteers from SMEE and SMS with an award ceremony and reception. Congratulations to volunteers Ronnie DeGarmo, Charlie Kennedy, John Yoder, Bobby Langley, and Yuka Elwell on receiving President’s Volunteer Service Awards!

And though summer is not yet over, we are already looking ahead to an upcoming collaborative festival this fall on September 24 in celebration of National Estuaries Day. SMEE will open its doors with free admission, bus rides will be available from the Aquarium to Harbor Branch Oceanographic Institute, and visitors will have an opportunity to take boat rides on the Indian River Lagoon.

For upcoming summer and fall events, be sure to visit our online calendar at www.sms.si.edu/SMEE or follow our Facebook and Twitter pages (SmithsonianSMS) for updates, including daily photos and videos of the wild creatures here at SMEE! SMS

Staff members of the Smithsonian Marine Station and the Ecosystems Exhibit are grateful for the ongoing support provided by the Florida Fish and Wildlife Conservation Commission through the Fish and Wildlife Research Institute. These funds allow us to conduct a number of research and education activities that would otherwise not be possible.