Ocean currents are the highways of the sea, and many organisms rely on surface currents to disperse their larvae across distances, great and small. The longer the larval stage of the animal, the farther it can be transported from its source population, which makes management of ecologically important species, such as parrotfish, especially difficult.

Smithsonian Marine Station researchers, Dr. Stephen Box and Dr. Courtney Cox, are using DNA tools to map connections among parrotfish populations across the Caribbean in an effort to arm managers and policy makers with the information necessary to establish effective management strategies.

With their constant grazing, parrotfish play a vital role on coral reefs, maintaining balance between fast-growing algae and slower-growing corals. But the significant decline in parrotfish populations in recent years due to overfishing means fewer parrotfish grazing on weedy algae, resulting in increased algal cover and decreased space for adult corals and coral recruits to settle and grow. Parrotfish population recovery depends, in part, on the addition of larvae from adult source populations. Therefore, reducing fishing pressure in one area may have little to no impact on increasing the local population if fishing continues on the larval source population. In order to increase parrotfish populations and restore balance on the reefs, managers need a better understanding of which populations are connected and how.

As part of her doctoral research, Dr. Cox identified a high level of genetic connectivity between stoplight parrotfish populations in Belize and Honduras, indicating that these populations are connected through larval dispersal. Stoplight parrotfish are common throughout the Caribbean and are considered one of the most important grazers on Caribbean coral reefs following the die-off of long-spined sea urchins and the functional extinction of larger parrotfish species through overfishing. Dr. Box and Dr. Cox have expanded the original study into other areas of the Caribbean, and over the past year have collected fin tissue for genetic analysis from adult parrotfish on reefs in Mexico, Honduras, Cayman Islands, and Jamaica.

Parrotfish are extremely difficult to catch during the day. However, they can be heavy sleepers at night and, in some cases, may be easily coaxed into a net. Once in a net, researchers can clip a small portion of the tail fin with scissors, release the fish unharmed, and store the sample in a resealable plastic bag. This is a minimally invasive method of collecting genetic material and fish are released within two minutes of initial capture. Later in the lab, molecular analysis can be conducted using a technique called “restriction site associated DNA genotyping” to assess genetic population structure and make inferences about larval dispersal between collection sites.

The understanding gained by SMS researchers from this study will help define the appropriate spatial scales for management that reflect larval dispersal of parrotfish and identify countries that would benefit from coordinated management efforts across international boundaries. Ultimately, an improved understanding of population connectivity will substantially improve the ability of managers around the Caribbean to restore parrotfish populations and improve coral reef health.
MarineGEO Field Campaign at CBC

Carrie Bow Cay (CBC) Field Station has been an important research site for over 40 years and continues to be a part of new directions in marine science for the Smithsonian. Researchers from Fort Pierce, Panama, and Washington converged at the station this fall for a two-week field campaign as a part of the Smithsonian's Tennenbaum Marine Observatory Network and Marine Global Earth Observatory (MarineGEO). MarineGEO is the first and only worldwide network to examine marine biodiversity in coastal waters and measure the ways it may be changing, as well as to identify the drivers of that change. This is accomplished by assessing key biological parameters that indicate the health of different habitats, such as coral reefs, mangroves, and seagrass beds.

Working out the methods that MarineGEO will replicate on a global scale is a formidable challenge. Experiments must be simple, inexpensive, and use materials that can be found or shipped anywhere in the world. Chief among these challenges is finding an efficient way to assess herbivory by marine fishes. Ecologically speaking, this simple process can have profound effects on the whole biological community. Grazing intensity plays a vital role in maintaining healthy and resilient coral reefs by limiting faster-growing algae and giving corals space to compete. Corals, in turn, provide structure and habitat for hundreds of species of fish and invertebrates.

In their effort to find a standardized feeding assay, experienced marine ecologists Dr. Emmett Duffy and Dr. Valerie Paul settled on a method akin to offering fish a "smorgasbord" of algae that have different levels of palatability. Algal defenses can be both chemical and physical, and researchers chose examples of each. The feeding assays were deployed in different habitats and checked after one hour and again after 24 hours. Preliminary findings suggest the method worked well, and elucidated interesting patterns within each habitat. Future deployments in new environments will determine if algal smorgasbords will go global.

Another Science Festival Success

There aren’t too many opportunities for science enthusiasts to build a coral colony, peer inside an active beehive, climb into a fire engine, and create works of art with algae all at the same place. Fortunately for residents of the Treasure Coast, the Indian River Lagoon Science Festival offered all that and more! More than 7500 children and adults joined scientists and educators from across the community to celebrate the amazing world of science and discovery at the second annual event, held on Saturday, September 26, 2015 at Museum Pointe Park behind the St. Lucie County Aquarium. Over 75 exhibitors from science, technology, engineering, and math (STEM)-related organizations shared hands-on, minds-on science activities with captivated festival-goers. The Festival served as the capstone event to a week-long celebration of STEM, with nine separate satellite events organized in Indian River, St. Lucie, and Martin Counties. Satellite events allowed participants to dive a little deeper into a variety of topics, including computer programming, civil engineering, recycling and solid waste management, and beer brewing. Although Smithsonian staff led the effort to organize the Festival, it was truly a community-wide labor of love. Special thanks to Festival sponsors, including Treasure & Space Coast Radio, COSEE Florida, FAU Harbor Branch, and Sunrise Ford. To learn more about the Festival, visit www.irlsciencefest.org.

Smithsonian Science Lectures

The Smithsonian Marine Station at Fort Pierce (SMS) is pleased to once again partner with the Pelican Yacht Club to offer a Smithsonian Marine Science Lecture Series in 2016, sponsored by COSEE Florida. As a part of the world's largest museum and research complex, SMS hosts many of the Smithsonian's most exemplary researchers in the natural sciences and this year’s speakers are no exception. Full details will be announced after the New Year, but be sure to save the dates! Lectures will be held on January 21, February 18, and March 17 at 7:00pm in the Indian River Ballroom of the Pelican Yacht Club at 1120 Seaway Drive. Admission is free and reservations are not required. For more information, please contact Joan Kaminski at 772.462.6220.
New Faces at SMS

Steve Canty joined SMS to coordinate the Latin American and Caribbean projects of the Marine Conservation Program. His specific research interests are mangroves and fisheries; his research at SMS aims to provide greater understanding of the spatial scales required for effective management of these important ecosystems.

Kimani Kitson-Walters is pursuing his PhD in Biotechnology from The University of the West Indies, Mona in Jamaica. While working at SMS as an SMS/Link Fellow he will be working with the Marine Conservation Program using molecular techniques to compare and contrast the fine-scale genetic structure of populations in the Jamaican conch fishery.

SMS Graduate Fellow Jason Spadaro is pursuing his PhD in Ecological Sciences at Old Dominion University. He is researching the role herbivorous crabs, like the Caribbean King Crab, play in mediating the growth of algae over coral reefs in Florida and the Caribbean region. While at SMS, he is focusing on the collective effects of multiple species of crabs within this cryptic guild on the algal communities of Caribbean reefs.

Thankful for Your Support

Become a Friend of SMS

The staff of SMS extend a warm welcome and a big “thank you” to new and renewing members of Friends of the Smithsonian Marine Station who are devoted to promoting research and educational programs at SMS. Annual membership provides critical financial support for student and postdoctoral researchers, large-scale outreach efforts like the annual Open House and IRL Science Festival, and a number of other mission-driven initiatives. For information on how to make a tax-deductable donation and become a Friend, call 772.462.0977 or visit www.sms.si.edu/Get_Involved.

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New Grants

Stephen Box and Mel Songer (SCBI) received Year 2 funds of $400,077 from the Leona M and Harry B Helmsley Charitable Trust for the project “Supporting Integrated Protected Area Land and Seascape Management in Tanintharyi, Myanmar.”

Stephen Box received $99,231 from the National Oceanographic and Atmospheric Administration for the project “Deploying Novel Technology to Support the Monitoring, Control and Surveillance of Small Scale Fisheries in Honduras.”

Stephen Box received $96,000 from The Summit Foundation for the project “Scaling Up: Creating a Network of No Take Zones in the Honduran Caribbean.”

Stephen Box received $52,983 from the National Oceanographic and Atmospheric Administration for the project “Developing Genomic Traceability Tools by Identifying Signals of Local Adaptation in Commercially Important Marine Species.”

Melanie McField received $185,000 from The Summit Foundation for the project “Healthy Reefs for Healthy People X.”

Valerie Paul received additional funds in the amount of $204,800 from the Florida Fish and Wildlife Conservation Commission for the project, “Research and Public Outreach Programs.”

Valerie Paul received Year 3 funds of $128,893 from University of Florida for the project, “Novel Targeted Anticancer Agents from Marine Cyanobacteria.”

Valerie Paul and Rick Oms (SERC) received additional funding in the amount of $753,000 to support two years of the project, “General Survey and Grazing Characteristics of Infauna and Epifauna in the Northern Indian River Lagoon System.”

Selected Publications


FWRI Supports SMS

The staff of the SMS and SMEE 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.
Out of the Lab, Into the Community

The Treasure Coast is home to an amazing diversity of marine science research and, as the public outreach lead for Florida’s Center for Ocean Sciences Education Excellence (COSEE Florida), the Smithsonian Marine Station has been working to increase opportunities for scientists to share their work with the community. Throughout the year and throughout the state, COSEE Florida sponsors events ranging from workshops for teachers to science cafes for the public, all in an effort to broaden the impact of ocean scientists’ research and enhance the public’s understanding, appreciation and stewardship of the ocean.

Although COSEE Florida is a statewide program, project staff at SMS make an effort to offer programming close to home. Since 2012, the Smithsonian Exhibit at the St Lucie County Aquarium has hosted “Marine Science in the Morning,” a biweekly lecture series held on Wednesdays in January through March. The series has garnered a regular following of science-hungry patrons who are eager to engage with local scientists to learn more about their work. The 2016 line-up includes researchers from Barry University, University of South Florida, and the Smithsonian Marine Station speaking on a variety of topics, such as oyster restoration, fisheries management, and Caribbean coral reefs.

Also popular with Treasure Coast residents, COSEE Florida science cafes provide opportunities for the public to interact with ocean scientists in less formal atmospheres, as the events are held in casual locations such as restaurants or breweries. Science cafes are defined by their audience-driven format, in which the scientists share a brief introduction to the chosen topic and then the conversation is guided by community members and their interests. COSEE Florida’s science cafes typically include several ocean scientists working in related fields that can give multiple perspectives on the subject. Recent science cafes on the Treasure Coast have covered topics such as engineering, invasive species, and sustainable food, and included experts from the City of Vero Beach, Florida Institute of Technology, and the Smithsonian.

There are a number of COSEE Florida-sponsored opportunities in the New Year to learn more about the research of local scientists. The Marine Science in the Morning lecture series begins at 9am on Wednesday, January 13th and continues every two weeks through March. Several science cafes are in the works and the monthly Smithsonian Marine Science Evening Lectures at the Pelican Yacht Club are scheduled for January 21, February 18, and March 17. For more information about these and other upcoming events, visit www.sms.si.edu/Events_Calendar.htm.

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