In 2011, two major phytoplankton blooms occurred in the Indian River Lagoon. One bloom stretched from Scottsmoor, near the Canaveral National Seashore, to Cocoa, and another bloom of different algae ran south to the Fort Pierce Inlet. The blooms lasted more than seven months and resulted in significant loss of seagrass. In response, the St. Johns River Water Management District established the Algal Blooms Investigation. This strategic initiative comprises multiple, specialized teams from across the state that are focusing on different aspects of the northern bloom, or what is termed the ‘superbloom’. A group of researchers from the Smithsonian Marine Station (SMS) is part of the team responsible for studying the effects of filter feeders on bloom formation.

Many invertebrates that live in the sediments and on hard substrates such as mangrove roots and dock pilings filter algae and other particles from the water for food. They have the potential to mitigate blooms if they can ingest the bloom-forming species. The first step in understanding how harmful algal blooms can be controlled is figuring out what species of filter-feeding animals are living in the lagoon and the relative abundance of each. SMS scientists are working to answer these questions by sampling both infauna (small animals living in sediments) and epifauna that attach to hard substrates (barnacles, mussels, tunicates, etc.) from more than 40 sites spanning the area of the superbloom. Each site is sampled quarterly and the species collected are identified and counted. From these samples, which will continue to be collected for the duration of the project, researchers are identifying common filter feeders such as oysters and clams that may be playing an important role in controlling the algal community of the lagoon.

These common filter feeders are being tested both in the field and in the lab. Field experiments determine how ‘happy’ the bivalves are in a natural setting, and allow the research team to determine the feeding rate and efficiency of oysters and clams in the three basins of the lagoon. Researchers found that both species tested are pickier about their food choices than previously thought, rejecting many of the particles they filter in before ingesting them. Expanding on these field experiments, laboratory assays are being conducted to test whether these species will consume algal species that contributed to the superbloom. Future experiments will alter salinity and temperature while exposing the animals to the bloom-forming species. The superbloom occurred after a very cold winter and a prolonged drought. By changing salinity and temperature, Smithsonian scientists hope to determine if the lower temperatures and lack of rain contributed to the bloom by stressing animals that would have otherwise kept the algae in check.

Many factors likely played a role in causing the superbloom, and preliminary results from work by Smithsonian researchers indicate that the story may be more complicated than originally thought. Just how much the lagoon’s filter feeders and their response to changing environmental conditions contribute to algal bloom formation and control remains to be seen, but the scientists at SMS are working hard to figure it out.
The Mesoamerican Reef (MAR) is the largest barrier reef in the Western Hemisphere, stretching across more than 600 miles of the Caribbean coasts of Mexico, Belize, Guatemala, and Honduras. Maintaining a healthy and diverse coral reef ecosystem is especially important to the four countries, as the reefs support the local economies and culturally-rich livelihoods of nearly two million people. Given its significant ecological and socio-economic value, it is no surprise that stakeholders throughout the MAR region are invested in protecting this valuable asset against further decline.

The Smithsonian’s Healthy Reefs Initiative (HRI), led by SMS scientist Dr. Melanie McField, has been working with local, regional, and international partners for more than a decade to monitor a growing number of sites across the reef tract, and evaluate the MAR using an extensive system of metrics rooted in four fundamental elements: ecosystem structure, ecosystem function, drivers of change, and social well-being and governance. Specific measurements recorded at the 248 study sites include percentage of the sea floor covered by living coral and fleshy macroalgae, biomass of herbivorous fish (parrotfish and surgeonfish), and biomass of commercially important fish. This data is compiled and shared via a user-friendly report card, issued by HRI every two years. One of the most notable findings in the 2015 Report Card is the improvement in overall reef health, upgraded this year to Fair from the 2012 designation of Poor, primarily due to increased fish biomass.

Like many areas of the Caribbean, the Mesoamerican Reef has a long history of fishing that has resulted in declining fish populations, especially those of commercially significant fish like groupers and snappers. Bigger fish produce more eggs and more eggs produce more fish for the future, so when it comes to protecting fish, size matters. Fortunately, efforts in the MAR region to increase the average size and population of target species through replenishment areas, or areas that are fully protected from harvesting, seem to be working. Based on data shared in the Report Card, fully protected areas had 10 times more snapper and grouper biomass, and more large-sized groupers, than those areas with little or no protection.

While there are encouraging signs of improving coral reef health in the MAR, regional stakeholders still have work to do. HRI and its partner organizations have identified a number of key issues yet to be addressed that would help ensure the Mesoamerican Reef’s long-term recovery, including better management of agricultural run-off, adoption of more sustainable coastal development practices, proper and adequate treatment of wastewater and pollution, and effective promotion of environmentally-sustainable and socially-responsible business practices across the region. With continued support and collaboration, HRI is determined to advance these issues and share its primary message – healthy reefs mean healthy people.

For more information on the Smithsonian’s Healthy Reefs Initiative, including the full 2015 Report Card for the Mesoamerican Reef, visit www.healthreefs.org.

Above: An increase in the size and abundance of commercially important fish species, like the yellowsnail snapper seen above, is a key indicator of improving reef health.


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**SMS: Thankful for Your Support**

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.

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**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.
New Faces at SMS

Eva Galimany received her PhD in Biology from the University of Barcelona, where she investigated the feeding behavior of mussels in response to toxic phytoplankton. She joined SMS as a postdoctoral fellow in 2015 to lead experiments studying the ability of benthic filter feeders to deplete algal blooms in the northern Indian River Lagoon.

Juliana Lopez is a predoctoral fellow carrying out her PhD thesis in the tropical eastern Pacific region encompassing Costa Rica, Panama and Colombia. Juliana’s work focuses on the interaction between ecological, social and cultural characteristics of coastal communities, using social-ecological models to assess resilience and the effectiveness of marine protected areas.

Postdoctoral fellow Jessica Lunt joined SMS in fall 2014 after receiving her PhD from Texas A&M University – Corpus Christi, where she focused on the effects of turbidity on oyster reef communities. At SMS, Jessica is part of the Northern IRL project, working to understand the impacts of environmental variability on the ability of epifaunal grazers to control algal blooms.

Postdoctoral fellow Iris Segura-Garcia earned a PhD in Molecular Ecology and Evolution at Durham University in the UK. She uses genetic tools to better understand the temporal variation in the settlement of early stages of ecologically and economically important marine species in Florida and countries along the Mesoamerica Reef system, including Mexico, Belize, and Honduras.

SMS/Link Fellow Chelsea Metzgar is pursuing a Masters degree in Biology at the University of North Florida. While at SMS, she is isolating a chemical compound produced by turtle grass, Thalassia testudinum, and testing its ability to inhibit a pathogenic protist that causes seagrass wasting disease.

Rachel Smith is a PhD student in the Odum School of Ecology at University of Georgia, where she is studying the physical, abiotic, and biotic factors that shape ecological communities. As an SMS/Link Fellow she is looking at the impacts of mangrove range expansion on the saltmarsh plants that live in the transitional zones.

Alex Tilley is a postdoctoral fellow developing methods and tools to assess the vulnerability of fisher communities to management changes, and to model optimal conditions for fisheries sustainability, food security and livelihood protection. Alex’s primary project site is Myanmar, Southeast Asia, where the Smithsonian is working with the Department of Fisheries to build capacity for marine management.

New Grants
Valerie Paul, Jennifer Sneed and Justin Campbell received Year 1 funds of $47,702 from the Smithsonian’s Competitive Grants Program for Science for the project “Can Corals Survive a 1-2 Punch? Combined Impacts of Ocean Acidification and Macroalgae on Coral Health and Recruitment.”

Steve Box received an award of $24,902 from the Smithsonian’s Institute for Biodiversity Genomics- Global Genome Initiative for the project, “Developing Genomic Markers for Traceability and Identifying Signals of Local Adaptation in Non-model Marine Species.”

Valerie Paul received an award of $19,500 from The Link Foundation for the project, “Graduate Student Training in Marine Sciences.”

Steve Box received an award of $49,500 from the Pew Charitable Trusts for the project “Use of DNA Barcoding Techniques to Characterize and Quantify the Species of Shark Used in Regional Dishes and Found in Local Fish Markets in the Caribbean.”

Seabird McKeon and Chris Meyer received an award of $271,045 from the National Science Foundation for the project, “CyberSEES: Type 1: Collaborative Research: Infrastructure and Technology Supporting Citizen Science Data Usage and Distribution for Education and Sustainability.”

Steve Box received an award of $88,747 from National Fish and Wildlife Foundation for the project, “Developing Trace Techniques for Monitoring Spiny Lobster Fisheries.”

Max Teplitski and Valerie Paul received an award of $9,932 from Mote Marine Laboratory for the project, “Defining the Coral Microbiome Trajectory Leading to the Black Band Disease.”

Justin Campbell and Jennifer Sneed received an award of $9,836 from Mote Marine Laboratory for the project, “Acidic Seas and the Future of Coral-Algal Interactions: Combined Effects of Oceanic Acidification and Algal Contact on Multiple Coral Life Histories.”

Ana Tronholm and Valerie Paul received an award of $10,229 from Mote Marine Laboratory for the project, “Who is Taking Over Coral Reefs? Assessing Biodiversity of the Ecologically Important Brown Algal Order Dictyotales in the Florida Reef Tract.”

Selected Publications


The Smithsonian Marine Ecosystems Exhibit (SMEE) at the St. Lucie County Aquarium aims to inspire appreciation and understanding of marine ecosystems, part of which includes motivating others to become involved in marine conservation. This summer, two significant opportunities to make that happen included the Smithsonian’s 10th annual World Ocean Day Celebration and an expanded Marine Science Summer Camp program.

World Ocean Day was celebrated at the Aquarium on Saturday, June 6, 2015. The worldwide theme, “Healthy oceans, healthy planet”, focused on the importance of ocean health and our responsibility to maintain it, emphasizing the problem of plastic pollution and ways to reduce it. Attendees were encouraged to commit to take action by posing for a photo in the “Better Bag Challenge” photo booth, sharing it on social media, and pledging to use no disposable plastic bags for at least one year. Children and adults also learned about everyday products that can be harmful to the ocean through an interactive game. For example, players could learn that microbeads, tiny plastic particles found in many brands of toothpaste and facial cleanser, make their way to the ocean through sewage systems and are detrimental to marine life. The event also included several opportunities to engage with Smithsonian scientists. SMS researchers led seining demonstrations in the Indian River Lagoon, shared information about local species in a large outdoor touch tank, and discussed ongoing oyster research on Florida’s east coast. Recycled art was a focus of the event as well, with several craft opportunities for children. Local nonprofit, Art Mundo, joined in the celebration with a display promoting, “Lil’ Feet”, a program that raises money for area children in need of new shoes by auctioning elaborately decorated firemen’s boots.

The Smithsonian’s Marine Science Camp Program is a main focus at SMEE each summer, with several week-long educational experiences available for children and teens. This year, a new session was offered for teens ages 14-15, the “Marine Science Field Experience”, with a special focus on marine science careers and conservation. Teens experienced more challenging snorkeling and kayaking trips, were exposed to different marine science careers, and conducted habitat surveys around a spoil island. For more information about summer camps, special events, and other education programs with the Smithsonian, please visit www.sms.si.edu/SMEE.