

The National Coral Reef Institute (NCRI) was established by Congressional mandate in 1998. NCRI's primary objective is the assessment, monitoring, and restoration of coral reefs through basic and applied research and through training and education. NCRI operates at the Nova Southeastern University Oceanographic Center near Ft. Lauderdale, Florida.

A PRODUCTIVE SUMMER 2007 FOR NSU NATIONAL CORAL REEF INSTITUTE RESEARCHERS



NCRI Hosts VIPs for Tire Removal Project and Will Study Project Impacts

Military, Federal, State, and Broward County officials as well as the NSU Oceanographic Center are set to begin a monumental project to remove hundreds of thousands of waste tires from the Osborne Reef in the Atlantic Ocean, off the coast of Fort Lauderdale, Florida.

Broward County is home to spectacular and economically valuable coral reefs, most just a short ride from shore. These are home to a myriad of soft and hard corals, including threatened Staghorn and Elkhorn corals, which belong to the coral family Acroporidae. The reefs also serve as home to hundreds of fish species and invertebrates.

Ten years ago, NSU OC PhD graduate Dr. Robin Sherman, now a professor at the NSU Farquar College of Arts and Sciences (FCAS) first observed the tires while working on her doctoral dissertation. A few years later, she obtained a NOAA grant to NCRI for her to study ways to best remove the tires, recruiting almost 90 diving volunteers and gathering 1,600 tires. The team recycled the tires. The sheer magnitude of the project prevented further cleanup but led to management recommendations on best practices and ultimately to what is happening today.

The Broward County Environmental Protection Department, the Florida Department of Environmental Protection, U.S. Army, Navy, and Coast Guard divers are participating in tire removal project. NCRI scientists will evaluate recovery of the injured reef.

It is estimated that nearly two-million tires were placed into the ocean in the 1970's by private organizations hoping to create an artificial reef. Over the years, the successful formation of an artificial reef did not occur; the tires loosened and moved, damaging the nearby natural coral reefs. The tires cover more than 34 acres on the seafloor in 60-70 feet of water about 1.3 miles off the coast of Fort Lauderdale beach.

A month long pilot project was conducted in June to determine the most efficient way to remove the tire debris from the ocean. After the pilot project, a three year initiative will begin to remove an estimated 700,000 tires from the ocean floor.

Benefits to the public in natural resource restoration and preservation

are enormous. Military divers will receive training in a real life environment. Waste tires will be removed from the ocean floor and recycled. Removal and recycling of the tires will turn an environmental hazard into an environmental asset. A continuing injury to coral reef habitat will be removed, allowing the natural reef to begin natural recovery. Research on coral reef restoration will be conducted and promoted through NCRI.

The military divers will gather and bundle the tires and buoy them to the ocean's surface. The tire retrieval project will serve as a training exercise. The Army is providing a landing craft unit (LCU) that will crane the bundles from the surface and deposit them into cargo containers that will be later transferred to trucks. The Florida Department of Environmental Protection's contractor will haul the tires to a waste tire processing plant in Georgia where they will be processed into tire-derived fuel (TDF) and sold to a recycled paper plant.

NCRI researchers Dr. Richard Spieler, Dr. Robin Sherman, and graduate student Lance Robinson plan to evaluate the recovery of fish and coral populations on the reef following tire removal. Their NOAA funded study will provide resource managers valuable information on restoration effects and reef recovery times. NCRI has a number of monitoring stations on the reefs and works in coordination with Broward county in a number of reef studies.

Dr. Spieler, Professor and NCRI Principal Investigator, stated: "This work provides a unique opportunity for scientists to examine the effects of the cessation of a major injury to the natural ecosystem. Will the impacted site return to a natural state similar to surrounding reef? If so, how long will this process take? The answers are of great significance for understanding the current and directing future restoration studies."

The State of Florida is spending \$2 million the project to facilitate the removal. Recently, Tim Keeney, the U.S. Deputy Assistant Secretary for Oceans and Atmosphere with NOAA, together with Mike Sole, Florida Secretary of the Department of Environmental Protection, got a firsthand look at reef damage, repair and recovery efforts. They met with NCRI Executive Director Richard Dodge for consultation on the project.



Almost two-million tires were placed between the reefs of Broward County in the 1970s.



Divers will attempt to remove approximately 700,000 tires in three years.



NOAA US Deputy Assistant Secretary, Tim Keeney, Florida DEP Secretary, Mike Sole and NCRI Executive Director, Dr. Richard Dodge.

BUSY SUMMER FOR NCRI RESEARCHERS IN BROWARD COUNTY . . .

NSU's Oceanographic Center Corals Reproduce

On Saturday night, May 12, 2007 the first release of coral larvae occurred in the NSUOC's new outdoor coral husbandry system. The coral husbandry system, which has made captive coral spawning a possibility at the NSUOC, is comprised of four large raceways holding over 450 gallons each, a 500 gallon holding tank, and a 10 ft tall protein skimmer. The system was fabricated and constructed over the past few months by Alison Moulding PhD, and research assistants Abby Renegar and Adam St.Gelais.

Ten colonies of the mustard hill coral, *Porites astreoides*, were collected from a near-shore reef off Broward County a few days prior to the predicted larval release date. *P. astreoides* is a brooding species, so fertilization and larval development occur within the parent colonies. Larval release is synchronized with lunar cycles, and *P. astreoides* is known to release larvae nocturnally a few days before or after the new moon, primarily in April, May, and June.

Collected colonies were placed in the outdoor system inside specially constructed larval collection buckets. Each of the ten buckets had its own water inflow and an overflow into a plastic container with 120-micron mesh sides. When larvae were released by the colony, they flowed out of the bucket and into the mesh cup where they were collected. Two of the ten colonies released larvae, which were individually transferred by hand to smaller settlement tanks in the lab. Limestone tiles in the bottom of the aquaria provided settlement substrate. Currently, over 60 coral larvae have successfully settled and begun to deposit calcareous skeletons. Many of the coral polyps have even divided, forming small colonies with up to 6 polyps.

As the spawning season progresses, Dr. Moulding plans on applying similar techniques to a number of other species including *Montastraea cavernosa* and *Siderastrea siderea*. Captive coral spawning holds exciting potential for reseeding coral reefs with captive raised colonies.



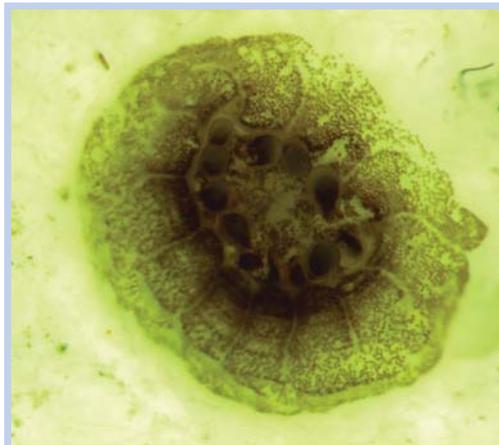
Larval collection buckets. Each orange bucket contains one colony of *P. astreoides*. White jars attached to orange buckets collect larvae as water flows out of the buckets.



Dr. Alison Moulding checking the settling tank, which features limestone tiles for settlement substrate.



Hand sorting of coral larvae to place in settlement tanks.



Settled *P. astreoides*, which are approximately seven weeks old.



... SPAWNING CORALS, TRANSPLANTATION & REATTACHMENT, AND SUPPORTING NOAA'S LOCAL ACTION STRATEGY (LAS) GROUP

NCRI Continues Coral Transplant and Restoration

One of NCRI's primary objectives is to advance coral reef restoration science. NCRI is very active working with County, State, and Federal agency together with NGO partners on reef restoration projects offshore southeast Florida. Beginning in 2005, NCRI Principal Investigator Dr. David Gilliam is working with Florida DEP on a multiyear, multi-project study to investigate methods to improve restoration methods and success. One of these projects, the Gorgonian Transplantation Project, started in spring 2007. Octocorals (gorgonians) are a major component of the southeastern Florida reef community, but there is limited knowledge on restoring gorgonian population following reef damage events. The Gorgonian Transplantation Project is looking at different transplantation methods using two species of local octocorals, *Pseuopteroorgia acerosa* and *Plexaura flexuosa*. Clippings of each species were taken from local donor colonies and subsequently transplanted to a vessel grounding site. The 25 cm clippings were transplanted using two different attachment materials (epoxy and cement) and base treatments (stripping base tissue off to the axis vs. not stripping). These transplants and donors will be monitored over the next two years to determine transplantation success.

In 2006, the Staghorn coral, *Acropora cervicornis*, was listed as a Threatened species under the Endangered Species Act. To begin efforts to restore southeast Florida *A. cervicornis* populations, NCRI is starting a Staghorn Restoration Project funded through The Nature Conservancy-NOAA Community-based Restoration Program. Donor colonies will be mapped and tagged. Clippings from these donor colonies will be transplanted to a nursery site. After a grow-out period, fragments from the clippings will be transplanted to several reef sites. In addition to collecting samples for transplantation samples from each donor colony will be used to examine genotypic variation within the Staghorn population. This SE Florida effort is an expansion of a project underway in the Florida Keys and includes partners from TNC, University of Miami, Biscayne National Park, and Mote Marine Laboratory. This large project will allow a quantitative comparison of genotypic variation in Staghorn coral populations along much of the Florida reef tract, evaluating genotypic and regional variation in survivorship and growth, and set the groundwork for regional-scale restoration efforts.



Acropora cervicornis patch in Broward County.



Right NCRI researcher with stripped Gorgonian from Broward County.



Left NCRI scientist surveying a threatened Staghorn coral patch.

NCRI Hosts SEFCRI Technical Advisory Committee Meeting

Continuing its close work with the Southeast Florida Coral Reef Initiative (SEFCRI), NCRI strengthens its liaison and participation with the LAS (Local Action Strategy) groups of the U.S. Coral Reef Task Force Southeast Florida Action Strategy Team (SEFAST).

NCRI hosted the bi-annual Technical Advisory Committee (TAC) meeting for the Land Based Sources of Pollution (LBSP) and Water Quality Working Group of SEFCRI on May 24th and 25th at the NSU Oceanographic Center. Attending the meeting were members of the TAC, as well as the LBSP Advisory Committee and interested members of the public.

The TAC is composed of representatives with expertise in pollution and water quality, representing federal agencies, including NOAA, EPA, and USGS, as well as state officials and industry scientists. Universities represented included NSU, University of Miami, FIU, and College of Charleston. The Advisory Committee is comprised of resource management agency representatives and other experts, including those from the Florida Department of Environmental Protection (DEP), South Florida Water Management District, and Broward County. Dr. Richard Dodge, NSU OC Dean and NCRI Executive Director, serves on the TAC. Many NCRI scientists and staff attended the meeting.

Presentations included "Human Fecal Indicator Bacteria and Pathogenic Viruses in Offshore Reefs and Human Recreational Risk in Nearshore Waters of the Florida Keys" and "Florida Oceans and Coastal Resources Council Update".

NATIONAL CORAL REEF INSTITUTE IS IN THE NEWS . . . DAN RATHER REPORTS AND THE HISTORY CHANNEL!

NCRI Work Covered in National and International News

The National Coral Reef Institute started the spring with a feature story on "Dan Rather Reports". Dan Rather visited the NSU Oceanographic Center (OC) in late March, 2007 to gather material for his television news show on the cable/DirectTV channel HDNET. The show features field reports that include politics, international affairs, and the environment. In researching for a story on the fate of coral reefs, Rather and his staff learned of the coral reef research being done by scientists at NCRI and of the 11th International Coral Reef Symposium (coming to Fort Lauderdale in 2008) that NCRI is helping organize.

Rather extensively interviewed NSUOC Dean Richard Dodge, Ph.D. who is also Executive Director of the National Coral Reef Institute.

During his visit, Rather was informed of one of the NCRI coral reproduction/restoration projects taking place. He was shown maps of the coastline and how close the reefs are to Port Everglades. Dr. Dodge explained that due to the poor placement of the anchorage sites, ships have drifted into the reefs causing groundings that destroy the coral.

NCRI researcher, Kevin Helmle, was recently filmed by Pioneer Productions for a 2 hour documentary special "A Global Warning?", which will air on The History Channel on Dec. 9, 2007 at 8 PM EST. The focus of the documentary is on the history of climate change and NCRI's contribution is on what corals can tell us about sea level and climate change.

Filming began at Windley Key Fossil Coral Reef State Park, near Key Largo, FL, illustrating that sea level was much higher 225,000 years ago. Footage was then collected at the Nova Southeastern University Oceanographic Center to discuss the use of coral cores and density banding to identify recent climate change over the last 300 years and the relationship to coral growth. Underwater filming was also taken to demonstrate the method of drilling coral cores that is used by NCRI researchers to procure samples.



Dan Rather interviewing NCRI Executive Director, Dr. Richard Dodge. Video of the interview may be seen at <http://www.nova.edu/ocean/>.



NCRI Researcher, Kevin Helmle, in the water, with the crew from The History Channel, off Broward County, FL.



Registration now open!

Visit www.nova.edu/ncri/11icrs to register for the 11th International Coral Reef Symposium - July 7-11 in Ft. Lauderdale, FL! Now accepting conference registration, abstract submissions and hotel and field trip reservations!



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