

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 research and education. NCRI operates at the Nova Southeastern University Oceanographic Center near Fort Lauderdale, Florida.

2008: PRODUCTIVE FOR RESEARCHERS FROM THE NATIONAL CORAL REEF INSTITUTE



NCRI Continues Mapping of Coral Reef Habitats in Southeast Florida

Working with the Southeast Florida Coral Reef Initiative (SEFCRI), NCRI researchers continue to map the fragile coral reefs of southeast Florida. Having already successfully mapped the benthic habitats of Broward and Palm Beach Counties, NCRI has begun the mapping of Miami-Dade coral reefs with funding through Florida Department of Environmental Protection (DEP) Coral Reef Conservation Program (CRCP). Both LIDAR and habitat mapping are in the planning stages for Martin County, FL through a recent award from the State of Florida's Wildlife Legacy Initiative Grant.

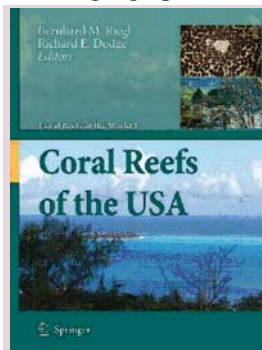
NCRI mapping research played an integral part in the recent reconfiguration of the Port Everglades commercial ship anchorage in Broward County, FL. The modifications were made after a review of commercial vessel groundings and in an effort to protect fragile living coral reef areas adjacent to current anchorage locations. The NSU Oceanographic Center and NCRI are both represented on the Port Everglades Harbor Safety Committee, which is chaired by the Coast Guard Sector Miami and includes representation from federal, state and county agencies, and local maritime and environmental stakeholders. The reconfiguration was a partnership effort among all the stakeholders and was a joint effort to both preserve the anchorage function and to protect the invaluable reef resources. NCRI researchers were particularly instrumental in providing GIS-based images of recent ship groundings associated with the anchorage and coral reef habitats plus GIS analyses to optimize the anchorage reconfiguration for all stakeholder interests. NCRI will soon be under contract with Florida DEP CRCP to evaluate the status of two other major ports in southeast Florida, the ports of Miami and Palm Beach. The benthic habitat maps will be a key component in the GIS to evaluate the coral reef's proximity to these major port anchorages. If necessary, modifications will be proposed to reduce ship anchoring impacts and help protect the coral reefs.

NCRI Directors Produce Coral Reefs of the USA

Dr. Bernhard Riegl, NCRI associate director, and Dr. Richard Dodge, NCRI executive director, recently worked with Springer to publish *Coral Reefs of the USA*, which is the first volume in the new series, *Coral Reefs of the World*.

Riegl and Dodge serve as editors of the book, which provides a complete overview of the present status of knowledge regarding all coral reef areas within the U.S. and its territories. It is written by the most experienced authorities in their fields and geographic areas. Stretching from the Caribbean to the western Pacific, the coral reefs of the U.S. span extensive geographic and biotic diversity in a wide variety of geomorphological settings.

Coral Reefs of the USA, written by 145 authors, is the first complete compilation of geology and biology information for all U.S. coral reefs. The book is richly illustrated and contains much information that has never been published before. There is also an extensive literature list that is useful as a guide to further study on coral reefs.



NCRI Scientists Observe Annual Coral Spawning in Southeast Florida

During the month of August, NCRI researchers will continue to expand understanding of coral reproductive biology by observing the spawning of two important Caribbean coral species, the massive coral, *Montastraea cavernosa*, and the staghorn coral, *Acropora cervicornis*.

In the case of *M. cavernosa*, scientists and students, working along with the Florida Department of Environmental Protection, will collect eggs and sperm from large male and female colonies on the reef. They will bring the gametes back to the laboratory to mature and settle on conditioned natural limestone settlement plates in a controlled environment. Gametes will also be collected from several smaller colonies maintained in NCRI's outdoor coral husbandry system. The resulting juvenile corals will be allowed to grow in this protected environment until they are large enough to be returned to the reef.



Spawning *A. cervicornis* in Broward County, FL.

Commission Proclaims Support for IYOR and Designates July 7-11, 2008 as "11th ICRS Week" in Broward County, FL

In preparation for, and recognition of, the 11th International Coral Reef Symposium, the Broward County Commission issued a Proclamation on June 24, 2008 celebrating the 11th ICRS, the 2008 International Year of the Reef, and conservation of southeast Florida's reefs by the Southeast Florida Coral Reef Initiative.

The Broward County Commission Proclamation recognizes the extraordinary biological, geological, and economic resources represented by coral reef ecosystems locally, nationally, and globally; and the fact that coral reefs worldwide, as well as in Florida, are suffering degradation from the effects of overfishing, coastal construction and development, land based sources of pollution, and global climate change.



From left: Kristin Jacobs, Broward County Commissioner; Dr. Richard Dodge, NCRI Executive Director; Wendy Wood, NCRI Administrative Coordinator; Dr. Ken Banks, Broward County Environmental Protection and Growth Management Dept. and Chantal Collier, FL DEP CRCP.

The Outcomes of the 11th ICRS

The 11th International Coral Reef Symposium concluded a marathon week (July 7-11, 2008) with over 3,500 attendees from 75 countries; 1032 oral and 1600 poster presentations; 26 mini-symposia; 3 special sessions; 20 field trips; addresses by 6 distinguished plenary speakers (Malcolm McCulloch, Joan Kleypas, Roberto Iglesias-Prieto, Robert Cowen, Drew Harvell, Daniel Pauley), the Darwin Medalist (Terry Hughes), the ISRS President (Richard Aronson), NOAA Administrator Vadm. Conrad Lautenbacher, and also by Florida's governor Charlie Crist, US Congressmen Ron Klein and Brian Baird, and Florida representative Ellyn Bogdanoff; 40 sponsorships from diverse government agencies (including Co-Sponsorships from the state of Florida, NOAA, and DOI), academic institutions, NGOs, and private industry; scores of exhibits; and a fine educational center.

The Local Organizing Committee and Super-Chairs of the 26 Mini-Symposia (scientific sessions) provided an overview to highlight outcomes.

A defining theme of the 11th International Coral reef Symposium is that the news for coral reef ecosystems is far from encouraging. Climate change is now much faster than in an ice-age transition, and coral reefs continue to suffer fever-high temperatures as well as sour ocean conditions. Corals may be falling behind, and there appears to be no special silver bullet remedy. Nevertheless, there are hopeful signs that we should not despair.

Reef ecosystems respond vigorously to protective measures and alleviation of stress. For concerned scientists, managers, conservationists, stakeholders, students, and citizens, there is a great role to play in continuing to report on the extreme threat that climate change represents to earth's natural systems. Urgent action is needed to reduce CO₂ emissions. In the interim, we can and must buy time for coral reefs through increased protection from sewage, sediment, pollutants, overfishing, development, and other stressors, all of which we know can damage coral health.

The time to act is now. The canary in the coral-coal mine is dead, but we still have time to save the miners. We need effective management rooted in solid interdisciplinary science and coupled with stakeholder buy-in, working at local, regional, and international scales alongside global efforts to give reefs a chance.

For the full 11th ICRS Outcomes Document, please visit www.nova.edu/ncri/11icrs/outcomes.html



Florida Governor Charlie Crist (seated) with (from left) Senator Burt L. Saunders (R-Fl, 37th District); Michael W. Sole, FL DEP Secretary; Dr. Richard Dodge, NCRI Executive Director; and Jonathan Saunders.

11th ICRS "Call To Action"

2008 is a critical time for coral reefs. At the 11th International Coral Reef Symposium held in July, midway in the International Year of the Reef, over 3000 experts from 75 countries assembled to face some hard truths: coral reefs are teetering on the edge of survival and it is our fault. High levels of carbon dioxide in the atmosphere have produced a lethal combination of hotter and less alkaline seawater. Pervasive overfishing, pollution, coastal development, and physical damage further undermine reef health, and consequently, that of the people and ecosystems depending upon them.

Coral reefs feed, protect, and provide livelihoods for hundreds of millions of people around the world. They create homes for billions of fish and other animals, buffer coastlines from the ravages of storms, and provide rich economic opportunities through tourism and fishing. Their value to society has been estimated at more than \$300 billion/yr. Reefs are the dynamic centers of the most concentrated biodiversity on Earth. Losing coral reefs would rob the world of one of nature's most precious gifts.

Despite these challenges, it is not too late to save coral reefs. The 11th ICRS gave a renewed sense of purpose and hope for the future. A consensus emerged that society has both the knowledge and the tools to bring coral reefs back from the brink. The only question is - will we act? We have a real - but rapidly narrowing - window of opportunity in which to take decisive action. We must immediately

- **Cut CO₂ emissions by lowering our carbon footprint and ask our policymakers to commit to low carbon economic growth.**
- **Eliminate open access fisheries in coral reef ecosystems.** Establish and enforce regulations on user rights, total allowable catch, individual catch quotas, non-destructive gear and other sustainable fisheries regulations.
- **Protect coral reef herbivores, including parrotfish.** Ban the harvesting of these species for sale and commercial consumption.
- **Establish and strictly enforce networks of Marine Protected Areas that include No-Take Areas.** Consult with local communities and authorities on design and benefit sharing to maximize returns and build sustainability into the process in order to protect marine biodiversity and restore vital fish stocks.
- **Effectively manage the waters in between Marine Protected Areas.** The enforcement of coastal zoning, environmental impact assessments and "polluter pays" regulations can help control marine and land-based sources of pollution, while strategic environmental assessment can effectively manage coastal development and tourism.
- **Maintain connectivity between coral reefs and associated habitats.** Mangroves, sea grass beds and lagoons contribute to the integrity of reef ecosystems and their continued production of ecosystem services.
- **Report regularly and publicly on the health of local coral reefs.** Include assessments of the effectiveness of management and conservation measures.
- **Recognize the links between what we do on land and how it affects the ocean.** We live on a blue planet - our health depends on ocean health.
- **Bring local actors together to develop a shared vision of healthy reefs and a road map for getting there.** Engage members of industry, civil society, local government and the scientific community to set ambitious targets and performance indicators.
- **Work for change with management to produce desired outcomes.**

Only by taking bold and urgent steps now can we hope to ensure that reefs will survive to enrich life on earth, as they have for millions of years before us. By failing to act we risk bequeathing an impoverished ocean to our children and future generations. We urge you to sign on at www.nova.edu/ncri/11icrs/calltoaction.html to this commitment to action.

11th ICRS Strives to Promote "Reefs for the Future"



NCRI Leadership and US Coral Reef Task Force Support Make 11th ICRS a Huge Success!

The 11th ICRS would not have been possible without the support of members of the U.S. Coral Reef Task Force. NOAA, the Department of the Interior (represented by MMS, FWS, OIA, NPS and USGS) and the State of Florida all served as Co-Sponsors. Other USCRTF members who supported the 11th ICRS were the U.S. Coast Guard, the U.S. Environmental Protection Agency (EPA), and the U.S. Department of State.

Dr. Richard Dodge, as Chair of the 11th ICRS Local Organizing Committee (LOC), spearheaded the effort to make this symposium a world-class event. The LOC was made up leading coral reef scientists from universities and government bodies throughout the state of Florida, including NOAA and the Florida Department of Environmental Protection. Other NCRI researchers and staff also played a critical role in the planning of the 11th ICRS and NCRI is proud to host the official 11th ICRS website and oversee the proceedings, which will be released in summer 2009.

A big thank you goes out to all the 11th ICRS sponsors, the Greater Ft. Lauderdale Convention and Visitors Bureau, who donated use of the Broward County Convention Center, meeting management company Federation of American Societies for Experimental Biology (FASEB), media specialists COMPASS and Seaweb, as well as the entire LOC, Scientific Committee chairs and co-chairs, and volunteers. The 11th ICRS would not have been impossible without the support and help of each of these groups.



From left: George L. Hanbury II, Ph.D., NSU Executive Vice President/COO; Timothy R.E. Keeney, Deputy Assistant Secretary for Oceans and Atmosphere, NOAA; Kameron Onley, Acting Assistant Interior Secretary for Water and Science, U.S. Department of the Interior; Michael W. Sole, FL DEP Secretary; Richard Dodge, NCRI Executive Director.



From left: Dr. Rich Appeldorn, Executive Director of the Climate Change Research Initiative; George L. Hanbury II, Ph.D., NSU Executive Vice President/COO; Dr. Richard Dodge, NCRI Executive Director; U.S. Representative Ron Klein (D-FL, Dist. 22).

Congressman Ron Klein Presents Coral Reef Institutes with FY 08 Funding

A highlight of the 11th ICRS for NCRI and the other coral reef research institutes was Congressman Ron Klein (D-FL) presenting NCRI and the Caribbean Coral Reef Institute (CCRI) with a check representing 2008 federal funding for both NCRI and CCRI.

Following his remarks at the opening ceremonies, Congressman Klein held a press conference to present a check representing 2008 funding from NOAA. He also discussed the importance of coral reefs to South Florida's ocean ecosystems, beaches, and economy, noting that Florida is home to 84 percent of the coral reef habitat in U.S. waters and that Florida reefs support \$5.7 billion in direct annual economic activity and 74,000 jobs in Broward, Miami-Dade and Palm Beach Counties.

Congressman Klein worked together with U.S. Representative Debbie Wasserman-Schultz and U.S. representatives from Puerto Rico to secure the NOAA funding, which will support coral reef research and management efforts at NCRI and CCRI (which is based at the University of Puerto Rico in Mayaguez). Dr. Richard Appeldorn, executive director of the Caribbean Coral Reef Institute, was present to accept funding on behalf of the University of Puerto Rico and to stress the importance of collaborative efforts to address alarming rates of recent coral die offs in the Caribbean and Florida. The check represents NOAA's 2008 funding. The institutes collaborate on research examining the stress on coral reef ecosystems and improving mitigation and management activities.



NCRI attendees at the closing banquet.

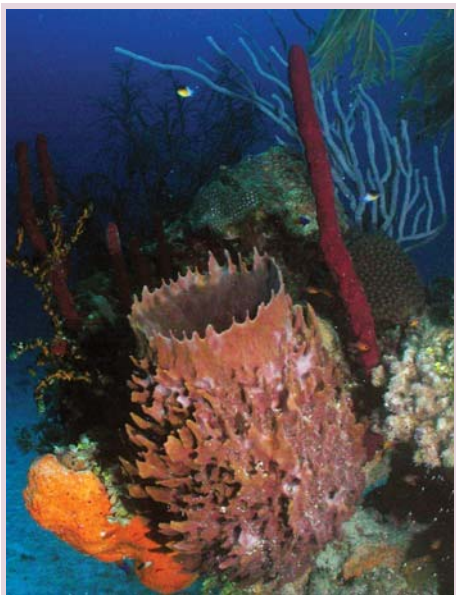


NCRI scientist and Director of the Guy Harvey Research Institute, Dr. Mahmood Shivji, with NCRI research assistants Elizabeth Goergen and Stephanie Saelens at the NCRI booth.

NCRI RESEARCHERS MAKE ELEVEN ORAL PRESENTATIONS AND TWENTY-SEVEN POSTER PRESENTATIONS AT 11th ICRS

Oral Presentations by NCRI researchers covered a wide variety of topics, representing the different scientific disciplines at NCRI, including the latest technology in coral reef mapping, population genetics and coral reef recovery. The following are the oral presentations made by NCRI scientists at the 11th ICRS:

- **Helmle, K.P., R. E. Dodge,** P. K. Swart, and J. H. Hudson. Coral growth records from Southeast Florida: A History of anthropogenic influence.
- **Walker, B.** A novel model framework for predicting organismal distributions across the seascape using GIS topographic metrics and benthic habitat associations.
- **Foster, G.** Statistical comparison of single-beam acoustic backscatter with LIDAR-derived coral reef benthic habitat classification and topographic complexity.
- **Richards, V.P., K. Feldheim and M. S. Shivji.** Contrasting patterns of population structure and dispersal for the giant barrel sponge (*Xestospongia muta*) within the Florida reef tract and Caribbean.
- **Horn, R., W. Robbins, D. J. McCauley, P. Lobel and M.S. Shivji.** Population genetic structure of a coral reef Ecosystem apex predator, the gray reef shark (*Carcharhinus amblyrhynchos*).
- **Purkis S.J., K.E. Kohler, B. Riegl.** The view from above - Are reefs fractal because of neutral-random construction?
- **Rowlands, G.P., S. J. Purkis, B.M. Riegl.** CASI mapping of the Farasan Islands (Saudi Arabia): Ecosystem processes in an atypical Red Sea setting.
- **Moulding, A. L., D. S. Gilliam, V. N. Kosmynin, and R. E. Dodge.** Natural and enhanced coral reef Recovery after injury.
- **Renegar, D. A., G.F. Harrison, P. L. Blackwelder, J. E. Thurmond, K.B. Rithcie and V. Vargas-Angel.** Occurrence of epidermal bacteria in the scleractinian coral *Montastraea cavernosa*.
- **Brinkhuis, V.I.P., V. Kosmynin, A. Moulding, and D. Gilliam.** Assessment of gorgonian transplantation techniques offshore southeast Florida, USA.
- **Riegl, B. and S. Purkis.** Reefs, Resilience and Refuges - Theoretical Consideratons and Real-Life Examples.



Giant barrel sponge, *Xestospongia muta*.

Giant Barrel Sponge Shows Very Low Connectivity Throughout Caribbean and Genetically Distinct Population in Dry Tortugas

The giant barrel sponge, *Xestospongia muta*, is a conspicuous and ecologically important member of coral reef communities, often reaching massive sizes and remarkable old age (hundred of years). NCRI scientists are using this iconic sponge, sometime called the “redwood of the reefs” as a model to understand the degree of genetic connectivity along the Florida reef tract, and among Florida and Caribbean reefs. Results suggest that in general, dispersal of *X. muta* larvae is restricted to relatively short distances, with currents strongly affecting dispersal patterns throughout the Florida reef tract and the Caribbean. Estimates of genetic relatedness show that there has been virtually no larval exchange between Florida reefs and those of several Caribbean locations over both long (evolutionary) and short (recent generation) time scales. Interestingly, although the Florida Keys reefs are highly connected, gene flow between these reefs and reefs the Dry Tortugas is restricted, resulting in a significant level of genetic distinctiveness for the Tortugas reefs. It is likely that larvae are being retained in the Tortugas by the prevailing Tortugas eddy current.

Overall, our results indicate a high degree of local larval recruitment within Florida and Caribbean reefs for the giant barrel sponge. For management, this means that gene pools of degraded reef populations are unlikely to receive input of genetic diversity required for adaptation and resilience via dispersal of larvae from distant reefs. Thus, the genetic distinctiveness of the Dry Tortugas population highlights the importance of the Tortugas Ecological Reserve and supports continued conservation efforts in this region.

This research was presented at the recent 11th ICRS by NCRI PhD student Vince Richards and Dr. Mahmood Shivji. NCRI is now expanding this work to assess detailed patterns of connectivity along the entire Florida reef tract, from Palm Beach reefs to the Dry Tortugas.



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