

CCRI NEWS

October 2011

CCRI Helps Florida Locate Critical Black Grouper Spawning Aggregation and Document Deep Fish Populations

Black groupers are an important but overfished species within south Florida, including the Florida Keys National Marine Sanctuary and the Dry Tortugas National Park. While populations have increased in closed areas, fish are still vulnerable to fishing when they leave to form annual spawning aggregations. To predict the potential movements of black grouper, scientists from the Florida Fish and Wildlife Conservation Commission initiated a search for the spawning aggregation site. Thinking the site was located in waters too deep for conventional diving, they asked the Caribbean Coral Reef Institute to add their deep-diving capabilities to the search. Last March, a team of five scientists using mixed-gas rebreathers and a remotely operated vehicle (ROV) joined Florida scientists on a 5-day mission aboard the M/V Spree in an attempt to locate the spawning aggregation site. Efforts focused on Riley's Hump, located within the Tortugas South Ecological Reserve. After several days of searching, the black grouper aggregation site was finally found! Located in waters deeper than 165 ft, the fish were associated with a unique geological formation of large outcrops and boulders. Video taken provided data to characterize the site, to estimate relative size and density of groupers, while the reproductive behavior recorded confirmed the aggregation was indeed for spawning. In addition, the cruise offered the first opportunity for scientists to assess fish populations in areas too deep to be included in standard surveys. Results indicated that these populations were significant, with 39 species being identified. In addition to black grouper, frequently sighted species include the commercially important mutton snapper, almaco jack, cubera snapper, and scamp, suggesting that deep areas constitute important habitats that should be included in standard surveys if population abundance and health are to be assessed. Resulting video recordings will serve as a baseline for future assessments. This cruise was a major step towards the understanding of the species composition, behavior and abundance of fishes in the deep waters of Riley's Hump.



Black groupers at 180 ft, Riley's Hump FL (Photo: M. Nemeth)



Acropora palmata reef at Vega Baja, PR (Photo: E. Hernandez)

CCRI's Reef Monitoring Documents Decline, Offers Hope

Since its inception, the monitoring of Puerto Rico's coral reefs has been a core activity of the Caribbean Coral Reef Institute. Monitoring efforts have been led by Dr. Edwin Hernandez and have covered sites on the east, south and west coasts of Puerto Rico, including the islands of Mona and Culebra. It is no surprise that these studies have seen a marked decline in the health of the coral and fish communities. Most significant was the 2005 massive bleaching and disease event. Elevated sea surface temperature was responsible for the bleaching, but most of the mortality was due to disease, the outbreak of which was spurred by the stress of bleaching and the increasingly mild winters that allowed the disease to spread unchecked during winter months. As a result, there was a 50% loss of living coral cover, and a significant decline in coral species richness and colony abundance. Especially disturbing was the 80%

loss in the star coral, *Montastraea annularis* species complex, the primary reef building coral. Following this was a community phase shift favoring macroalgae, cyanobacteria and algal turfs. Subsequent reproductive failure in response to the bleaching-disease event gave little chance for the recruitment of new colonies. As severe as this event was, long-term monitoring shows it to be just part of a sustained decline in reef health, with both global and local causes. For example, high coral mortality was found off Culebra following high sedimentation and turbidity due to poor land clearing practices. However, all sites have not responded equally, and therein lies hope. In shallow reef habitats under strong surface currents and wave action (for example Mona, Culebra, Rincon) coral communities have been less impacted and show significantly higher coral recruitment and fish biomass. Thus, these areas have the potential for replenishing adjacent depleted reefs over the long term and may be key components contributing to overall reef resilience. Long-term monitoring on an annual basis has been fundamental for not only documenting the decline in reefs but also of pointing to probable causes, identifying key areas where protection may be critical, and emphasizing the urgency with which action is needed.

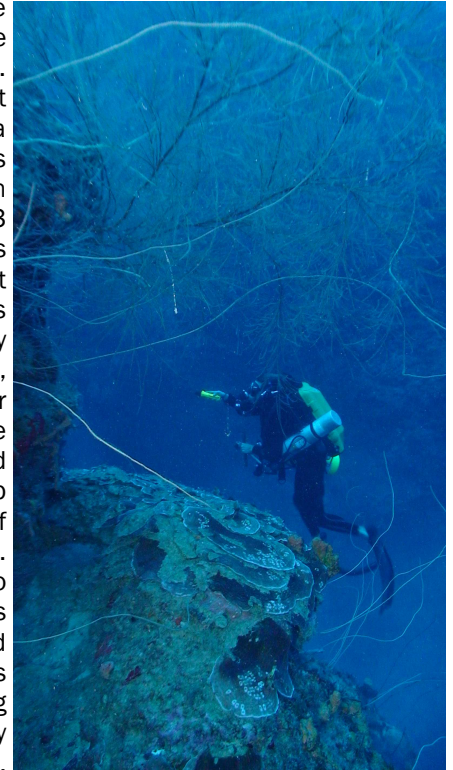
CCRI Continues Exploration of Deep Mesophotic Coral Ecosystems



Massive coral head of *A. undata* in St. Croix USVI.
(Photo: D. Kesling)

Deep mesophotic coral ecosystems (MCEs) between 165 and 330 ft are little known but diverse communities composed of corals, sponges and other invertebrates, algae and fishes. While still light dependent like their shallow water counterparts, MCEs occur where light becomes limiting. Yet, MCEs can be vibrant, with high structural development from corals and sponges, which in turn provide habitat for many reef fishes, some of high commercial importance. How these communities are distributed, what factors may be important in sustaining their productivity, how MCEs are connected to shallow coral ecosystems or to other MCEs, and how they respond to anthropogenic stress are some of the questions spurring studies by the Caribbean Coral Reef Institute (CCRI).

In January of 2010, CCRI led the first ever exploration of deep MCEs in the Caribbean on a cruise exploring sites from Mona Island, west of Puerto Rico, east to sites off St. Thomas and St. Croix, US Virgin Islands (CCRI News February 2010). This work was extended this year during April-May, when again scientists visited sites from Mona Island to St. Croix. Thirteen scientists spent 3 weeks aboard the commercial dive vessel M/V Spree conducting quantitative surveys and collecting specimens for identification and genetic and reproductive analyses. At most sites, studies were focused at two depths 165 ft and 270 ft. Teams of divers using mixed-gas rebreathers conducted a variety of tasks. High-resolution photography and visual census were used to quantify the benthic and fish communities, respectively, while samples and video were taken to further characterize the sites and for further processing back in the lab. A remotely-operated vehicle (ROV) was deployed to explore and photo-document a broader depth range down to at least 330 ft. The sites visited offered a broad array of potential MCE areas, including islands, sea mounts and steep insular slopes. Two areas really stuck out. The first was Bajo de Sico, a seamount off of western Puerto Rico, where live coral cover was very high at all depths surveyed. Nevertheless, the shallow slope and the flattened nature of the corals (a response to low light) did not result in high structural complexity. This contrasted with what was found at Cane Bay on the north coast of St. Croix. Visited in 2010, the site was revisited this year at multiple locations along the slope to document the full extent of this extensive and well developed MCE, with large coral heads of several species showing high live cover and forming a structurally complex environment that was as scenically inspiring as it was scientifically interesting. Back in the lab, the studies continue. Genetic analyses of collected samples will determine if the many colonies comprising large coral heads constitute only one individual, and if corals may adapt to low light conditions by utilizing different strains of their symbiotic algae (termed zooxanthellae). Variations in factors such as slope angle, sediment flow, surface roughness, wave exposure and depth are being analyzed to determine the factors promoting MCE development and potentially predicting their extent and distribution. These studies are critical for gauging the status and health of MCEs around the Caribbean and informing management of the need and mechanisms for their protection. A full account of the cruises daily activities can be found at http://ccri.uprm.edu/media/Mesophotic_Web_page/MCE_Cruise_2011.html



Dr. Sherman at 200ft along the steep slope at Cane Bay, St. Croix, with *Agaricia* coral in the foreground and a large black coral above. (Photo: D. Kesling)



Scientific and Ship Crew of the 2011 MCE Cruise

Caribbean Coral Reef Institute

PO Box 9000

University of Puerto Rico

Mayagüez, Puerto Rico 00681-9000

ccri@uprm.edu

Phone: 787-899-2048 ext.280

Fax: 787-899-5500

CCRI is a cooperative agreement between the University of Puerto Rico-Mayaguez and NOAA's Center for Sponsored Coastal Ocean Research. CCRI activities contribute to the mission of NOAA's Coral Reef Conservation Program.