

Deep-Sea Exploration Beneath Katrina's Wake

Despite having to evade hurricane Katrina, a team of scientists from Harbor Branch and other institutions is returning to port this Sunday with new tales from the deep after completing their second annual Deep Scope expedition.

The group has discovered a mysterious visual capability in a deep-sea crab; captured new video of a large, recently discovered squid species; and took clear video of the world's first known fluorescent shark.

The Commerce Department's National Oceanic and Atmospheric Administration funded the mission to sites around the Gulf of Mexico.

The expedition, which began Aug. 19, is taking place aboard Harbor Branch's Seward Johnson research vessel and the Johnson-Sea-Link I submersible, capable of diving to depths up to 3,000 feet. The mission's overall purpose is to use a variety of new technologies to gain a better view of deep-sea life, and to understand how that life itself views the deep sea.

The team has targeted hardbottom landscapes such as a coral mound about 200 miles west of Tampa and the Viosca Knoll, about 140 miles southeast of New Orleans. Though the team was able to conduct dives at both locations early on, hurricane Katrina forced them to run for Galveston, Tex., where they took shelter for 3 days before heading back out.

The ship's crew took special precautions as they cruised from Texas back to the Viosca Knoll to avoid hurricane debris. They encountered extensive garbage, but nothing that threatened the ship. They also saw signs of damage on oil rigs and heard reports from other ships that all rigs within a 50-mile-wide swath beneath the hurricane's path appeared to be thrashed beyond operable condition.

Amidst calm seas, submersible dives resumed today and will continue through Saturday, Sept. 3, offering ample opportunity for additional discoveries.

"Considering that a category 5 hurricane just went through this area, I'm surprised that we can be out here and diving again so soon," says Chief Scientist Tammy Frank, a visual ecologist from Harbor Branch, "it really is astonishing how quickly the seas have laid down."

Frank has been conducting detailed studies of how the eyes of animals on the deep seafloor work, in collaboration with others aboard.

Working with animals collected in special light-tight devices that avoid damage to delicate deep-sea eyes, Frank has discovered a species of deep-sea crab that can detect ultra-violet light, despite there being no known ultraviolet light in deep water. UV sensitivity is common in animals that live closer to the surface, but has never been discovered in a deep species.

The reasons for this seemingly bizarre ability are not clear, but the sensitivity could point to a deep-sea light source about which researchers are not aware, or to some unknown characteristic of known light sources such as bioluminescence--the light chemically produced by countless open ocean organisms.

One key instrument used on the expedition to help humans see in the deep sea is the prototype Eye-in-the-Sea camera system, which was designed by Edith Widder, former Harbor Branch senior scientist who recently founded Ocean Recon in Ft. Pierce, Fla. This system is deployed on the seafloor using the submersible and left for 24-hour or longer intervals to film animals and activities using very low

levels of infrared light virtually invisible to deep-sea animals.

This allows an exceptionally sensitive intensified camera to capture natural behaviors and footage of animals that have evaded scientists that used other, more disruptive tools such as relatively loud ROVs and submersibles with their bright lights.

Last year, the system captured footage of a six-foot squid believed to be a new species. This year, at a site hundreds of miles away, the camera caught footage of what appears to be the same species, which would suggest that the squid is not rare, and would also illustrate how poorly explored the deep sea remains if such a large animal could have gone undiscovered.

The squid appears to have been attracted by a flashing light lure designed to mimic a deep-sea jellyfish's bioluminescent display. Much remains unknown about how animals use bioluminescence, and one of the key goals for Eye-in-the-Sea beyond basic observation is to use the bioluminescence lure and other techniques to learn how animals use the light they produce.

Based in large part on the success of last year's expedition, Widder has been awarded a \$500,000 National Science Foundation grant to build a more advanced Eye-in-the-Sea in collaboration with Harbor Branch engineers, a project now underway.

Prior to the hurricane, the Deep Scope team was also exploring fluorescence given off by deep-sea animals. Fluorescence occurs when an animal or object absorbs light of one color and then reemits light of, or glows, another color.

In the ocean, detecting fluorescence can allow scientists to spot animals that would otherwise be too effectively camouflaged to see. Fluorescence is also important because the proteins that allow animals to fluoresce are used in genetic research and new fluorescent animals may contain proteins that offer novel benefits in such work.

Mike Matz, of the University of Florida's Whitney Laboratory in St. Augustine, and others aboard are using powerful lights mounted on the front of the submersible to illuminate animals whose fluorescence is then captured on the sub's video camera using a filter that blocks non-fluorescent light reflected back.

Last year, using this technique, the group discovered the world's first fluorescent shark, a previously known species called a chain dogfish whose fluorescence had never been observed. To their dismay, though, the team was unable to capture the fluorescence clearly on film.

During this year's expedition, Matz was ecstatic when he came upon a shark kind enough to rest on the bottom in front of the sub, allowing him to record incredible video footage of the animal's intricate fluorescent pattern, not unlike that of the fictional glowing "jaguar" shark in the film *The Life Aquatic*, which it may be worth noting came out months after the team made its discovery.

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