Deep Sea Marine Life of the Monterrey Shipwrecks

Four thousand three hundred feet beneath the surface of the Gulf of Mexico, scientists have discovered three early 19th century shipwrecks that contain important archeological artifacts. Living on the remains of the shipwrecks and its artifacts is a specialized community of marine life.

A team of biological scientists are working alongside archeologists to explore what are being called: *The Monterrey Shipwrecks*. The biological team seeks to understand the ecological and physical processes functioning at the wreck sites, and the wrecks' influences on these processes.

The habitats created by the artifacts and remains of the ships provide a rare oasis for hard bottom animals in the deep sea.

The biological assemblages on and around the wrecks provide important insight into how the shipwrecks are influencing the local abundance and distribution of organisms in the deep sea and how the organisms are influencing the wrecks.

Important Questions Being Asked:

What organisms have colonized the site and what are the mechanisms of recruitment in this deep marine environment?

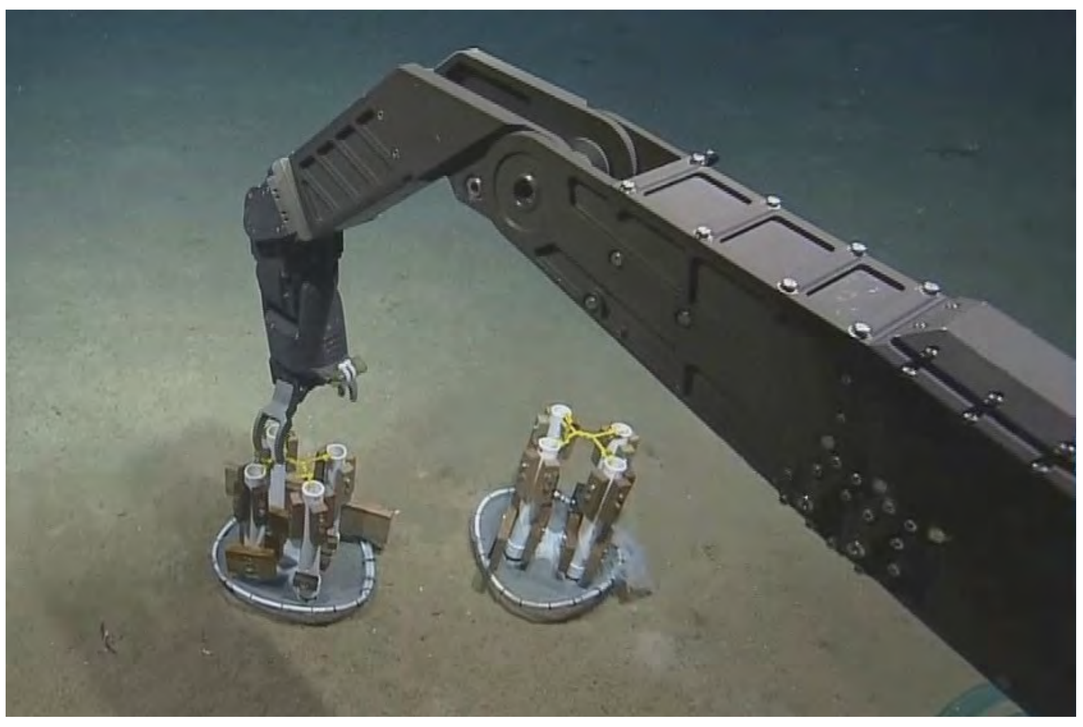
How is the biology influenced by the ship and by changes in the ship over time?

How do biological and physical processes influence the preservation of the ship and artifacts over time?

What are the mechanisms of destruction, alteration and consumption of wood and other materials found at the site?

Are bioactive compounds present at the site and do they support chemosynthetic communities?

Wood degradation experiments have been deployed to evaluate the rate and processes of deterioration of different wood types at the wreck sites. Also, sediment core samples are being analyzed for benthic community structure and physiological processes influencing organic carbon and nitrogen content.



The manipulator arm of the remotely operated vehicle deploys two sets of wood experiments that are assessing the biological colonization and rates of degradation of wood used to build 19th century ships.

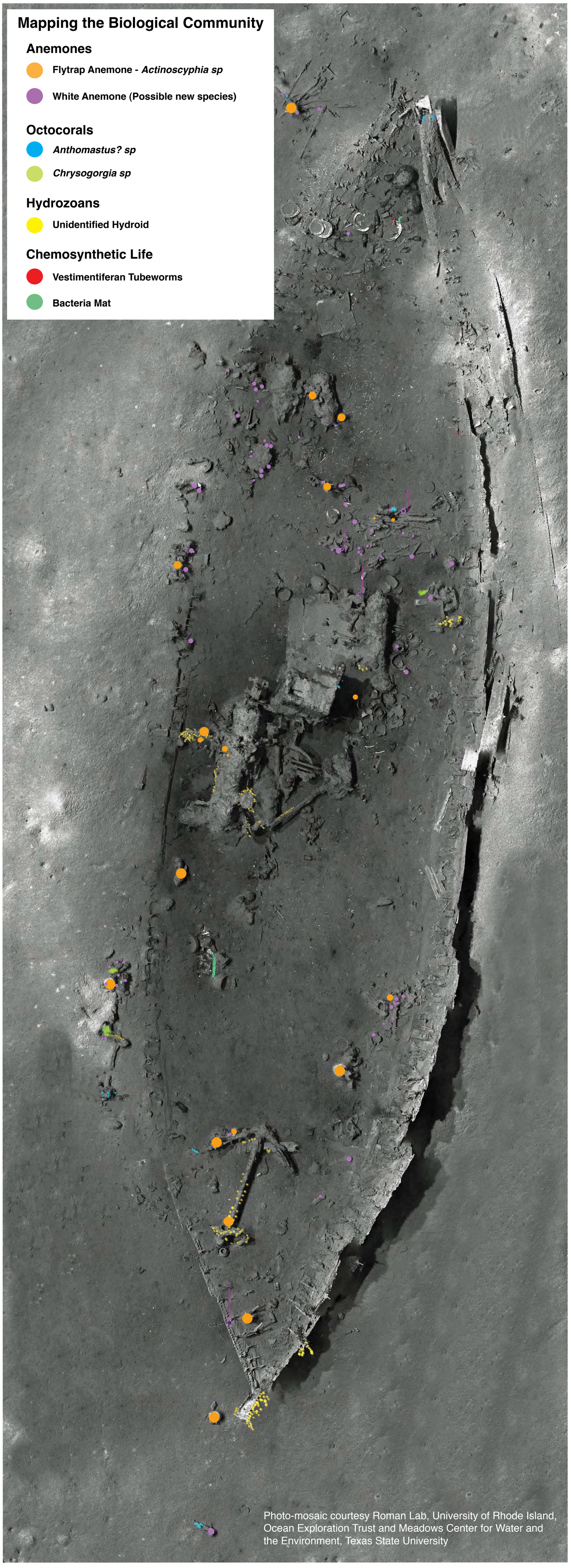
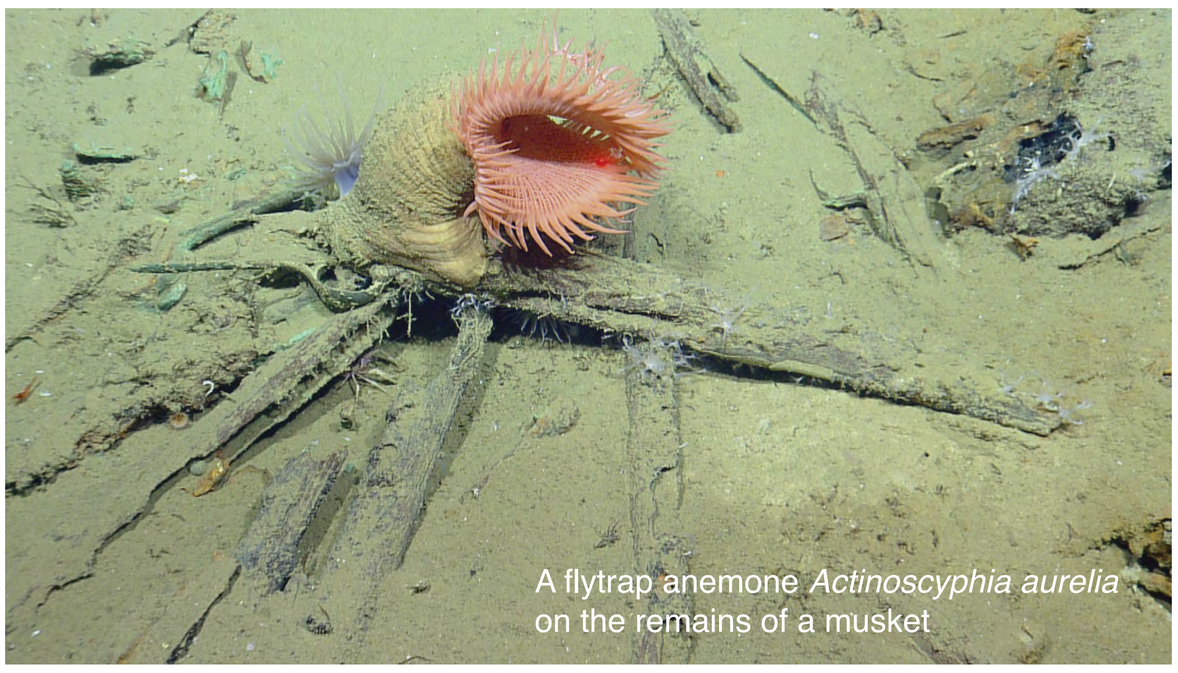


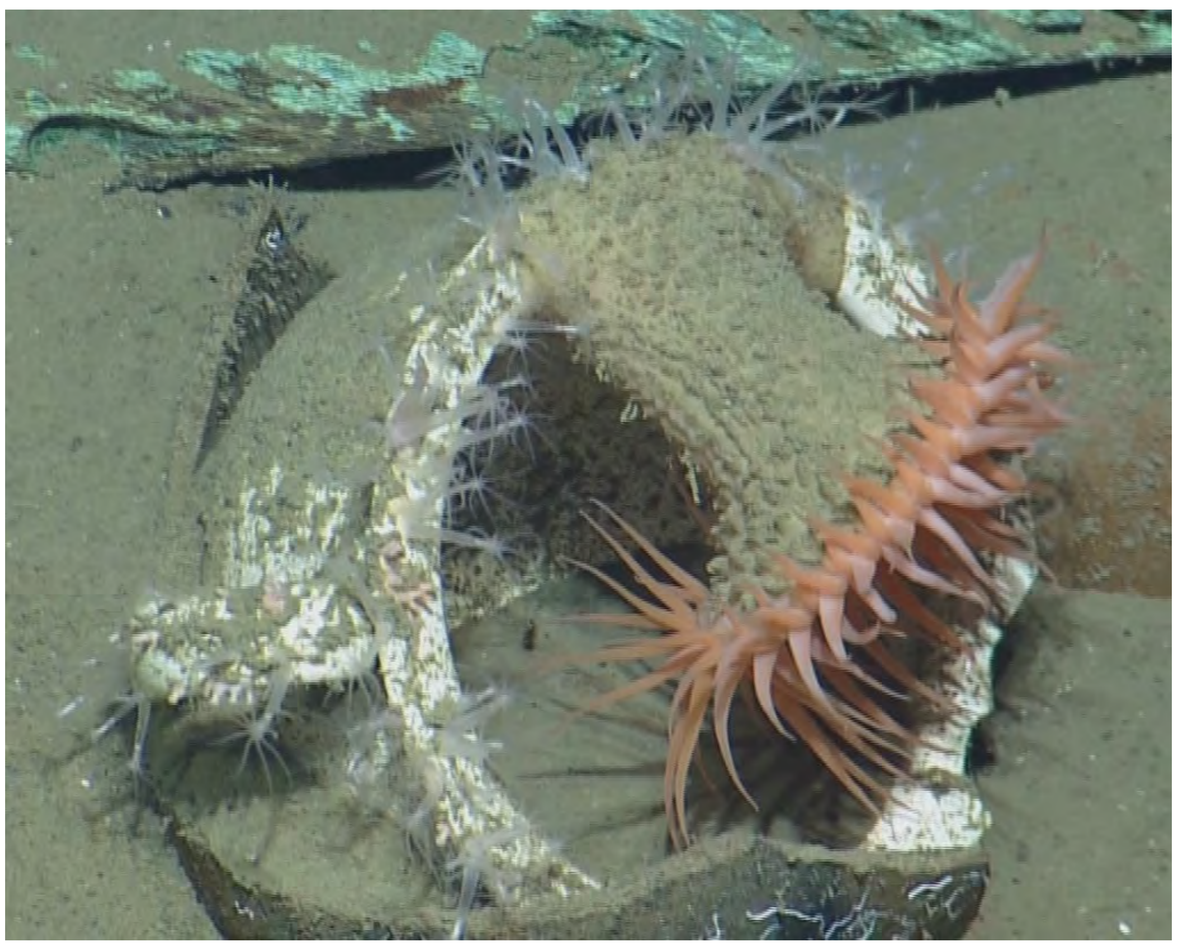
Photo-mosaic courtesy Roman Lab, University of Rhode Island, Ocean Exploration Trust and Meadows Center for Water and the Environment, Texas State University

A Ship's Demise Gives Rise to Life

A rich community of organisms has found a home among the artifacts of the Monterrey Shipwrecks, and decay of the ships' structures provides energy for a unique ecosystem.



A flytrap anemone *Actinoscyphia aurelia* on the remains of a musket



Flytrap anemone and *Anthomastus*-like octocorals on a chamber pot

Small white squat lobsters among bottles on left, and white solitary corals on brown ceramic jug.

Chaceon quinquidens (above) and *Cataetyx laticeps* (right)

Hydroids on the ship's bow.

Vestimentiferan tubeworms near a china dinner plate.

The eroded wood framing of the ship and the remains of tubeworms.

These tubeworms get their nutrition from sulfides produced by chemosynthetic bacteria. Their presence on the shipwreck suggests a sequence of biological processes that begins with the destruction of the ship's wood structures by wood boring organisms. These borers transform the energy stored in the wood into nutrients. As organisms devour these nutrients, increased respiration causes the development of anoxic conditions and sulfide production by sulfate reducing bacteria. As a result, the shipwrecks are producing conditions similar to those of other deep sea chemosynthetic habitats such as methane seeps and hydrothermal vents.

The Research Continues

The expedition to the Monterrey Shipwrecks in July 2013 was a collaboration between archeological and biological scientists from diverse institutions and areas of expertise. As the historical artifacts and biological specimens are conserved and studied at laboratories in Texas and around the country, the collaboration forged by this mission will continue. The scientific teams have come away with more questions than were answered. The results so far inspire a drive to go back to discover more in the near future. It also inspires the desire to protect the shipwrecks from damage or pillage. This means that new partnerships and collaborations between scientists, governments and the public will be needed to put in place effective stewardship procedures and management for these special places that tell both the historical and ecological story of the Gulf of Mexico.

Biological Characterization Team:
NOAA/Office of National Marine Sanctuaries: William Kiene, Steve Gittings, Catherine Marzin, Lauren Heesemann
NOAA/National Centers for Coastal Ocean Science: Peter Etnoyer
Bureau of Ocean Energy Management: Alicia Caporaso
US Geological Survey: Amanda Demopoulos
Texas A&M University Galveston: Gilbert Rowe, Thomas Heathman
Texas A&M University College Station: Mary Wicksten
University of Rhode Island: Michael Brennan
American Museum of Natural History: Estefania Rodriguez
Field Museum of Natural History: Janet Voight