

Shocking Tell-All: Sclerosponges Reveal Secrets of Past Climate

by Lara Hinderstein and Colleen Wood

Scientific divers, supported by the National Oceanic and Atmospheric Administration's Center for Sponsored Coastal Ocean Research and the National Science Foundation are diving to deeper depths in Puerto Rico in search of an ancient type of sponge that may help scientists better understand climate change. This sponge, called a sclerosponge, makes its home in the recesses of coral reefs and has a soft body that covers a hard skeleton of calcium carbonate. Its range is from the surface to about 250 m (820 ft).

Sclerosponges are slow growing and can live to be about 500-1000 years old. Drs. Amos Winter and Clark Sherman of the University of Puerto Rico's Caribbean Coral Reef Institute, who are leading this study, are using these long-lived creatures to understand what the oceans were like long ago before any instruments existed to study the oceans. Amazingly, the chemical make-up of their skeletons is a direct reflection of the chemistry



Sclerosponge in a reef cavity at a depth of ~36 m in southwest Puerto Rico. (Photo by H. Ruíz)



Sclerosponge collected from a depth of ~33 m at Bajo de Sico seamount, PR. Radiometric (Th-U) dating indicates that this sponge is ~800 years old. (Photo by H. Ruíz)

of the surrounding water at the time they lived. So, over long periods of time sclerosponges incorporate chemicals into their skeletons, which can provide clues about historical water temperatures, salinities, and other measurements.

Sclerosponge analyses can give information about the expansion of the upper warm layer of the ocean and vertical movement of the thermocline, a zone of rapid temperature change separating the warmer surface waters from deeper cold waters in the ocean. Over geologic time, the depths of the upper warm layer and thermocline have changed, and scientists hope to identify any warming trends that may be attributable to humans.

“The rate of heat storage in the ocean is one of the most crucial numbers that is needed to understand the importance of human influence on long-term climate change. One way to improve our understanding of ocean warming is to use paleo-archives [long-lived organisms or fossils] which can document the temperature record of the oceans beyond that which is available from instruments. So sclerosponges will give us invaluable information about how the ocean surface [waters] have been changing in response to global warming,” says Winter.

As ecosystems world-wide face increasing threats from changing climate conditions, it is important to determine the extent of this change and how much is due to anthropogenic causes versus natural climate variability. There is little doubt that our oceans are warming, and sclerosponges can provide evidence of the rate and extent of this warming signal. These are seemingly simple, ancient sponges, yet they are helping to unlock the secrets to past climate, and improve the understanding of current and future climates.