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Chinchilla Poop Reveals How Much It Rained

By measuring the size of poop pellets from these diminutive mammals, scientists reconstruct rainfall levels from centuries ago.

By Jessica Marshall | Thu Aug 12, 2010 06:00 AM ET

Chinchilla poop is serving an unlikely purpose in one of the world's driest places, Chile's Atacama Desert. The animals' tiny waste pellets are helping scientists reconstruct the rainfall in the region over the last 14,000 years.

Reconstructing rainfall history of the Atacama can provide important information about how events like La Niña and El Niño affect Chile's rainfall, said Claudio Latorre Hidalgo of the Universidad Catolica de Chile and the Institute of Ecology and Biodiversity in Santiago.

Knowing this is important for predicting the future water supply in Chile. About 98 percent of the population gets its water from sources in the Andes adjacent to the high Atacama.

Chinchillas (more formally called chinchilla rats) and other rodents deposit their waste in "middens," their own personal scrap piles full of local plants and their poop that they glue together with urine, which then crystallizes and soaks up moisture to form a seal.

The dry climate in the Atacama (and elsewhere including the southwest United States) preserves rodent middens for thousands of years. "Anything in the Atacama is preserved very well," said Latorre -- even the bodies of people unfortunate enough to be stranded in the desert more than 100 years ago, and mummies thousands of years old.

In previous work, Latorre and others have analyzed the contents of various types of rodent middens to determine what plants, pollen, and insects, for example, were available to the rodents at the time the middens were deposited. They used radiocarbon dating to determine the middens' ages.

"Each of these is like a little window into an ancient ecosystem," Latorre said. "If you collect enough of them, you can get a record of past variations at a single spot."

Now, Latorre's team has found that measuring the size of the poop pellets sealed inside chinchilla middens can reveal the amount of rain that fell at the time the chinchillas were going about their business.

Changes in chinchilla pellet size correlate well with changes in precipitation levels, the team has found, presumably because more rain meant more plants, which in turn meant the animals could grow larger, making bigger pellets, and vice versa, Latorre said.

Temperature did not correlate at all with pellet size, according to Latorre, whose team presented their results this week at a meeting of the American Geophysical Union in Foz do Iguacu, Brazil.

By measuring pellet size in middens deposited in modern times when rainfall records exist, the team determined the relationship between chinchilla pellet size and amount of rain.

They then used this relationship to estimate how much rain fell at points throughout the past 14,000 years, by measuring and radiocarbon dating the animals' poop.

The results show increases in rainfall at 11- to 13.8-thousand years ago, and again about one- to two-thousand years ago.

The Atacama is one of the driest places on Earth, with less than 10 percent humidity. Records indicate it has been a hyper-arid desert with less than 30 mm (1.2 inches) of rain per year for about 10 million years.

"The Atacama desert is a region with very few paleoclimatic records and the few proxies that exist (e.g. lake sediment) have proven very difficult to accurately date and interpret," said Mathias Vuillle of the University of Albany, in New York. "The midden analysis by Latorre's group is therefore a very important alternative way to learn about how and when climate has varied in this region."
