

Research presented at the
2009 annual meeting of the
Geological Society of America

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Land snail fossils suggest subtropical, semiarid eastern Canary Islands were cooler, wetter 50,000 years ago

Fossil land snail shells found in ancient soils on the subtropical eastern Canary Islands show that the Spanish archipelago off the northwest coast of Africa has become progressively drier over the past 50,000 years.

The research advances understanding of the global paleoclimate during an important time in human evolution, when the transition from gathering and hunting to agriculture first occurred in the fertile Middle East and subsequently spread to Asia, North Africa and Europe.

Isotopic measurements performed on fossil land snail shells resulted in oxygen isotope ratios that suggest the relative humidity on the islands was higher 50,000 years ago, then experienced a long-term decrease to the time of maximum global cooling and glaciation about 15,000 to 20,000 years ago, according to new research by Yurena Yanes, a post-doctoral researcher, and geochemistry professor Crayton Yapp, both in the Roy M. Huffington Department of Earth Sciences at Southern Methodist University in Dallas.

With subsequent post-glacial climatic fluctuations, relative humidity seems to have oscillated somewhat, but finally decreased even further to modern values.

Consequently the eastern Canary Islands experienced an overall increase in dryness during the last 50,000 years, eventually yielding the current semiarid conditions. Today the low-altitude eastern islands are characterized by low annual rainfall and a landscape of short grasses and shrubs, says Yanes.

In the Canary Archipelago, land snails are one of the rare 'continuous' records of paleoclimatic conditions over the last 50,000 years," Yanes says. "The results of this study are of great relevance to biologists and paleontologists investigating the evolution of plants and animals linked to climatic fluctuation in the islands."

The researchers' isotopic evidence reflects changing atmospheric and oceanic circulation associated with the waxing, waning and subsequent disappearance over the past 50,000 years of vast ice sheets at mid- to high latitudes on the continents of the Northern Hemisphere.

The research also is consistent with the observed decline in diversity of the highly moisture-sensitive land snails.

Land snail shells are abundant and sensitive to environmental change and as fossils they are well-preserved. Measurement of variations in oxygen isotope ratios of fossil shells can yield information about changes in ancient climatic conditions.

The shells are composed of the elements calcium, oxygen and carbon, which are combined to form a mineral known as aragonite. Oxygen atoms in aragonite are not all exactly alike. A small proportion of those atoms is slightly heavier than the majority, and these heavier and lighter forms of oxygen are called isotopes of oxygen.

Small changes in the ratio of heavy to light isotopes can be measured with a high degree of accuracy and precision. Variations in these ratios are related to climatic variables, including relative humidity, temperature and the oxygen isotope ratios of rainwater and water vapor in the environments in which land snails live.

Yanes will present the research at a scientific session of the 2009 annual meeting of The Geological Society of America in Portland, Ore., Oct. 18-21.

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When & Where

Topic: 24015: Yanes, Yurena, presenter

"A 50,000-year land snail isotopic record of Pleistocene-Holocene environmental change in the Canary Archipelago."