

Cantabrian cornice experienced seven cooling, warming phases over past 41,000 years

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In 1996, an international team of scientists led by the University of Zaragoza (UNIZAR) started to carry out a paleontological survey in the cave of El Mirón. Since then they have focused on analysing the fossil remains of the bones and teeth of small vertebrates that lived in the Cantabrian region over the past 41,000 years, at the end of the Quaternary. The richness, great diversity and good conservation status of the fossils have enabled the researchers to carry out a paleoclimatic study, which has been published recently in the *Journal of Archaeological Science*.

"We carried out every kind of statistical analysis over a six-month period at the University of New Mexico, analysing around 100,000 remains, of which 4,000 were specifically identified, and catalogued according to species and the number of individuals in each stratum", Gloria Cuenca-Bescós, lead author of the study and a researcher in the Paleontology Department of the UNIZAR's Institute for Scientific Research (IUCA), tells SINC.

The resulting study involves climatic inferences being drawn on the basis of the fossil associations of small mammals whose remains have been deposited in El Mirón over the past 41,000 years. The fossil associations of these mammals reveal the composition of fauna living around the cave at the time, and have made it possible to develop a paleoclimatological and paleoenvironmental reconstruction of the

environment.

The research shows that there have been seven periods of cooling and warming in the Cantabrian cornice over the past 41,000 years. An analysis carried out by other authors on data relating to pollen, marine isotope stratigraphy, and materials deposited by glaciers backs this up this result.

The water rat was king of the Late Pleistocene

According to the study, there were four unstable cold periods, two more stable ones, and a temperate climatic period at the El Mirón cave. The scientists are unsure about dating the seventh and last period ended, as this "could correspond with the Bronze Age, the Ice Age, or the start of agricultural expansion by human beings, which certainly would have impacted on the wild animals living close to the caves.

However, the study shows that during earlier periods at the end of the Late Pleistocene, the species that predominated during cold periods were rodents and insectivores that were well-adapted to environments with only sparse vegetation. "When climatic conditions became more mild at the end of the last cold pulse of the Late Pleistocene, known as the Dryas III, forest-dwelling rodents and insectivores flourished and become more frequent in the associations", explains Cuenca-Bescós. We now know that the water vole (*Arvicola terrestris*) dominated in this period.

According to the researcher, this domination by woodland species started to decline in the area only at the end of the Holocene, when human activities began to change the landscape, and when deforestation resulting from permanent settlements and agriculture can be observed "even though the climate continued to be favourable to these kinds of organisms".

The study has also shown that the majority of the Pleistocene taxa became extinct around 10,000 years ago while "some cold-adapted species, which had managed to survive, moved to the north of Europe, leaving our warmer latitudes behind", the scientist concludes.

More information: Cuenca-Bescós, Gloria; Straus, Lawrence G.; González Morales, Manuel R.; García Pimienta, Juan C. "The reconstruction of past environments through small mammals: from the Mousterian to the Bronze Age in El Miron Cave (Cantabria, Spain)" *Journal of Archaeological Science* 36(4): 947-955 abril de 2009.

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