

Cave bears declined slowly

Natural Environment Research Council

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The cave bear went out not with a bang, but with a whimper. Its European population underwent 25,000 years of slow decline before finally going extinct around 24,000 years ago, according to recent genetic analysis.



Earlier theories suggested it died out more quickly, perhaps because of a sudden catastrophe like rapid environmental change or hunting by a fast-growing population of humans.

The results of some recent research into the question, published in *Molecular Biology and Evolution*, suggest that while such problems may have helped push the bears over the brink, their decline was too gradual for these explanations to be the root cause.

Instead a combination of factors, including climate change, hunting and competition with humans or other rivals for valuable cave space, may be the likeliest explanation.

'We still know very little about how quickly the cave bear became extinct, but their remains are quite abundant until comparatively recently - we were expecting to see something more catastrophic and not such a long and drawn-out decline' says Professor Michael Hofreiter, an evolutionary biologist at the University of York and one of the paper's authors.

The team took 59 sample of genetic material from cave bears that lived all over Europe from the dental roots of bears in museums, and from the GenBank database of genetic sequences. For comparison, they also analysed 40 samples of DNA from the closely-related brown bear during the same period.

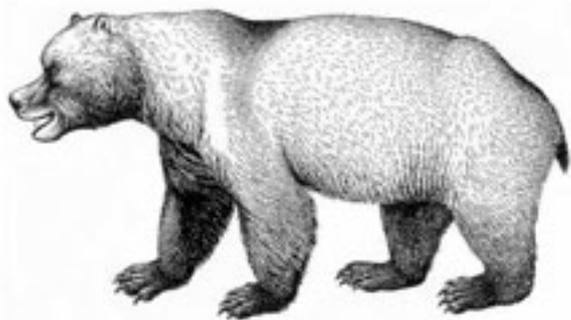
They focused on mitochondrial DNA. This is different from nuclear DNA, the genetic

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material found in the cell nuclei of living things that provides the blueprint for their development. It is found instead in the mitochondria - the tiny structures that let each cell make energy from food. This DNA is passed on only down the mother's line, and it changes more quickly than nuclear DNA.

The team analysed the contents of the bears' mitochondrial DNA and put the results into statistical software along with dates for each sample - obtained both with radiocarbon dating and through archaeological analysis of the layers of soil they were found in. This allowed the researchers to reconstruct the bears' 'effective female population size' and how this changed over time.



European cave bear

By comparing their data to what they would expect from a static population and from a declining one, to see which model best explained their results, the researchers found that the European cave bear declined, but only gradually. The brown bear population, by contrast, stayed stable over the same period.

The cave bear, *Ursus speleus*, was among the biggest bears ever to walk the Earth, with large males thought to have weighed as much as 1000kg and to have stood up to 3.5 metres tall. They probably looked similar to modern brown bears like grizzlies, but with a larger hump above the shoulders, a more rounded forehead and a generally stockier build.

Despite their fearsome bulk, the wear on their teeth suggests they ate less meat than brown bears, which managed to survive despite the problems that finally killed off their cousins, and still roam the wilderness today.

Some researchers have suggested this greater reliance on vegetation made cave bears more vulnerable to sudden shifts in the climate than their relations. Certainly their eventual extinction coincides closely with the height of the last ice age, but their decline had begun long before - although this climate change may have helped tip the bears over the edge.

Another possibility is a shortage of caves. Brown bears need caves only to hibernate in, but cave bears seem to have spent much more of their time there and needed them not just for hibernation but also for giving birth.

Humans were probably too few to have killed off the bears quickly, but we know that they lived in the same habitats for tens of thousands of years, and did on

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occasion kill the animals - skeletons have been found that bear the marks of butchery with stone tools, and one even has a spear point lodged in one of its vertebrae.

It's possible that hunting hastened the bears' decline by gradually wearing down their breeding population. And humans aren't the only possible candidates; cave hyenas may also have competed with bears for living space. 'We can certainly say that humans didn't rapidly hunt the bears to extinction,' Hofreiter says. 'But beyond that we are only making inferences - they may be true, but we just don't know. This is the problem with studying events that took place tens of thousands of years ago!'

The cave bear has been an object of fascination ever since its bones began to be discovered in large numbers in the eighteenth century. Some finds seemed to suggest that ancient Neanderthals might have worshipped the bears in an early religious cult, but most researchers are now sceptical of this idea.

The results only relate to the cave bear's fate in Europe. Researchers recently learned the bears weren't confined to Europe, but so far we have far fewer samples of bears from Asia and there is little indication how and when this population might have died out.

The research drew upon radiocarbon dates arrived at by Professors Adrian Lister of the Natural History Museum and Anthony Stuart of Durham University during their NERC-funded project on the chronology of the timing of the extinction of prehistoric megafauna (giant animals) throughout Europe.

[SOURCE](#) [1]

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