What Happened 12,000 Years Ago That Killed So Many Animals?

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Head skeleton of saber tooth cat that died out along with dozens of other animal species at the end of the Pleistocene ice age about 12,000 years ago. Photograph courtesy University of California.

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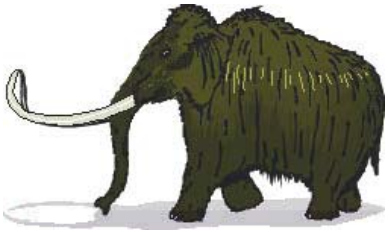
November 13, 2002 Seattle, Washington - Tonight at the University of Pennsylvania Museum of Anthropology and Archaeology, scientists gathered to discuss what killed off so many large mammals of North and South America at the end of the last ice age about 12,000 years ago, the end of the Pleistocene. At least 35 genera of animals in North America alone were wiped out, including the huge saber-toothed cat, woolly rhinos, woolly mammoths, mastodons, giant skunks, giant rabbits, camels and horses. Using modern DNA analysis, bodies and bones found freeze-dried are being explored for signs of unusual disease. Did a deadly virus or bacteria infect and kill the animals? Or did a growing human population throughout the world exterminate species after species in its search for food and hides?



The giant Irish elk on the left and the woolly mammoth on the right did not survive the end of the ice age.

One anthropologist who does not think either disease or humans are responsible for the extinctions is Dr. Donald Grayson, Professor of Anthropology, University of Washington in Seattle. He thinks it was global climate change, specifically rapid warming, that caused some kind of wide scale trauma that certain animal and plant species could not survive. If global climate change, why did an animal

like the woolly mammoth, that had lived for hundreds of thousands of years through previous climate changes, suddenly die out? Why did so many other smaller animals prevail? What exactly happened to end the ice age and begin the warming trend that has lasted for 12,000 years and is now accelerating under the influence of human civilization's greenhouse gas emissions? Just how vulnerable to extinction is earth life when this planet undergoes rapid climate change?

Interview:

Donald Grayson, Ph.D., Prof. of Anthropology, Univ. of Washington, Seattle, Washington: "If you look at the radiocarbon dates we have for the extinctions, we can show that only about 15 of 35 extinct species even survived after 12,000 years ago. The rest were completely gone before the 12,000 year mark.

Also, if you look at the radiocarbon record for extinctions in Europe, it turns out that different animals became extinct towards the end of the ice age at different times and in different places. It could well be exactly the same thing was happening in North America. In other words, not all these extinctions happened all at once. If that's the case, then the kinds of explanations that we need to look at are going to be quite different. In fact, one of the amazing things about this big debate over the extinctions is that people have chosen their explanations based on the assumption that there was a major wave of extinctions at 11,000. But that wave, while it may have occurred, has never definitively been demonstrated to actually have existed.

Is there anything in the physical evidence, whether it's in permafrost or ice in which these animals have been found preserved, that would give insight about what might have happened if there was some sudden event that caused the devastation of several species?

There are 3 major causes that are being debated for these extinctions in North America and some of these causes are also looked at in Old World Europe as well.

1) climate change;
2) advent of human hunters in North America around 11,500 years ago, argued by David Meltzer, Southern Methodist University;
3) spread of a virulent disease. That last one is a relatively new hypothesis proposed by Roth MacPhee, American Museum of Natural History.

The well-preserved remains of now-extinct mammals that are now available can be used to test probably any of these hypotheses.

If disease of some unusual nature is not found, then could climate volatility have caused the destruction of so many animals? And if so, could it happen now when we are challenged by global warming and its future consequences?

You bet. If you look around the landscape today and see populations of animals going extinct, it is hard today to be able to specify exactly what aspects of change in their environment drove those extinctions. That means that if it was climate at the end of the Pleistocene that caused these extinctions, it can be very difficult to determine precisely what aspects of climate change it was. And we also know, and this has become very obvious in the last 15 to 20 years, that different animals respond to climate change in different ways. That means that if we are going to figure out what aspects of climate caused these extinctions, then we need to look at the animals one at a time.

For an example of wide variations in the time line of extinctions, there is a small rabbit from the southern parts of North America. Paul Martin, argues that the small rabbit was driven to death by human hunters around 11,000 years ago. But we can't even show that this animal survived the late glacial maximum 18,000 to 22,000 years ago! So, there are a lot of chronological mysteries here as well. I think it is a mistake to assume that everything did go extinct at around

11,000. But even if it did, 11,000 years ago was a time of major climate change. You see extinctions not only in North America, that people have been blamed for, but also in Europe where people have never been blamed for it.

A huge animal called the Irish Elk went extinct in Ireland at about the same time as the North American extinctions happened, even though in Ireland there were no people at all. So, whether there were people present or not as with the Irish Elk or whether people had been preying on an animal for tens of thousands of years like reindeer in southern France these extinctions occurred.

What you are implying is that something about 12,000 years ago did happen that affected the planet's Northern Hemisphere. Why do you think the climate's warming could have caused the disappearance of so many different species throughout North America?

I have no idea. There have been a number of arguments made and none seem to explain not only the extinctions in North America, but also the roughly contemporary extinctions in the Old World. And there were also extinctions in South America and Australia. The extinctions in Australia seemed to be 15,000 to 20,000 years earlier. Some are now arguing that the Australian extinctions may have occurred as early as 46,000 years ago.

So, there are mysteries all over the place! None of these things have been well explained.

There were 35 genera of animals that went extinct in North America, but there were also lots of things that survived as well. Reindeer survived. Musk ox survived. Elk survived. Bisons survived. Lots and lots of small animals survived. Only one kind of tree is known to have gone extinct. So, lots and lots of things survived. The extinction event, if we can call it an event, was selective in what it removed.

Why would so many large animals have been wiped out?

It's the large things that tend to be most prone to extinction just in general. There are lots of reasons for that. Large animals tend to reproduce more slowly, they have fewer offspring per given period of time. They make heavier demands on their environment than do small things. So, for instance, toward the end of the ice age in North America, there was a small animal called the Yellow Cheek Bull. The Yellow Cheek Bull today lives in the Arctic and sub-Arctic, way far north. During the ice age, it was found as far south as Tennessee. Towards the end of the Pleistocene, its southern populations disappeared. But it did just fine in terms of the longevity of the species itself. It is still very much around. That's the kind of pattern you expect to see in climate change. Large mammals reproduce slowly and because they make such heavy demands on their environment, they don't have the same ability to track and change with environmental change as the small mammals.

But the mystery is that there were a lot of species that went extinct in a small period of time and you and other scientists would like to understand what exactly happened that would cause catastrophic destruction?

You bet. We can show that 15 of these animals went extinct between 10 and 12 thousand years ago. That is a huge loss. So even if there were 15 losses in that period of time, we are talking about a major extinction event.

One thing worth remembering is that the cause of these extinctions has been a scientific issue since the early 1800s. That is, we are now entering the 3rd century of debate over the causes of these things. Darwin, in 1859, when he was talking about extinctions in general said what I think is still an appropriate thing to say. He said, 'There is no reason to be surprised that we can't explain extinctions of this sort because in fact we are hard put to explain extinctions any time, no matter when they appear." He pointed out the fact that during some periods of time, some animals appear to be more abundant and during some other periods of time, they tend to be less abundant. It is very difficult to look around the landscape today and understand why a particular animal has in

recent times in front of our very eyes disappeared from the landscape.

It seems very relevant as we enter the 21st century.

No question.

There is now an accelerating extinction rate of species that some scientists say we haven't seen since 65 million years ago, the end of the dinosaurs. The extinctions are linked to global warming and loss of biodiversity as civilization spreads. So, to understand what might have happened at the end of the last ice age might give us some insight about where we could be headed in this warming century.

I agree entirely. And I'll come back to reindeer. When reindeer went extinct in France 11-12 thousand years ago, several things were happening. There was general atmospheric warming, so reindeer were living on a much warmer landscape and there was vegetation change. If you look at the far north today, one of the animals that is of great concern in the far north under conditions of global warming is in fact reindeer. And I think it is critically important for us to be able to understand what happened in the past, why reindeer went extinct in the deeper past so as to be better able to predict what might happen to them under conditions of global warming in the future.

Essentially with reindeer what happened is that their southern boundary moved northwards. So, while they are no longer found in France, they are found in Scandinavia and all across the far north. The question you can validly ask: if global warming proceeds far enough, and the southern boundary of the reindeer continues to move further north, how further north is it going to go? Is it going to go too far north for them to survive?

Which is the same issue with polar bears now as well.

You bet.

How close could we be to those kinds of extinctions now as earth warms so quickly?

Sure, how close we are, I don't think anybody knows. That we could be coming close is the reason for the tremendous concern over global warming among biologists who are interested in the welfare of the earth's biodiversity.

When does *Homo sapiens* become threatened in its own survival on a planet in which climate could change so rapidly?

I don't have an answer to that and I don't know anybody who does have an answer to that. But it's a good question. People are pretty plastic in their behavior and their adaptations. That doesn't mean we are necessarily in for a fun time, but no one has the answer to what is going to happen to us.

Do you see any specific connection between climate change and the ice age extinction of so many species?

Assuming that Ross MacPhee's disease argument is wrong he may not be, but it's hard for me to see a disease vector causing extinction of so many large mammals at the same time and causing the re-arrangement of so many small mammals on the landscape that happened at the end of the Pleistocene in North America. Further, there is no reason to believe that people were the cause of these extinctions. Then we are only left with one possible explanation and that's climate change. The real challenge for the future is figuring out what aspects of climate change caused these extinctions. And to do that, I'm convinced we're going to have to analyze data one animal at a time."

Website:

http://www.ucmp.berkeley.edu/quaternary/ple.html

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