**Sporormiella Spore Analysis Could Help Explain Ice Age Extinctions**

*Sporormiella* spores found in Pleistocene-age dung specimens, which were recovered from Appleman Lake in Indiana, are helping to explain what led to the sudden disappearance of 135 species of Pleistocene animals in North America between 14,800 and 13,700 years ago, according to Jacquelyn Gill from the University of Wisconsin, Madison, and her collaborators. Although their report in the November 20th *Science* does not say exactly what abruptly killed off several dozen species, it tends to rule out two leading hypotheses that sought to explain those extinctions. The arrival of humans in North America during this period was likely behind the demise of those species, she suggests.

The animals that went missing from North America during the Pleistocene included both herbivores, such as mammoths, mastodons, camels, horses, stagmoose, giant ground sloths, and beavers the size of bears as well as meat-eating predators such as saber-toothed cats, short-faced bears, cheetahs, lions, and large wolves. During that same period, humans arrived in North America, ice sheets retreated as the Earth warmed, and forest communities expanded into deglaciated areas.

“When you have a lot of animals on the landscape producing a lot of dung, you have a lot of *Sporormiella* fungi, which produce a lot of spores, which then wash into the lake and are preserved along with other biological materials,” Gill says, referring to Appleman Lake, which is considered a “kettle lake” because of its shape. “These lakes were formed by retreating glaciers, and become excellent archives of landscape change, collecting pollen from local plants, charcoal from local fires, and other materials in lake mud that builds up over time.”

After using radiocarbon dating on plant macrofossils, charcoal, and pollen recovered from Appleman Lake sediments to determine their ages, Gill used *Sporormiella* spores to reconstruct a pattern and ecological context for those North American extinctions. In doing so, she and her collaborators argue that at least two of the commonly cited causes for those species losses—namely, climate change and an extraterrestrial impact—no longer fit the data. “Our data rule out [an impact event] as the cause of the extinctions because by 12,900 years ago the populations of megafauna were already well in decline,” they note. “We also have no evidence for widespread fires at that time, which were also hypothesized by the proponents of the impact hypothesis.”

“This is an important result regarding the timing of events associated with the end-Pleistocene extinction,” says Spencer G. Lucas, Curator of Palaeontology and Geology at the New Mexico Museum of Natural History and Science in Albuquerque, N.M. “It seems to support the idea that a climate warming is what caused the megafaunal population collapse, and other changes followed.”

However, Gill disagrees with his conclusion. “It is definitely difficult to imagine a climatic mechanism that would target only large animals and ignore smaller animals, amphibians, fish, and plants,” she says. “Pleistocene megafauna survived over a dozen cycles of ice ages and interglacials.”

Another long-standing theory about Pleistocene extinctions is that of Ross McPhee, who is Curator of Vertebrate Zoology at the American Museum of Natural History in New York, N.Y. He and his collaborators surmise that a species-crossing disease quickly wiped out several dozen species of animal in that period. “In my view, climate change was too slow to be a cause of extinction in this case,” he notes. “Human hunters might be much faster, but there is no way that they could have simultaneously caused faunal collapses in every ecosystem from desert to rain forest. However, disease knows no similar bounds, and—as Ebola illustrates—‘new’ diseases can be extraordinarily lethal in species that are imperfectly adapted to them.” [See: http://www.amnh.org/exhibitions/expeditions/siberia/hyperbody_hp.html]

Gill disagrees. “There has been little support for McPhee’s theory, in part because we have no analogs for a widespread extinction event across so many [34 in North America] genera of animals,” she says. “Our evidence suggests that the declines and final extinction took 2,000–3,000 years, which is within the range of possibility for both climate and human hunting pressure.”

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