

Extinctions on Ice

By BRUCE BOWER

It is a paleontological mystery that falls under the heading "Now you see them, now you don't." The last Ice Age, or Pleistocene epoch, extended from 1.6 million to 10,000 years ago, yet not until its final two millennia did large numbers of North American animals make their swan song. In a blip of time in the 3.5-billion-year history of life on earth, the fossil evidence indicates that 35 classes of mammals became extinct in North America and most vanished altogether.

What caused the virtually simultaneous demise of mammoths, mastodons and saber-toothed cats, not to mention native horses, ground sloths, native camels, armadillo-like glyptodonts, giant peccaries, mountain deer, giant beavers, four-pronged antelopes, dire wolves, native lions and giant short-faced bears? Scientists have grappled with this question for nearly two centuries, and, as evidenced by a recent symposium at the Smithsonian Institution in Washington, D.C., the debate is not about to cool down.

There is broad agreement that the extinctions occurred 12,000 to 10,000 years ago, and probably more precisely about 11,000 years ago. But the cause of this disappearing act is attributed either to hunting by early inhabitants of the New World, climate change or some combination of the two.

"The seemingly incredible notion I have defended is that prehistoric people obliterated hundreds of species of large mammals, and even more species of

smaller animals as oceanic islands were populated, in a very brief moment early in the colonization of the globe," says ecologist Paul S. Martin of the University of Arizona in Tucson.

Martin formulated what is known as the "Pleistocene overkill" hypothesis in 1967. He observed that the abrupt North American extinctions of about 11,000 years ago primarily affected large plant-eating mammals whose adult weight exceeded 100 pounds. Unlike earlier episodes of mass extinction during the previous 65 million years, this one did not significantly affect small mammals, amphibians, reptiles and invertebrates.

In addition, archaeologists had found that from 11,500 to 11,000 years ago parts of North America were occupied by people whose fluted spear points had been found with the remains of mammoths, mastodons, horses, tapirs and camels. These people, called Clovis, after a site near Clovis, N.M., may have been the first to penetrate far into North America, although some investigators argue that there were earlier settlers (SN: 3/14/87, p.172).

Martin suggested that Clovis big-game hunters crossed the Bering land bridge from Asia to Alaska and moved through an ice-free corridor just east of the Canadian Rockies about 11,500 years ago. They then entered a hunter's "garden of Eden," populated by 50 million to 100 million

Mass extinctions of North American mammals at the end of the last Ice Age continue to draw scientific attention and debate

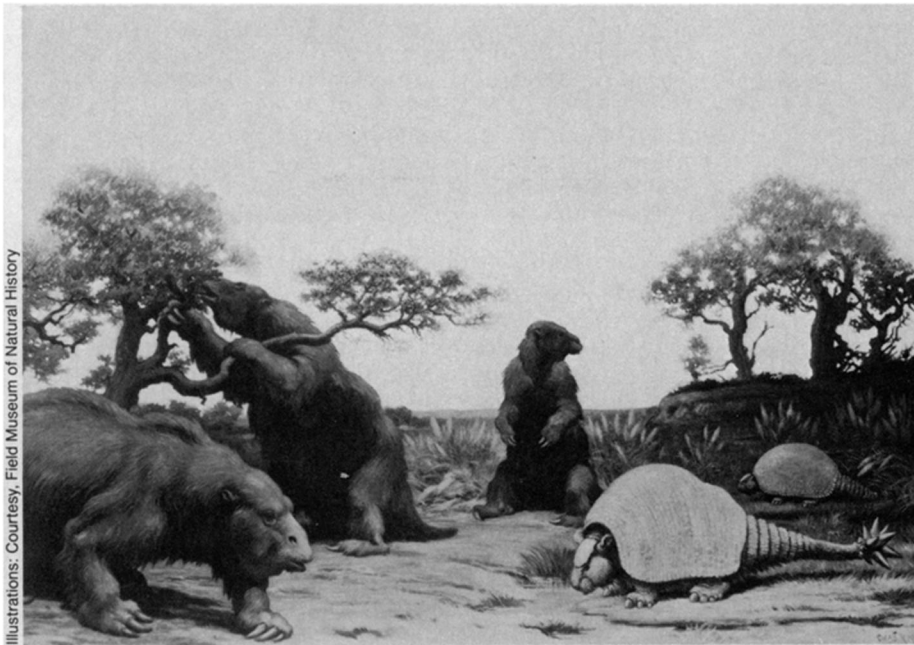
large mammals similar to prey that had been hunted in Europe and Asia, but unadapted to human predation. Given easy hunting and exposure to few, if any, new illnesses, population growth soared. Humans spread southward and within several hundred years, according to Martin, could have left many big-game extinctions in their wake.

Martin now compares the overkill in North America to an extremely rapid "blitzkrieg." Because humans apparently were never in one place for very long, he says, human remains associated with many classes of extinct herbivores, such as capybaras, giant beavers and ground sloths, were not well preserved and are not likely to be found by investigators.

Archaeologist C. Vance Haynes, also of the University of Arizona, agrees that Clovis people emerged from the glacial corridor into what he calls "the happiest hunting ground ever known" and rapidly spread throughout the continent. But unlike Martin, he sees a role for climate. The transition out of the Ice Age resulted in a rise in sea level and lowered water levels over much of North America. Large mammals probably congregated at the few remaining springs and were far more vulnerable to hunting. Haynes also argues that the human population grew slowly, with neighboring groups probably engaging in cooperative hunts.

Other scientists, such as geologist Ernest L. Lundelius of the University of Texas in Austin, hold that climate change

Two types of mammals that became extinct in North America about 11,000 years ago were the giant sloth and the armadillo-like glyptodonts.



Illustrations: Courtesy, Field Museum of Natural History

alone was the ultimate cause of the extinctions. Lundelius points to evidence that the habitats, or natural living areas of many animals, underwent extensive destruction at the end of the Pleistocene. Many late Ice Age sites contain plant and animal species whose ranges do not currently overlap. The yellow-cheeked vole, for example, shared its southeastern United States habitat with the eastern pack rat in late Pleistocene times. Today these two species live 1,200 miles apart.

"Disharmonious" mixes of species can be explained, says Lundelius, only if late Pleistocene winters were warmer than they later became, allowing southern species to range farther north, and summers were cooler, allowing northern species to travel farther south. Plants and animals either adapted to the more severe weather conditions or, as with many large mammals, became extinct.

There is further evidence, says Lundelius, that small mammals shifted locales at the same time as large-mammal extinctions in Australia, where late Pleistocene extinctions were also massive.

Martin, however, says climate change cannot explain different intensities of extinction on different continents (heavy loss of species in the Americas and Australia, light in Asia and Africa). He contends that human predation led to Australian extinctions.

But overkill is unlikely to have caused the disappearance of 10 classes of North American birds at the end of the last Ice Age, says archaeologist Donald K. Grayson of the University of Washington in Seattle. Only one group, composed of huge vultures with 12-foot wingspans, relied on carcasses provided by large carnivores, in Grayson's view.

Martin contends that nearly all of the bird extinctions occurred among scavengers that fed on carnivore leftovers.

Another perspective is provided by zoologist Norman Owen-Smith of the University of Witwatersrand in Johannesburg, South Africa. The late Pleistocene elimination of "megaherbivores" weighing more than 2,200 pounds, by whatever means, would have drastically changed vegetation patterns and resulted in extinctions or geographic migration among many smaller herbivores, says Owen-Smith in the summer PALEOBIOLOGY.

In modern Africa, he points out, the massive appetites of grazing and browsing megaherbivores such as elephants and rhinoceroses help to transform wooded savanna to open, short-grass savanna dominated by rapidly regenerating plants and herbs. This, in turn, provides more nutritious food sources for other herbivores.

Following the elimination of megaherbivores, says Owen-Smith, the savanna



The giant Irish elk outlived many other species, at least in western Europe, where it vanished around 10,000 years ago.

would revert to a tall grassland. More frequent and fierce fires would further clear away remaining trees and shrubs. The fossil pollen record hints at similar types of vegetation changes at the end of the Pleistocene, he says. The elimination of megaherbivores, concludes Owen-Smith, may be what separates vegetation changes at the end of the last Ice Age from those accompanying previous glacial meltdowns.

There are, however, few data on extinct animals' ability to tolerate habitat change, says Lundelius.

Alack of data clouds other aspects of the debate. "The timing of Ice Age extinctions is really very poorly understood," says Grayson. "Radiocarbon chronologies are bad in North America and worse in Europe."

There are some species extinctions that will probably never be reliably dated, acknowledges Martin. Other remains, he says, such as those of the Barrington mountain goat and Shasta ground sloth in the Grand Canyon, show a clear timing of extinction at 11,000 years ago.

Grayson also contends that the sample of Clovis sites uncovered so far provides a biased view of the early settlers' lives. "Big-game hunting may not have been a common activity," he says. "If they spent most of the time hunting mice and eating berries we probably wouldn't know it."

Although the archaeological remains are not conclusive, big game was the only abundant food supply for people who crossed the Bering land bridge into frozen Alaskan tundra, maintains Richard Morlan of the National Museum of Man in Ottawa, Canada. "They must have been expert hunters and skilled in the use of fire and in sewing," says Morlan.

There is one point, at least, that elicits general agreement: archaeologists hunt-

ing for new clues to resolve the debate over late Ice Age extinctions face a formidable task. A "smoking gun," possibly in the form of a kill site with varied now-extinct animal remains lying in the same sediments as both human remains and uncontaminated charcoal that could be radiocarbon-dated, continues to elude them.

Some additional light is being shed on the late Pleistocene by ongoing excavations at the Cutler Fossil Site in southern Florida (SN: 1/25/86, p.52). At least 65 animal species, many now extinct, have been identified in a cave exposed by a sinkhole, says Dade County archaeologist and project director Robert Carr. Several radiocarbon dates put the remains at about 10,000 years old.

"We've established that the center of the cave was a human habitation site that included a dispersed area of burned rock and charred animal bones, although there is no discrete pit or hearth," says Carr.

Human skeletal remains of five individuals as well as several projectile points have also been found, indicating that some animals at the site, such as early horses and camel-like creatures, were hunted. On the other hand, the recent discovery of fossilized seeds at the Cutler site includes a now-extinct hazelnut, which suggests to Carr that a climate change may have led to its departure.

Martin, who visited the Florida site last year, says the variety of extinct animal remains is impressive, but a clear association with human cultural artifacts is not evident and a series of dependable radiocarbon dates has not yet been established.

"In the history of this continent," remarks Martin, "there's a big gap between where the written record ends and the spade begins." □