

Palaeontology

Britain's newest mammoths

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FOR many years those who borrowed from palaeontological data believed that mammoths disappeared from Britain during the maximum expansion of ice sheets during the Last Cold Stage, between 18,000 and 15,000 years before present (BP), and that they did not reappear there during the subsequent ameliorated climates of the late-glacial. This absence was thought to result from generally reduced mammoth populations on the European continent following that last glacial maximum. On page 472 of this issue¹, Coope and Lister report the discovery of mammoth skeletons in late-glacial kettle deposits at Conover, Shropshire, England. Their reported radiocarbon dates of $12,920 \pm 390$ BP and $12,700 \pm 160$ BP are the youngest for mammoths in Britain, averaging approximately 5,000 years younger than those previously available. It appears, furthermore, that all was well with these mammoths in their late-glacial British habitat, and it is no surprise that this new unexpected record is an important and interesting discovery.

The Last Cold Stage in Britain is the Devensian, extending from approximately 110,000 to 10,000 BP². Although climatically complex, it was predominantly characterized by a cold climate that favoured permafrost conditions and subarctic park-like landscapes. During the Devensian glacial maximum 18,000–15,000 BP, with sea water locked in glacier ice and sea level perhaps as much as 100 m lower than today, the unglaciated southern portions of England and Wales were joined to the European continent as part of a broad contiguous region of predominantly tundra, north of the Alps and extending east to Siberia. The Devensian

was succeeded 10,000 years ago by the Flandrian, the current interglacial characterized by temperate deciduous forest. The Late Devensian vertebrate faunal history of Britain² is recorded at 11 primary localities in England, from the Isle of Man and York southwards, and at Ballybetagh^{2,3} in Ireland. To these Conover can now be added.

Mammoth (*Mammuthus primigenius*), horse (*Equus ferus*), woolly rhinoceros (*Coelodonta antiquitatis*) and reindeer

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Cold comfort — did mammoths survive the Last Cold Stage?

(*Rangifer tarandus*) occur in the earlier Late Devensian assemblages (about 26,000–18,000 BP) in association with tundra-like vegetation and arctic climates. Artefacts are not associated with these faunas. Until the discovery at Conover, later Late Devensian faunas lacked mammoths, but horses, giant deer (*Megaloceros giganteus*), European elk (*Alces alces*) and reindeer are recorded associated with birch woodlands or parklands containing grasses. Artefacts occur in association with these faunas after 12,000 BP.

One of the implications in Coope and Lister's report is particularly noteworthy.

This is the issue of large-mammal extinction during the late-glacial. Mammoths later than the Conover record are unknown in Britain, where later late-glacial fossil deposits also lack woolly rhinoceroses². Although discoveries such as that at Conover leave open the issue of timing, mammoths, woolly rhinoceroses and giant deer are extinct today, part of a pattern of extinction throughout the Northern Hemisphere (and elsewhere) that was complete by 10,000 BP. Cultural as well as climatic causes have been proposed for this event.

Did the last mammoths of Britain die out before those of America? Coope and Lister¹ have reduced the temporal differences from 7,000 years to about 2,300 years (12,800 BP at Conover versus

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10,500 BP at Rawhide Butte, Wyoming, the youngest date for mammoths in America⁴). As additional well-dated late-glacial mammoths are found in Britain and on the continent (now a reasonable expectation), temporal differences in late or last occurrences may be reduced. If these temporal differences could be reduced to zero, then late-arriving native Americans at 12,000 BP would seem less likely to be sole agents in the extinction of the American megafauna⁵. Events on a global scale would be sought and the most likely of these would be climatic change. Global glacial recession during the Last Cold Stage seems to have been harmonious (Devensian², Weichselian⁶, Valdaian⁷, Wisconsinian⁸) and indicates parallel patterns of late-glacial climatic change. This change seems to have been rapid and to have occurred through two phases of climatic amelioration: the first commencing 13,000 years ago, and interrupted by climatic deterioration at 11,000 BP, in turn followed by the second abrupt amelioration about 10,000 BP, resulting in the current interglacial. In America (and perhaps elsewhere) late-glacial extinctions occurred during the climatic deterioration at 11,000–10,000 BP and therefore correspond with the end of the Last Cold Stage. □

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Size change in Siberian mammoths (*M. primigenius*) during the Last Cold Stage. Size of fore-limb is compared to radiocarbon age. In Siberia the large forms date to the Karginsk interstadial where their size is thought to be a response to optimal foraging conditions. The environment indicated for the Conover mammoths is temperate to boreal, but not arctic, and a "relatively mild climate is implied"

(ref. 1). Radiocarbon dates indicate an early Windermere Interstadial age for the Conover remains and, based on the Siberian model, the early part of this late-glacial warming of Britain was accompanied by the return of optimal mammoth habitat. (From ref. 9, after ref. 10).

