

LETTER TO THE EDITOR

Even More Earliest Isotopically Dated *Mammuthus* from North America

Mammuthus hayi (Barbour, 1915) was the most primitive elephant in North America, as well as the earliest (Madden, 1981, 1982, 1983, 1985, 1986a, 1986b).

In this journal, Lucas (1995), a former colleague at the New Mexico Museum of Natural History, identified the Thornton Beach mammoth as *Mammuthus imperator* (Leidy, 1858) and, moreover, stated that it was the oldest radiometrically dated example of that species. However, as a major student of North American fossil elephants, I wholly disagree with his statements, both of which are in error. I (Madden, 1981, 1983) reidentified the Thornton Beach elephant as *M. hayi*, which Lucas neglects to mention. I (Madden, 1980) earlier identified that mammoth as “. . . *Mammuthus* sp. indet. . . .” because *M. hayi* had not been re-established, and I (Madden, 1977) had followed Maglio’s (1973) theory that “*meridionalis*” had been present in North America. Nevertheless, the extremely primitive morphology and small size of the Thornton Beach sample (UCMP 68128, housed in the University of California Museum of Paleontology, Berkeley) identifies it as *M. hayi* (Barbour, 1915). Its best preserved M/3 has 11 plates, is 222 mm long, and is only slightly more than 89 mm high (guesstimate 92 mm). These parameters are indistinguishable from those for *M. hayi*. They are not in the 95% confidence intervals for *M. imperator* and are not even in the observed ranges of variation for that species (Table 1). Primitive morphology of the Thornton Beach *M. hayi* is consistent with an early Pleistocene age for its locality and contained deposit. G. H. Curtis (in Hall, 1966, p. 156), one of the founders of K/Ar dating (Curtis, 1961), determined an age of 1.5 ± 0.8 myr for a whole-rock sample 10 m below the Thornton Beach elephant site and horizon. Lucas (1995) prefers to use a fission-track determination of 0.45 ± 0.08 myr by Meyer *et al.* (1980) which is inconsistent with the primitive morphology and small size of the Thornton Beach *M. hayi*. Furthermore, the samples used are not from Thornton Beach. Other paleontologic and stratigraphic evidence supports the early age. A locality, probably at the base of the cliffs near the former site of the Cliff House Restaurant, some 11 km nearly due north of the Thornton Beach locality, yielded an elephant M2 identifiable as *M. imperator*, CAS 54055 in the California Academy of Sciences, San Francisco. N. T. Hall (oral communication,

1981) stated that the deposits at the Cliff House Beach are stratigraphically higher than those at Thornton Beach. CAS 54055 represents a late *M. imperator* because its morphology is consistent with that observable for advanced second molars in late populations of *M. imperator* from the earliest Rancholabrean of Nebraska (Madden, 1981). CAS 54055 has the following parameters for plates, length, width, height, average enamel thickness, and plate ratio: 12, 206 mm, 83 mm, 139 mm, 2.2 mm, and 7.0. Incidentally, Lucas states that I did not mention the Meyer *et al.* (1980) reference. This is a mistake. Original mention of that reference, as well as its first discussion, is in “Mammoths of North America” (Madden, 1981, p. 141).

The oldest isotopically dated *M. imperator* or Imperial Mammoth from North America is not the Thornton Beach elephant, *contra* Lucas. Instead, it is from Rock Creek 2, Texas (Madden, 1981, p. 151). Izett (1977, p. 1034) showed that Pearlette Type 0 ash overlies deposits containing an upper fauna at Rock Creek, which is the classical local fauna of that Texas locality. Naeser *et al.* (1973, p. 94) assigned a fission track age of 0.6 ± 0.1 myr to that ash at other sites. This determination is of mid-Pleistocene or late Irvingtonian age and provides a minimum age for the two local Rock Creek fauna. Gidley (1903) identified mammoths from that fauna as *M. imperator* or Imperial Mammoths. Hay (1924) described Gidley’s samples as the same species. The samples include a partial skeleton (AMNH 10598, American Museum of Natural History, New York) and a large humerus (UM 7531, University of Michigan). The first sample comprises of upper and lower jaws with third molars and an associated, articulated right humerus, right ulna, and right radius, the last three components of which were described by Hay (1924, p. 425) and figured by Osborn (1942, pp. 1017–1018, Fig. 907). Hay (1924, p. 85) observed that the left M3/ has 18 plates and is nearly 340 mm long and 93 mm wide, whereas the right M/3 probably originally had 18 plates. Such parameters confirm Gidley’s and Hay’s identification of AMNH 10598 as *M. imperator* (Table 1). UM 7531 represents a second individual of *M. imperator* because it is from the right side, like AMNH 10598.

Lucas and Effinger (1991), Lucas *et al.* (1993), and

TABLE 1
Parameters for M/3 Characters of Thornton Beach Mammoth (UCMP 68128) and Sample Statistics for Those Characters in *Mammuthus hayi*, *M. imperator*, *M. columbi*, and Eurasian *M. valdarnensis* ("meridionalis") and *Loxodonta africana*

	UCMP 68128	<i>M. hayi</i>	<i>M. imperator</i>	<i>M. columbi</i>	<i>M. valdarnensis</i>	<i>L. africana</i>
Plates						
\bar{X}	11	10	17	21	13	12
<i>N</i>	1	14	19	16	40	95
<i>s</i>	—	0.68	2.49	1.67	1.39	0.93
CV	—	6.8	14.6	8.0	10.7	7.7
CL	—	10–10	16–18	20–22	13–13	12–12
OR	—	—	14–22	—	—	—
Length						
\bar{X}	222	238	332	323	284	236
<i>N</i>	1	15	19	15	26	44
<i>s</i>	—	18.54	49.58	42.99	30.81	29.82
CV	—	7.8	14.9	13.3	10.8	12.6
CL	—	229–247	310–354	301–345	272–296	227–245
OR	—	—	251–434	—	—	—
Width						
\bar{X}	79	95	95	93	95	75
<i>N</i>	1	21	61	48	54	48
<i>s</i>	—	11.38	14.15	10.22	11.87	5.7
CV	—	12.0	14.9	11.0	12.5	13.3
CL	—	90–100	91–99	90–96	92–98	73–77
OR	—	—	—	—	—	—
Height						
\bar{X}	+89(g92)	113	145	148	121	117
<i>N</i>	1	2	25	33	23	17
<i>s</i>	—	—	20.18	13.92	16.37	14.6
CV	—	—	13.9	9.4	13.5	12.5
CL	—	—	137–153	139–157	114–128	110–124
OR	—	99–126	113–183	—	—	—
AET						
\bar{X}	2.9	3.5	2.7	2.1	3.4	—
<i>N</i>	1	17	56	40	34	—
<i>s</i>	—	0.69	0.37	0.46	0.53	—
CV	—	19.8	13.7	21.9	15.6	—
CL	—	3.2–3.8	2.6–2.8	2.0–2.2	3.2–3.6	—
OR	—	—	1.9–3.6	—	—	—
APR						
\bar{X}	5.0	4.3	5.5	6.2	5.0	4.7
<i>N</i>	1	22	61	48	9	0.68
<i>s</i>	—	0.59	1.09	1.02	0.55	8
CV	—	13.7	19.8	16.5	11.0	14.5
CL	—	4.1–4.5	5.2–5.8	5.9–6.5	4.6–5.4	4.2–5.2
OR	—	—	3.6–7.8	—	—	—

Lucas (1995) identified a mammoth jaw with third molars (UNM 11028) from Tijeras Arroyo 1, New Mexico as "... *M. meridionalis*, ..." However, this fossil, housed in the University of New Mexico Museum collections, is better identified as *M. hayi* rather than a species that was never present in North America. M/3s in UNM 11028 probably had 11 plates, are 282 mm long, and have extremely thick enamel (4.7 mm) and a very low plate ratio (4.0). This *M. hayi* was contained within a reworked bed of Guaje pumice (K/Ar age 1.61 myr) and was directly associated with early Irvingtonian mammals (Lucas and Effinger, 1991; Lucas *et al.*, 1993). S. G. Lucas *et al.* (unpublished data) first identified the Tijeras mammoth as *M. hayi*.

Finally, I reidentify portions of M/3's of a "... probable *M. meridionalis* ..." of Lucas (1995) from Wellsch Valley, Saskatchewan as *Mammuthus* sp. indet., or indeterminate species of mammoths. This sample (NMC 17804, 33.10018), which I feel Lucas has not examined, is housed in the National Museums of Canada. It is far too fragmentary for an identification even to probable species.

REFERENCES

- Barbour, E. H. (1915). A new primitive mammoth from Nebraska, *Elphas hayi*. *American Journal of Science* 40, 129–134.
- Curtis, G. H. (1961). Clocks for the Ages: Potassium–argon. *National Geographics* 120, 590–592.

- Gidley, J. W. (1903). The freshwater Tertiary of northeastern Texas. American Museum expeditions of 1899–1901. *American Museum of Natural History, Bulletin* 19, 617–635.
- Hall, N. T. (1965). Late Cenozoic stratigraphy between Mussel Rock and Fleischhacker Zoo, San Francisco Peninsula. In "INQUA VIIIth Congress Guidebook for Field Conference. I. Northern Great Basin and California" (C. B. Schultz and H. T. U. Smith, Eds.), pp. 151–158. Nebraska Academy of Sciences, Lincoln.
- Hay, O. P. (1924). "The Pleistocene of the Middle Region of North America and Its Vertebrated Animals." Carnegie Institute Washington Publication No. 322A, viii + 283 pp.
- Izett, G. A. (1977). Volcanic ash beds in continental deposits of the Southern High Plains: Their bearing on the time of the Blancan–Irvingtonian faunal transition. In "Geological Society of America, Abstracts with Programs," Vol. 9, p. 1034.
- Leidy, J. (1858). Notices of remains of extinct Vertebrata, from the valley of the Niobrara River, collected during the exploring expedition of 1857, in Nebraska, under the command of Lieut. G. K. Warren, U.S. Top. Eng., by F. V. Hayden, geologist to the expedition. *Academy of Natural Sciences of Philadelphia, Proceedings* 10, 20–29.
- Lucas, S. G. (1995). The Thornton Beach mammoth and the antiquity of *Mammuthus* in North America. *Quaternary Research*.
- Lucas, S. G., and Effinger, J. E. (1991). *Mammuthus* from Lincoln County and a review of mammoths from the Pleistocene of New Mexico. *New Mexico Geological Society Guidebook* 42, 277–282.
- Lucas, S. G., Williamson, T. E., and Sobus, J. C. (1993). Plio-Pleistocene stratigraphy, paleoecology, and mammalian biochronology, Tijeras Arroyo, Albuquerque area, New Mexico. *New Mexico Geology* 15, 1–8, 15.
- Madden, C. T. (1977). Elephants of North America. In "Geological Society of America, Abstracts with Programs," Vol. 11, p. 471.
- Madden, C. T. (1980). Earliest isotopically dated *Mammuthus* from North America. *Quaternary Research* 13, 147–150.
- Madden, C. T. (1981). "Mammoths of North America." Unpublished Ph.D. thesis, University of Colorado, Boulder, xvi + 271 pp, 10 pls.
- Madden, C. T. (1982). Mammoths of North America. *Dissertation Abstracts* 42, 339.
- Madden, C. T. (1983). More isotopically dated *Mammuthus* from North America. *Quaternary Research* 19, 275–277.
- Madden, C. T. (1985). On a single elephant tooth: Most primitive mammoth from coastal plain of southeastern United States. *Southeastern Geology* 25, 207–211.
- Madden, C. T. (1986a). Early elephant from coast of Central California. In "Geological Society of America, Abstracts with Programs," Vol. 18, p. 128.
- Madden, C. T. (1986b). *Stegomastodon* associated with *Mammuthus* in Arizona during the Quaternary. *Quaternary Research* 26, 266–271.
- Maglio, V. J. (1973). Origin and evolution of the Elephantidae. *American Philosophical Society, Philadelphia, Transactions* 63, 266–271.
- Meyer, C. E., Woodward, M. J., Sarna-Wojcicki, A. M., and Naeser, C. W. (1980). "Zircon Fission-Track Ages of 0.45 Million Years on Ash in the Type Section of the Merced Formation, West-Central California," U.S. Geological Survey Open-File Report, Vol. 80, No. 1071, 9 pp.
- Naeser, C. W., Izett, G. A., and Wilcox, R. E. (1973). Zircon fission-track ages of the Pearllette family ash beds in Meade County, Kansas. *Geology* 1, 187–189.
- Osborn, H. F. (1942). "Proboscidea," Vol. 2, pp. 805–1640. American Museum Press, New York.

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