

The American Mastodon *Mammut americanum* in Mexico

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SUMMARY: Aim of this study is to clarify the occurrence of the American mastodon *Mammut americanum* at the southern portion of its distribution. Twenty-three specimens from 15 localities in Mexico have been recorded, most of them from the Central Plateau, up to an altitude of 1500 meters above sea level, and to the east of the country. In addition, the mammoth *Mammuthus* and the American mastodon are contemporaneous in three localities, and mastodon possible association with man in two localities. Their southernmost record is from Honduras. Our data indicate that the American mastodon is a rare taxon at the southern portion of its distribution, which could be related to the presence and possible feeding overlap with the gomphothere *Cuvieronius*.

1. INTRODUCTION

From 1996 to 1998, an electronic database on Late Quaternary mammals of Mexico was developed with a similar structure to the FAUNMAP project in the United States of America. The purpose was to gather, verify and update the records of each mammal taxon in the country. From those data, it was clear that at least three genera within the Order Proboscidea inhabited México during the Late Pleistocene, the mammoth *Mammuthus*, the gomphothere *Cuvieronius*, and the American mastodon *Mammut*. The first two genera were very abundant, while the third is rare, and poorly known due to the scarcity of its remains in the country.

The American Mastodon, *Mammut americanum* (Kerr 1792), is a mammutid (Proboscidea, Mammutidae) with a wide distribution in North America, from Alaska to central Mexico (King & Saunders 1984; Polaco *et al.* 1998; Saunders 1996; Shoshani 1990, Tobien 1996), and an isolated record in

Central America (Honduras; Lucas & Alvarado 1991). However, the presence of American Mastodon is not clearly documented or is relatively scarce in the fossil record from México, as it is only known from few localities in the Mexican Plateau (Polaco *et al.* 1998). Here, we present the synthetic knowledge about this unique taxon for the Mexican Pleistocene.

A review was undertaken using various sources: published literature; materials housed in the Instituto Nacional de Antropología e Historia collections, and documents from Chester Stock's archives about his team's research carried out in Mexico during the 1930's and 1940's, and presently housed in the Natural History Museum of Los Angeles County (LACM). The objective was to update the known distribution for this species in the southern portion of its range. As a result, the American mastodon was recorded from 15 localities distributed in eight states of the Mexican Republic (Fig. 1).



Fig.1 - Known record of *Mammut americanum* south of its southern distribution range (Mexico and Central America).

2. LOCALITIES NUEVO LEÓN

2.1 Nuevoleón

1. - Sierra Alta, La Estanzuela, 10 km south of Monterrey (25° 34' 35" N, 100° 16' 34" W, altitude 601 m (López-Oliva *et al.* in press).

More than 100 bones were recovered, most of them in excellent preservation. They included tusks, molars, mandibles with molars, mandible fragments, ribs, vertebrae, and scapulae from at least 14 individuals within five taxa, *Mammuthus columbi* (2 individuals), *Mammut americanum* (7), *Camelops hesternus* (1), *Bison* sp. (3), and *Equus* sp. (1). Regarding the American mastodon 15 molars or molar fragments, three mandible ramii, and poscranial material were recovered. At least seven individuals were represented.

Molars identification and measurements follow Laub (1992), Miller (1987), and Saunders (1977). The following molar data list indicates kind of teeth, number of elements, total length (mm): average, minimum and maximum, and width (mm): average, minimum and maximum. Dp4 (1) 70.6, 55.1; M1 (1) 50.5, 68.6; M2 (3)

113.6 (108.2-116.6), 88.6 (80.2-94.4); M3 (3) 175.7 (163.6-187.9), 104 (100.9-107.2); m2 (3) 116.3 (104.5-131.5), 87.8 (83-95.2); m3 (5) 183.1 (162.8-200.5), 97.7 (88.1-108.6). The measurements are similar to those provided by Miller (1987) and Saunders (1977).

The presence of *Bison* sp. indicates a Rancholabrean age for the fauna of La Estanzuela. It is the first place in México where the association of *Mammuthus columbi* and *Mammut americanum* has been clearly documented. The possible transverse marks on one mammoth scapula suggest human presence at the time of deposition of the proboscidean remains (López-O. *et al.* 2000).

2. - Iturbide (López-Oliva *et al.* in press).

From this locality, five molars and one lower tusk were recovered. The material was from an approximately 10 year-old young adult mastodon (African age, following Saunders 1977). The measurements of the molars (length vs. width, in mm) are: recently emerged left M2, 128.2, 100.5; unerupted left M3, 195.5, 105.7; worn left dp4, 69.0, 60.5; right m1, 99.2, 74.5; recently emerged left m2, 131.2, 93.6; recently emerged right m2, 128.6, 92.3; inferi-

or tusk with enamel at the tip, 198.8, 24.5. These measurements are similar to those given by Saunders (1977).

2.2 Tamaulipas

3. - Río Vírgenes, at west of Villa Hidalgo and near of the state limits between Nuevo León and Tamaulipas (Miller 1987).

In 1935 molars of the American mastodon were discovered. They are currently housed at LACM. This material is mentioned by Miller (1987). Bode (*in litt.*) refers to this and the discovery of molars of “*Mammuthus* (as *Elephas*)”, suggesting that both species coexisted in the same region.

2.3 Zacatecas

4. - Laguna de El Salitre, approx. 6 km NW Villa Hidalgo, altitude 2100 m (Polaco *et al.* 1998).

A left mandible fragment with a complete third molar was recovered. Other bone fragments from the site pertained to mammoth, the Pleistocene horse *Equus*, and the Pleistocene camel *Camelops*. Such an assemblage suggests a Late Pleistocene fauna.

2.4 Aguascalientes

5. - 3.5 km S Aguascalientes (21° 17' N, 102° 5' W) altitude 2000 m.

Mooser & Dalquest (1975) recorded a well-preserved mandible and teeth. The relative age for this fauna is Illinoian or Early Rancholabrean (Montellano-Ballesteros 1992). Ferrusquía-Villafranca (1978) erroneously assigned this material to San Josecito Cave, Nuevo León (Barrios-Rivera 1985). Lucas & Alvarado (1991) also suggested the San Josecito Cave record as the southernmost one for this species.

2.5 San Luis Potosí

6. - Rancho La Amapola, 1.5 km SE El Cedral (23° 49' N, 100° 43' W), altitude 1700 m.

In 1965, two molars were recovered, both

right and complete, and with a smooth form. The measurements (length vs. width, in mm) are: M2, 105, 78; M3 131.6, 76.1. New excavations were made in this locality from 1977 to 1983, and additional teeth were discovered. Those were either well-developed or deciduous molars; dp 2 unworn; left dp3 unerupted, 47, 33; right m2, 106.7, 71. In addition, postcranial material was recovered, and included a fibula, a complete axis and vertebrae fragments.

Several springs were in the region at the end of the Pleistocene. Current vegetation is scrubland, but the late Pleistocene vegetation was probably different due to more humid conditions. Three different faunal stages were defined for the age intervals, including those between 30,000 and 25,000 years BP, around 15,000 years BP, and between 10,000 to 8,000 years BP. However, this material could not be allocated to these intervals. While *Mammot americanum* and *Mammuthus columbi* coexisted at this locality, mastodon was the most abundant. Although evidence was found of human presence, it was not associated with mastodon.

7. - Laguna de la Media Luna, near Río Verde, altitude 1020 m (López-Oliva *et al.* in press).

A partial cranium with two molars and basal fragments of two tusks were recovered. Measurements of a left M2 were: 117.3-106.2. Several other animals were recovered from the lake bottom, including *Canis latrans*, *Procyon lotor*, *Mammuthus* sp., *Equus* cf. *mexicanus*, *Platygonus* sp., *Camelops* sp., *Tanupolama* sp., *Odocoileus virginianus*, *Antilocapra Americana*, and *Hydrochoerus* sp. (Hernández Junquera 1977).

2.6 Hidalgo

8. - Zacualtipán.

This locality was the first known in Mexico, and recorded by Freudenberg, (1922). The specimen apparently was a right M1 (Hay 1925). The reported measurements in mm are: length, 85; width, 58.

9. - Minas Anaya, 15 km NW Actopan (Castillo Cerón *et al.* 1996).

A cranial fragment with maxilla and a complete mandible were recovered. Castillo Cerón

et al. (1996) assumed a late Pleistocene age for the deposit.

10. - Arroyo Amajac (GPS 20° 18' 18" N, 98° 42' 44,4" W, altitude 1860 m).

This locality was mentioned by Miller (1987) based on material housed at the LACM. It was discovered in the 1930's, and at least two skeletons of American mastodon were recovered (Bliss in *litt.*).

11. - Santiago Tulantepec Municipality.

Cabral-Perdomo (2000) recorded at least two individuals which were of different ages, after the cranial and poscranial remains found.

2.7 Estado de Mexico

12. - Tequiquiac (Pichardo del Barrio 1961).

This locality is one of the best known paleontological locality in Mexico, although much of the material was collected from the surface, and only a very few controlled excavations have been done (Hibbard 1955). Pichardo del Barrio (1961) illustrated an isolated upper (left M3) from such locality. However, Hibbard (1955) did not study any specimen pertaining to this taxon, but recorded a third molar without locality data.

13. - Xico (300 m at south of Xico, 8 m profundity).

In 1967 a right M2 practically unworn was recovered. Measurements: length 114.49 mm; width 74 mm.

2.8 Puebla

14. - Valsequillo Area.

The first report of mastodon from this locality was by Irwin-Williams (1967), although a complete description of the remains is lacking to assure its identification as American mastodon, and not as a gomphotherid (Polaco *et al.* 1998). Pichardo (1997) identified the remains as *Mammot americanum* from El Horno and Hueyatenco localities, with dates of 9150 ± 500 BP, and between $21,000 \pm 1500$ and $26,000 \pm 530$ BP. These remains are the first dated materials for this species in Mexico. For a mastodon third molar from El Horno locality, Pichardo (2000) recorded a date of 280,000 BP,

without any doubt the earliest presence of this taxon in a Mexican locality. However, Graham (in *litt.*) studied the Valsequillo materials, identifying both mastodon and gomphotherid bones and, in the case from El Horno, he only recorded gomphotherid remains. The identity of the remains dated by Pichardo (2000) warrants further investigation.

15. - San Pedro Candelaria, near of Cd. Serdán.

Pichardo (1961) mentioned a third lower molar. This molar has five lophs and a talonid. For *Mammot americanum*, this character pertains to species variation.

3. CONCLUSIONS

The American mastodon is known by 23 specimens from 15 localities in Mexico. Most of them are found in localities up to 1500 m in the Central Plateau. Except those from Monterrey and Río Vírgenes, all of them are from the eastern part of the country. In three localities (Río Vírgenes, Monterrey and El Cedral), the contemporaneous presence of mastodon and mammoth is recorded. In two localities (Monterrey and El Cedral), human occurrence is possible. The southernmost record in Mexico for the species is at San Pedro Candelaria, Puebla (written as "Pueblo" by some authors), but in the continent, the southernmost and isolated record is from San Pedro Sula, Honduras (Lucas & Alvarado 1991).

From these data, it is clear that the American mastodon was very rare in its southern distribution range. This situation might be correlated with the presence of South American forms of the gomphotherid *Cuvieronius*, with which *Mammot* could have overlapped in terms of habitat and feeding preferences.

4. ACKNOWLEDGEMENTS

We thank Dr. Eileen Johnson, Museum of Texas Tech University, for her kindness in reviewing an earlier draft of the English version of this manuscript.

5. REFERENCES

- Barrios-Rivera, H. 1985. *Estudio analítico del registro paleovertebradológico de México*. Tesis de Licenciatura. Facultad de Ciencias, Universidad Nacional Autónoma de México.
- Cabral-Perdomo, M. A. 2000. Presencia de *Mammot americanum* (Proboscidea: Mammotidae), en sedimentos del Pleistoceno Tardío del noreste de la Cuenca de México. In J. G. López Oliva, J. A. Arz, J. R. Chapa Guerrero, T. Cossio Torres, H. De León Gómez, F. Medina Barrera & J. A. Ramírez Fernández (eds.), *VII Congreso Nacional de Paleontología y I Simposio Geológico en el Noreste de México. 22-28 de julio 2000. Libro de Resúmenes*: 15-16. Universidad Autónoma de Nuevo León.
- Castillo Cerón, J. M., Cabral Perdomo M. A. & Carranza Castañeda O., 1996. *Vertebrados fósiles del Estado de Hidalgo*. Universidad Autónoma del Estado de Hidalgo, Pachuca.
- Ferrusquía-Villafranca, I. 1978. Distribution of Cenozoic vertebrate faunas in Middle America and problems of migration between North and South America. In I. Ferrusquía-Villafranca (ed.), *Conexiones terrestres entre Norte y Sudamérica*: 193-321. *Universidad Nacional Autónoma de México, Instituto de Geología, Boletín* 101: 1-329.
- Freudenberg, W. 1922. Die säugetierfauna des Pliocäns und Postpliocäns von Mexiko. II. Teil: Mastodonten und Elefanten. *Geologische und Palaeontologische Abhandlungen* 14: 103-176.
- Hay, O. P. 1925. Extinct proboscideans of Mexico. *The Pan-American Geologist*, 44: 21-37.
- Hernández Junquera, A. 1977. *Fauna local Laguna de la Media Luna, Pleistoceno Tardío, Municipio de Río Verde, San Luis Potosí, México*. Tesis de Licenciatura. Facultad de Ciencias, Universidad Nacional Autónoma de México.
- Hibbard, C. W. 1955. Pleistocene vertebrates from the Upper Becerra (Becerra Superior) Formation, Valley of Tequiquiac, Mexico, with notes on other Pleistocene forms. *Contributions from the Museum of Paleontology, University of Michigan*, 12: 47-96.
- Irwin-Williams, C. 1967. Associations of early man with horse, camel, and mastodon at Hueyatenco, Valsequillo (Puebla, Mexico). In P. S. Martin & H. E. Wright, Jr. (eds.), *Pleistocene extinctions: the search for a cause*: 337-347. New Haven and London: Yale University Press.
- King, J. E. & Saunders, J. J. 1984. Environmental insularity and the extinction of the American mastodon. In P. S. Martin & R. G. Klein (eds.) *Quaternary extinctions: a prehistoric revolution*: 315-339. The University of Arizona Press.
- Laub, R. S. 1992. Positional and ordinal identification of the teeth of *Mammot americanum*. *Current Research in the Pleistocene* 9: 105-108.
- López-Oliva, J. G., Polaco, O. J., Arroyo-Cabres J., & Corona-M. E., In press. New records of the American Mastodont in Northeastern Mexico. *Current research in the Pleistocene*. (submitted)
- López-O., J. G., Polaco, O. J., Arroyo-Cabres, J., Corona-M., E., Kouzoub, N., Méndez, S., Sada-G., P., de La Fuente, A., Ramos-L., A., Treviño-C., A., & Rodríguez-S., P., 2000. Vertebrados fósiles de la Sierra Alta en La Estanzuela, sur de Monterrey, Nuevo León, México. In J. G. López Oliva, J. A. Arz, J. R. Chapa Guerrero, T. Cossio Torres, H. De León Gómez, F. Medina Barrera & J. A. Ramírez Fernández (eds.) *VII Congreso Nacional de Paleontología y I Simposio Geológico en el Noreste de México. 22-28 de julio 2000. Libro de Resúmenes*: 105-106. Universidad Autónoma de Nuevo León.
- Lucas, S. G. & Alvarado, G. E. 1991. El hallazgo más austral de un *Mammot americanum*: el caso del mastodonte de San Pedro Sula, Honduras. *Revista Geología de América Central* 13: 85-89.
- Miller, W. E. 1987. *Mammot americanum*, Utah's first record of the American

- Mastodon. *Journal of Paleontology* 61: 168-183.
- Montellano-Ballesteros, M. 1990 (1992). Una edad del irvingtoniano al rancholabreano para la fauna Cedazo del estado de Aguascalientes. *Instituto de Geología, Revista* 9: 195-203.
- Mooser, O. & Dalquest, W. W. 1975. Pleistocene mammals from Aguascalientes, Central México. *Journal of Mammalogy* 56: 781-820.
- Pichardo del Barrio, M. 1960. Proboscídeos fósiles de México: una revisión. Instituto Nacional de Antropología e Historia, *Serie Investigaciones* 4 (1961): 1-63.
- Pichardo, M. 1997. Valsequillo biostratigraphy: new evidence for Pre-Clovis date. *Anthropologischer Anzeiger* 55: 233-246.
- Pichardo, M. 2000. Redating Iztapan and Valsequillo, Mexico. *Radiocarbon* 42: 305-310.
- Polaco, O. J., Arroyo-Cabrales J. & García-Uranga, B., 1998. The American Mastodon in Mexico. *Current Research in the Pleistocene* 15: 122-124.
- Saunders, J. J. 1977. Late Pleistocene vertebrates of the Western Ozark Highland, Missouri. *Illinois State Museum, Reports of Investigations* 33: 1-118.
- Saunders, J. J. 1996. North American Mammutidae. In J. Shoshani & P. Tassy (eds.) *The Proboscidea: evolution and palaeoecology of elephants and their relatives*: 271-279. Oxford: Oxford University Press.
- Shoshani, J. J. 1990. Distribution of *Mammut americanum* in the New World. *Current Research in the Pleistocene* 7: 124-126.
- Tobien, H. 1996. Evolution of zigodonts with emphasis on dentition. In J. Shoshani & P. Tassy (eds.) *The Proboscidea: evolution and palaeoecology of elephants and their relatives*: 76-85. Oxford: Oxford University Press.