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ABSTRACT BOOK

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More calf fossils of steppe mammoth (*Mammuthus trogontherii*) unearthed recently from Nihewan (Nihowan) Basin, North China

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The Shanshenmiaozi Site is an Early Pleistocene locality rich in mammalian fossils that was excavated during the past years. The site is located on the south bank of the Sangganhe River (40°13' 08"N; 114° 39' 54"E) and is nearby Xiaochangliang, a well-known Paleolithic site. The preliminary study shows that the fossils from the

new locality belong to the following taxa: *Lepus* sp., *Ochotona* sp., *Canis chihliensis*, Felidae gen. et sp. indet., *Pachycrocuta* sp., *Mammuthus trogontherii*, *Coelodonta nihowanensis*, *Elasmotherium* sp., *Proboscideipparion* sp., *Equus sanmeniensis*, *Sus* sp., *Eucladoceros* sp., *Spirocerus* sp., *Gazella sinensis*, *Bison palaeosinensis* etc. (Tong et al.,

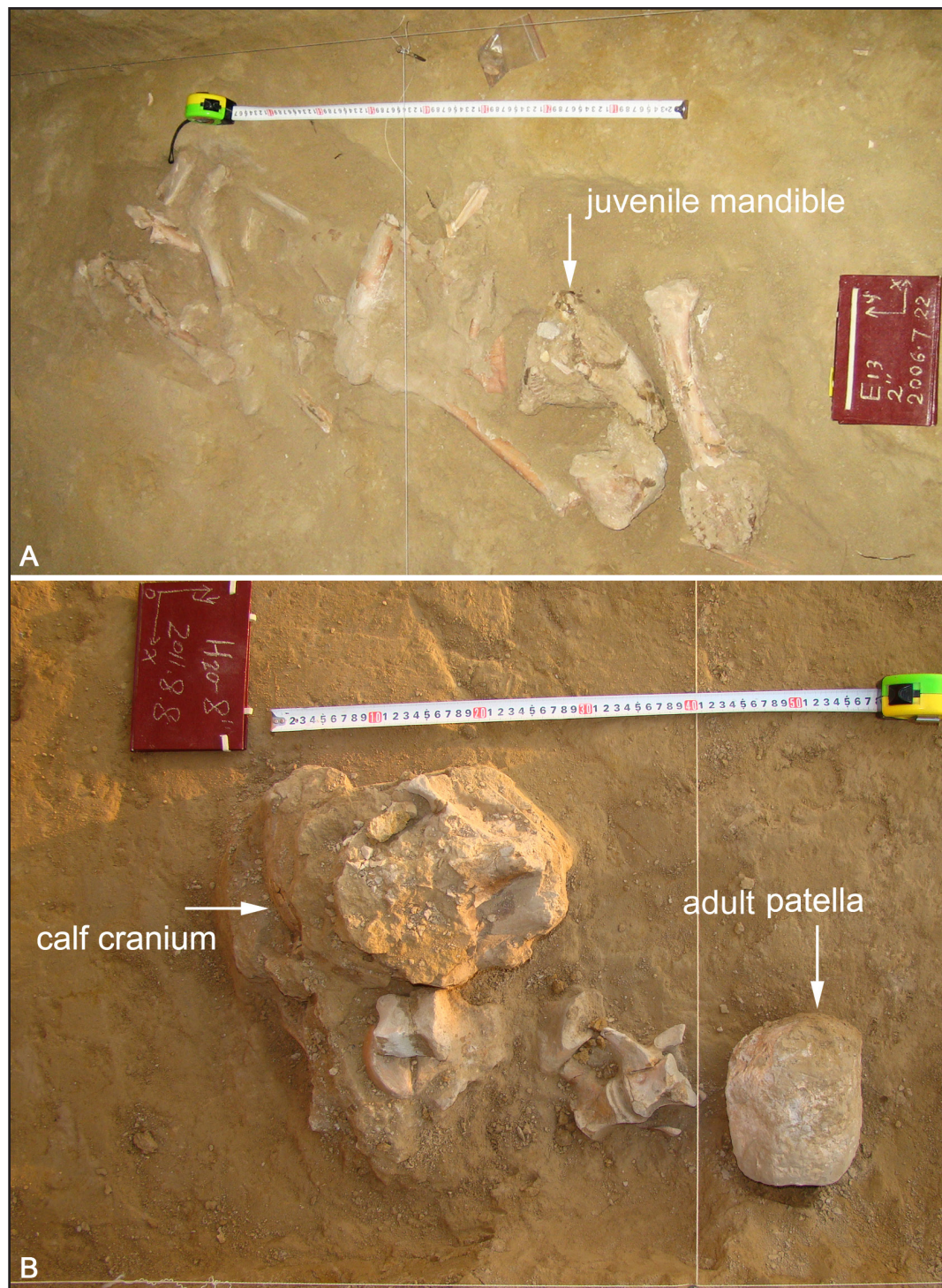


Fig. 1. A, Juvenile mandible of *Mammuthus trogontherii* was exposed at the Shanshenmiaozi Site in Nihewan Basin in 2006; B, Cranium of calf *Mammuthus trogontherii* was exposed in situ in 2011.

2011), all of which represent the principal elements of the Nihewan Fauna (*sensu stricto*) (Teilhard de Chardin and Piveteau, 1930). Preservation conditions and taxa diversity suggest this new locality is the best site ever excavated in the Nihewan Basin during the past half-century.

The recent stratigraphic survey indicates that the Shanshenmiaozi Site can be correlated with the palaeolithic layer of the Xiaochangliang Site, and has a geologic age of ca. 1.3 Ma B.P. according to magnetostratigraphic results (Zhu et al., 2001). In a wider however scale, the Nihewan Fauna (*sensu stricto*) is comparable to the Olivola Fauna of Europe (Qiu, 2004).

Although numerous juvenile specimens, including skulls and deciduous teeth, of the true woolly mammoth (*Mammuthus primigenius*) have been reported before (Maschenko, 2002), few of such kind of fossils have ever been discovered for the early mammoth species, including *Mammuthus meridionalis* and *Mammuthus trogontherii*. Fossil records of adult *Mammuthus trogontherii* are already well-known (Guenther, 1969; Lister and Stuart, 2010; Athanassiou, 2012), but the DP2 and DP3 of this species were completely unknown (Mol and Lacomat, 2009) since the discovery of the Shanshenmiaozi Site in the Nihewan Basin. Since the report of the juvenile mandibles and the associated lower deciduous teeth of *Mammuthus trogontherii* (Tong, 2012), some more specimens, including an almost complete calf skull with the DP2 and DP3 of both sides preserved in situ, have been recovered from the Shanshenmiaozi site. This specimen represents therefore a first discovery for the species *Mammuthus trogontherii*. Though previous scholars proposed that the Nihewan Basin would be the origin center for *Mammuthus trogontherii* (Wei et al., 2003), the so far studied fossil material was rather insufficient. For that reason, the newly discovered skull specimens at Shanshenmiaozi Site are of great importance in the study of the origin of steppe mammoth, as well as in the reconstruction of the phylogenetic relationships within the mammoth lineage. In addition, the juvenile dominated proboscidean fauna is also important for taphonomic studies.

During the Quaternary Period, the proboscidean taxa were quite diversified in the Nihewan Basin (Tong, 2010a, 2010b), which is very helpful for the evolutionary and biostratigraphic studies in the Nihewan Basin.

Because of the rareness of deciduous teeth for the early mammoth species, the comparative studies have been limited to *Mammuthus primigenius* and the two living elephant species. The study shows that both the upper and lower DP2s of *Mammuthus trogontherii* are more elongated than that of *Mammuthus primigenius*, whereas the DP3 has less lamella (or plate), and is less hypsodont than that of *Mammuthus primigenius*. The comparative study of skull and dental morphology also show that the newborn calves of the elephantids, including different extinct mammoth species as well as the extant *Elephas* and *Loxodonta*, are very close to each other; but in adult stage,

they are distinctly different.

The Shanshenmiaozi site is extraordinarily rich in juvenile large mammals, including juvenile horses, woolly rhinos, steppe mammoths and large bovids. On the contrary, the only dominant carnivore taxon, *Canis chihliensis*, is exclusively composed of adult individuals (Tong et al., 2012). It's still open to discussion whether the Shanshenmiaozi Fauna is a human-hunted assemblage or a wolf-collected assemblage.

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