



SCIENTIFIC ANNALS of the School of Geology,
Aristotle University of Thessaloniki

SPECIAL VOLUME 102



GREVENA
SIATISTA
GREECE 2014

VIth International
Conference
on Mammoths
and their Relatives

ABSTRACT BOOK

Editors:

Dimitris S. KOSTOPOULOS, Evangelos VLACHOS, and Evangelia TSOUKALA

THESSALONIKI, MAY 2014

Diversification of fossil proboscideans from the Neogene of the Linxia Basin, northern China

ShiQi WANG ✉, Tao DENG, ZhanXiang QIU, BanYue WANG, Wen HE,
ShanQin CHEN, and Jaroon DUANGKRAYOM

Recent studies reveal extraordinary diversity of fossil proboscideans from the Neogene of the Linxia Basin. The record of fossil proboscideans spans about 6 Myr from the early to late Miocene but may extend into the early Pleistocene based on one unidentified tusk segment (Deng et al., 2013; Fig. 1). This tusk indicates that proboscideans persisted in the Linxia Basin at least into the early Pleistocene in spite of middle Miocene tectonic reorganizations including basin isolation and potentially local and regional surface uplift (Craddock et al., 2011). We have identified at least 11 species belonging to seven genera of three families

of Miocene proboscideans, which include examples from all Miocene proboscidean subfamilies.

Prodeinotherium sinense is the only member Deinotheriidae known in China. The discovered lower mandible is characterized by its relatively small p3 with separated protoconid and metaconid, and with very rudimentary ectolophid. Its symphysis is anteroventrally oblique. The material is from the earliest late Miocene. Thus *P. sinense* is a terminal, isolated representative of *Prodeinotherium* (Qiu et al., 2007).

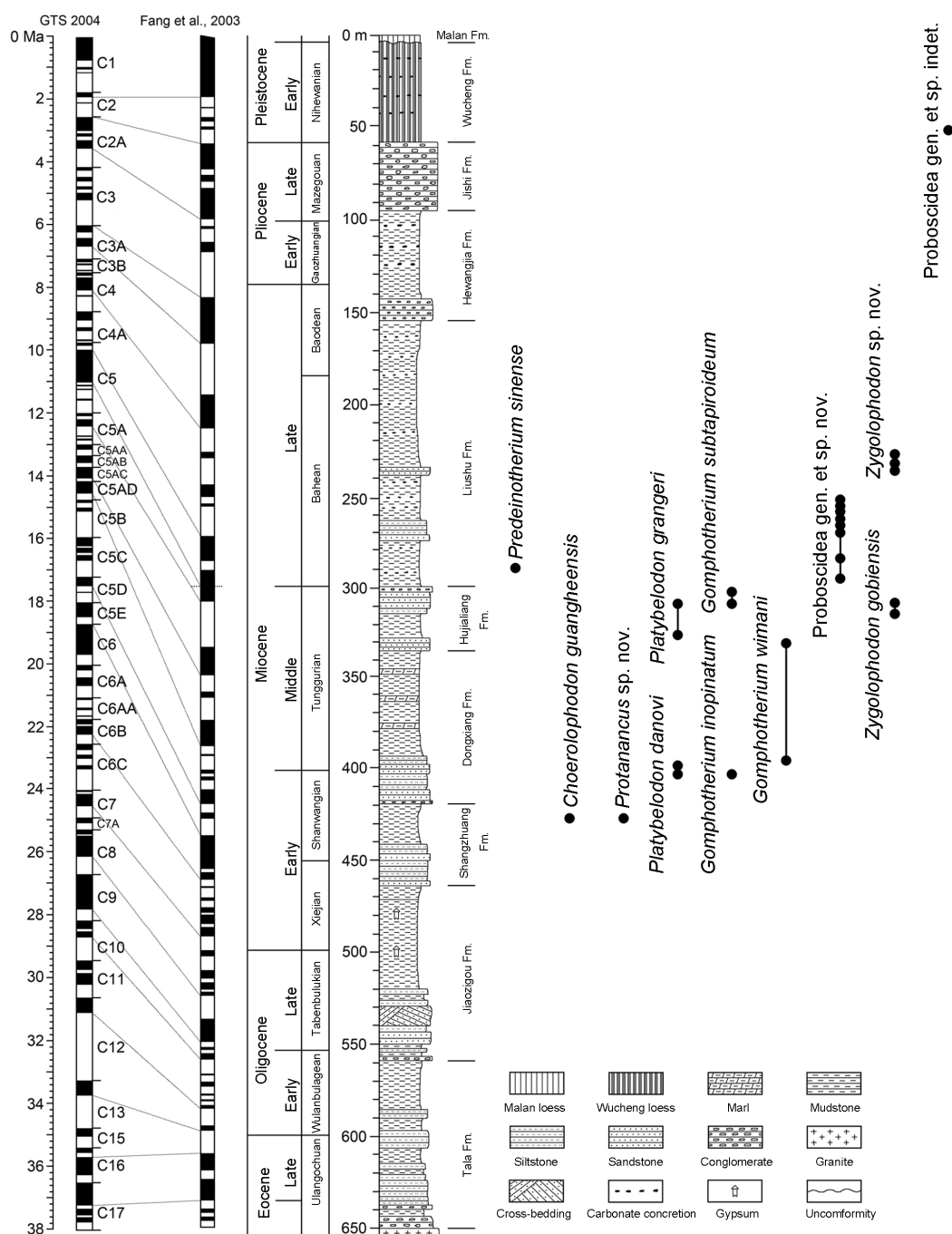


Fig. 1. Stratigraphic section of the Linxia Basin, showing proboscideans' distribution.

The only representative genus of Mammutidae is *Zygodolophodon*. As with other Eurasian specimens, they belong to the “*Z. turicensis* group”. Tobien et al. (1988) attributed all the Chinese zygodolophodont specimens to *Z. gobiensis*. This is also in case for the zygodolophodont specimens from the middle Miocene of the Linxia Basin. The zygodolophodonty of these teeth is rudimentary. From the late Miocene, *Zygodolophodon* sp. nov. was also discovered including a complete cranium. Well developed thin crests on the cheek teeth resemble those of *Mammut*, and are different from the middle Miocene *Z. gobiensis*. The cranium also shares a flattened neurocranium but erected basicranium with the terminal taxon, *M. americanus*. However, the ventrally bent upper tusks take precedence, indicating a close relationship to *Zygodolophodon*.

Another family of fossil proboscideans is Gomphotheriidae. *Choerolophodon guangheensis*, the only example of the subfamily Choerolophodontinae, was discovered from the early Miocene and is represented by a completed cranium. As is typical of choerolophodontine, this species is characterized by dorsally bent upper tusks which lack enamel and by its choerolophodonty (although relatively incipient). However, its orbit is anteriorly positioned and P4 is retained, showing plesiomorphies of the subfamily. This specimen is the most primitive extant cranium of Choerolophodontinae, and may be related with *C. palaeoindicus*.

Specimens of another subfamily, Amebelodontinae, are very abundant. A complete cranium with associated mandible of *Protanancus* sp. nov. has been discovered from the early Miocene. This skull features very rudimentary secondary trefoils and pseudo-anancoidy suggesting that it is the most primitive extant *Protanancus*. However, it shares a relatively short and broad mandibular symphysis with *Pr. tobieni* from middle Miocene strata of eastern Asian suggesting that the two species may be related. Another genus is *Platybelodon*. It is represented by the ancestral *Pl. danovi* (from the early middle Miocene) and *Pl. grangeri* (from the late middle Miocene). The latter has features distinguishing it from the former, including more prominent secondary trefoils, pseudo-anancoidy, and cementodonty, as well as broader symphysis. *Pl. grangeri* represents the most abundant mastodont assemblage all over the world. Almost 60 relatively complete crania plus mandibles have been excavated from the Linxia Basin.

For the basal group, Gomphotheriinae, at least three species of *Gomphotherium* have been recognized. *G. inopinatum* is the most conservative species and is represented by an incomplete lower hemimandible from the early Miocene. The interlophids of the cheek teeth are moderately open, but it lacks subdivision of the pretrite central conules and subdivision of the posttrite half lophids. This contrasts with *G. subtapiroideum* from the late middle Miocene which is characterized by further opening of the interloph(id)s, subdivision of pretrite central conules, and subdivision of posttrite half loph(id)s. An additional complete cranium

of *G. subtapiroideum* represents the first known cranium of this species. The upper tusks are relatively divergent and twisted. *G. subtapiroideum* is possibly the direct descendant of *G. inopinatum*, and both of them belongs to the “*G. angustidens* group” (Tassy, 1985). Another species, *G. wimani*, lasted from the early to middle Miocene and may be the ancestor of the Pliocene–Pleistocene *Sinomastodon*. It is characterized by narrowed interloph(id)s, subdivided pretrite central conules, and subdivided posttrite half loph(id)s. It is an endemic species, and possibly grouped with *G. steinheimense*.

A tetralophodont gomphotherere was also discovered in the late Miocene and represented by crania, mandibles, isolated teeth, and postcranial bones. This taxon exhibits flattened lower tusks, elongated mandibular symphysis, and tetralophodonty. This feature combination resembles “*Mastodon*” *grandincisivus* and North American *Amebelodon*. However, It differs from *Amebelodon* by its divergent lower tusks that are longer than the symphysis and also differs from “*M.*” *grandincisivus* by its rudimentary tubular structure in lower tusks thus representing a new species. The latter also indicates derivation of a tusk tubular structure that is independent from *Platybelodon* and *Amebelodon*. The limb bones of the new taxon are also thicker than any known mastodonts or extant elephants.

Thanks for the improvement for the English writing and advice of the geological part by J. Saylor.

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✉ wangshiqi@ivpp.ac.cn



Citation:

Wang, S., Deng, T., Qiu, Z., Wang, B., He, W., Chen, S., Duangkayom, J., 2014. Diversification of fossil proboscideans from the Neogene of the Linxia Basin, northern China. Abstract Book of the VIth International Conference on Mammoths and their Relatives. S.A.S.G., Special Volume 102: 217–218.