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# Gomphotheriidae and Mammutidae (Proboscidea, Mammalia) from the Miocene of the Linxia Basin

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Linxia Basin is situated on the northwest border of the Tibetan Plateau. Cenozoic deposits in the Linxia Basin are well developed and cover entire Miocene, consisting of Lower Miocene Shangzhuang Fm., lower Middle Miocene Dongxiang Fm., upper Middle Miocene Hujialiang Fm., and Upper Miocene Liushu Fm. Abundant fossil mammals have been discovered from these strata including Proboscideans (Deng et al., 2013). Evolutionary details of Miocene Gomphotheriidae and Mammutidae in East Asia can be traced based on these fossils.

Five genera of Gomphotheriidae belonging to three subfamilies have been discovered from the Miocene of the Linxia Basin. Choerolophodontinae is represented by the only species *Choerolophodon guangheensis* from the Lower Miocene Shangzhuang Fm. The skull of the species is characterized by its not posteriorly positioned orbit, as well as rudimentary choerolophodonty, ptychodonty, and cementodonty in cheek teeth, thus is more primitive than any known skull within the subfamily (Wang and Deng, 2011). Amebelodontinae is represented by *Protanancus* sp. nov., from the Lower Miocene Shangzhuang Fm., *Platybelodon danovi* from the lower Middle Miocene Dongxiang Fm., and *Pl. grangeri* from the upper Middle Miocene Hujialiang Fm. *Protanancus* sp. nov. is characterized by a relatively short and broad mandibular symphysis, as well as rudimentary secondary trefoils and pseudo-anancoidy on cheek teeth. These features indicate that *Protanancus* sp. nov. and *Pr. tobieni* constitute an ancestral but distinct branch of *Protanancus* in East Asia. Whereas, *Pl. danovi* and *Pl. grangeri* constitute a continuously evolutionary clade. The former exhibits simpler crown patterns on cheek teeth and a narrower mandibular symphysis than the latter (Wang et al., 2013).

Gomphotheriinae is represented by three species of *Gomphotherium*. *G. inopinatum* from the lower Middle Miocene Dongxiang Fm. is the most conservative species among the three. The interlophids are moderate open. No subdivision of posttrite half lophids and no posttrite central conules can be observed. *Gomphotherium subtapiroideum* from the upper Middle Miocene Hujialiang Fm. was possibly derived from *G. inopinatum* with more open interlophids and subdivided posttrite half loph(id)s. These two species can be grouped with European *G. angustidens* as "*G. angustidens* group" (Tassy, 1985). *G. wimani* was discovered from both Dongxiang and Hujialiang Fms., and is contemporary with other two species of *Gomphotherium*. This species can be aligned with European *G. steinheimensis* exhibiting subdivided posttrite half loph(id)s and posttrite central conules, but less open of interloph(id)s.

All of the trilophodont taxa of Gomphotheriidae were extinct by the end of the Middle Miocene. However, a tetralophodont gomphotheriid taxon has been discovered from the Upper Miocene Liushu Fm. This taxon possesses tetralophodont intermediated cheek teeth and an elongated mandibular symphysis as in Amebelodontinae, and resembles to European "*Mastodon*" *grandincisivus* (Schlesinger, 1917). The authors consider that this taxon and "*M.*" *grandincisivus* constitute a new genus. The Linxia taxon differs from "*M.*" *grandincisivus* in ventrally bended upper tusks and in no detinal tubules in the lower tusks, therefore, represents a new species distinct from "*M.*" *grandincisivus*. It seems that this new taxon was extinct by the time corresponding to the end of the Vallesian.

The only genus *Zygolophodon* of Mamutidae has been discovered from the Linxia Basin. It lasted from the Middle Miocene to Late Miocene. Tobien et al. (1988) attributed all of the East Asian *Zygolophodon* to the same species *Zygolophodon gobiensis*. However, *Zygolophodon* from Middle Miocene and Late Miocene are distinct in morphologies. As in the type species of *Zygolophodon*

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