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RECOMMENDATION

The fossil record of deinotheres in the Jura Mountains and the specific diversity of European deinotheriids

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Martin Pickford and an anonymous reviewer

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A recommendation of

Gagliardi F, Maridet O, and Becker D (2021). The record of Deinotheriidae from the Miocene of the Swiss Jura Mountains (Jura Canton, Switzerland). *bioRxiv* 244061, ver. 4 peer-reviewed by PCI Paleo. DOI: 10.1101/2020.08.10.244061

Proboscideans belong to the Afrotheria, a superorder of mammals with an African origin, which was recently recognized based on molecular data (see review in Asher et al., 2009). The fossil record of Proboscidea is well documented and shows that an important part of their evolutionary history took place in Africa, with their representatives inhabiting the continent for at least 60 million years (Gheerbrant, 2009). However, proboscideans also proved to be great travellers, and a flourishing diversity of proboscidean forms colonized most of the continents of the planet, including Europe, from where they have since completely disappeared. Nowadays, *Loxodonta africana*, *L. cyclotis*, and *Elephas maximus* are flagship species of the African and Asian faunas, but they only represent a minor part of the modern mammalian diversity. In contrast, their ancient relatives seemed to be relatively abundant in past ecosystems (Sanders et al., 2010), which raised a number of interesting, but challenging, questions relative to the structure and evolution of ancient megaherbivore communities (Calandra et al., 2008).

Among proboscideans, deinotheres represent a special case. Their morphology clearly departs from that of other groups, notably in displaying distinctive downward curving lower tusks. Compared to their successful sister group the elephantiforms (i.e., all elephant-like proboscideans closely related to modern elephants; sensu Tassy, 1994), deinotheriids are often regarded as the poor sibling of the Proboscidea for showing a relatively low specific diversity and displaying a reduced morphological variability. In fact, many grey areas still exist regarding the evolution of this unique family.

In their article, Gagliardi et al. (2021) revised the material of deinotheres recovered in the Miocene sands of the Swiss Jura Mountains. They described for the first time the material attributed to *Prodeinotherium bavaricum* and *Deinotherium giganteum* from the Delémont valley, and reported the presence of a third species, *Deinotherium levius*, from the locality of Charmoille in Ajoie. Based on comparisons made

on specimens recovered from middle to the late Miocene localities, the authors discussed the potential link between the mode and tempo of deinothere dispersions and the evolution environmental and climatic conditions in Western and Eastern Europe during the Miocene. They also considered the evolution of ecological specializations in the group, especially with regard to size increase.

Gagliardi et al. (2021) proposed to follow the two genera/five species concept (i.e., *P. cuvieri*, *P. bavaricum*, *D. levius*, *D. giganteum*, and *D. proavum*), which implies the co-existence of several deinothere species in Europe. The latter hypothesis contrasts with the recognition of a single African *Deinotherium* species (i.e., *D. bozasi*) in deposits dated from the late Miocene to the early Pleistocene (Sanders et al., 2010). Such a co-existence of European species was and still is debated; it was here questioned by both reviewers. However, as acknowledged by the authors, only an extensive revision of the material of all recognized species, in Europe and worldwide, will enable to shed more light on the deinothere morphological variability and specific diversity. There is no doubt that such a revision would have a profound impact on our view of the evolution of this enigmatic group.

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Appendix

Reviews by Martin Pickford and an anonymous reviewer, DOI: 10.24072/pci.paleo.100008.