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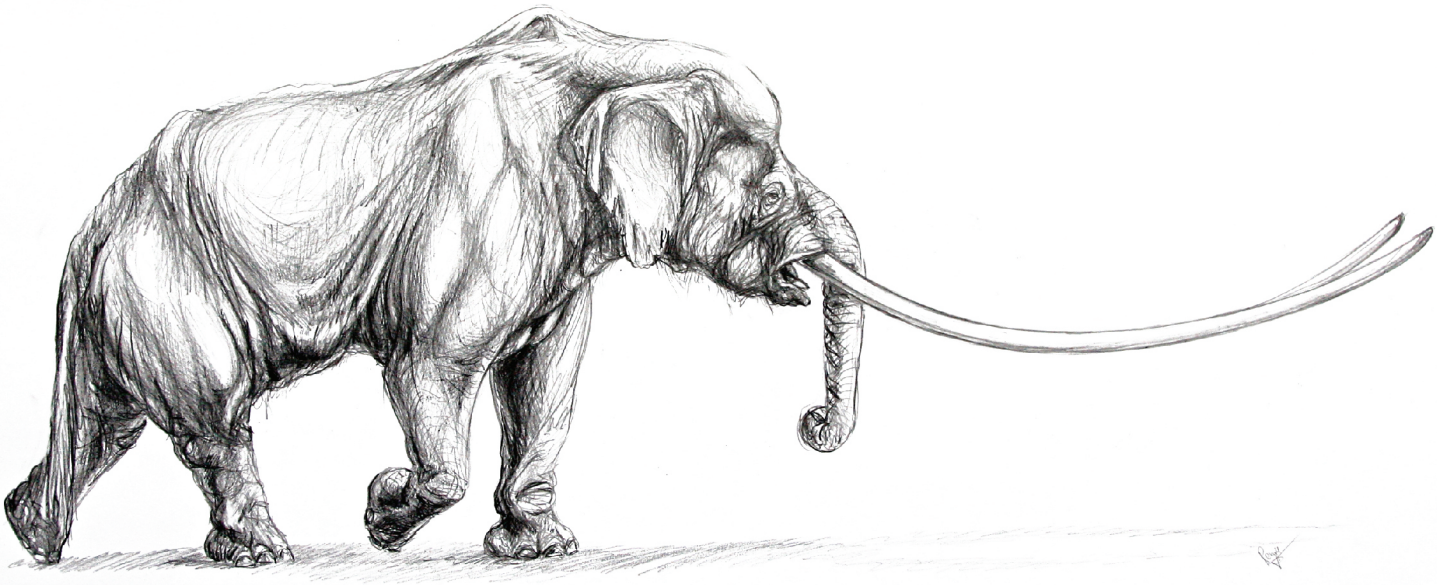

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ABSTRACT BOOK

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Taxonomy, biostratigraphy and palaeoecology of the genus *Choerolophodon* (Proboscidea, Mammalia) during the Miocene of the peri-Mediterranean region

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Choerolophodons, represented by the single genus *Choerolophodon*, are bunodont, trilophodont elephantoids with unique craniodental features, such as the strong development of the facial region, the long and gutter-like mandibular symphysis without tusks, the upward-curved upper tusks that lack enamel and the choerolophodont cheek teeth, characterized by choerodonty, ptychodonty and chevroning (Fig. 1A-C). Choerolophodons existed from the early until the late Miocene and were widely distributed in Northern/Eastern Africa, Southwestern/Central Asia and Southeastern Europe, coexisting with deinotheres, mammutids and gomphotheres. During the late Miocene they flourished in the peri-Mediterranean region, where they were the dominant proboscidean group, known with abundant remains from various fossiliferous localities.

The last decades several excavation campaigns in Greece brought into light several new and important proboscidean specimens, studied recently by Konidaris (2013). Here, the choerolophodons from the peri-Mediterranean region are presented, based on the Greek fossil record, including the middle Miocene locality Thymiana (Chios Island, Aegean Sea) and the late Miocene localities of Axios Valley (Macedonia), Pikermi (Attica), Samos Island (Aegean Sea) and Nikiti (Chalkidiki) (Fig. 1D).

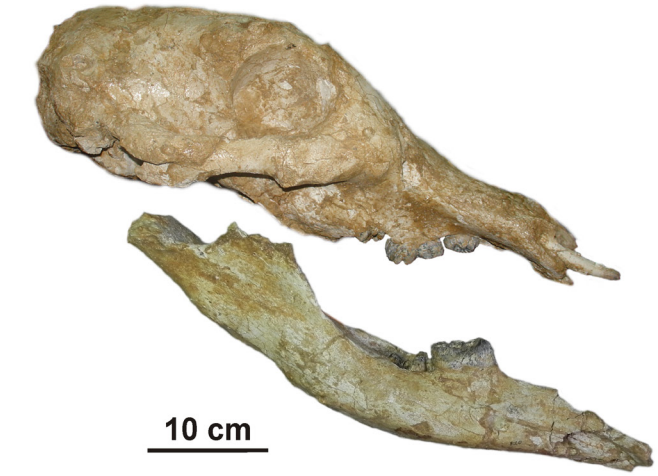
The study revealed that three choerolophodont species existed in Southeastern Europe-Southwestern Asia: the middle Miocene *Choerolophodon chioticus* and the late Miocene *Choerolophodon anatolicus* and *Choerolophodon pentelici*. *Choerolophodon chioticus* marks the first penetration of choerolophodons in Europe. The species is known from the locality Thymiana, dated to ~15.5 Ma (late Orleanian, MN 5). Cranial, mandibular and dental features indicate the primitive character of this species in regard to the late Miocene choerolophodons. In Thymiana *C. chioticus* coexisted with *Prodeinotherium bavaricum* and possibly with *Gomphotherium angustidens*.

Choerolophodon is known from several late Miocene localities of the Mediterranean region. In particular, the localities of Axios Valley, which cover the entire late Miocene and are tied to the absolute time, render their choerolopodont assemblage valuable for understanding the *Choerolophodon* evolution in the peri-Mediterranean region. Cranial, mandibular and dental features permit the recognition of two species and three evolutionary stages of *Choerolophodon* during the late Miocene of the peri-Mediterranean region (Konidaris and Koufos, 2013). The more primitive species *C. anatolicus* is traced in the early Vallesian (MN 9) and corresponds to the first evolutionary stage (Fig. 1E). Previously known only from Turkey (Yassiören, Sinap 12, Eşme Akçaköy, Akin, Kayadibi), this species is identified in Pentalophos (Axios Valley), recognized for the first time in Greece. The more evolved *C. pentelici* can be divided into two groups (Fig. 1E). The primitive group, dated from the late Vallesian (MN 10) until possibly early Turolian (MN 11), includes the material from Xirochori, Ravin de la Pluie, Ravin des Zouaves-1 (Axios Valley, Greece) and Kemiklitepe-D (Turkey). The more advanced group, dated to Turolian (MN 11- MN 13), is known from the Greek localities Ravin des Zouaves-5, Prochoma-1, Vathylakkos-2, Dytiko-2, 3 (Axios Valley), Pikermi (type locality), Samos and Nikiti-2, as well as from Turkey (e.g. Kemiklitepe-A, B, Akkaşdağı), Bulgaria (e.g. Hadjidimovo) and Iran (Maragheh).

The relationships among the several *Choerolophodon* species from the Miocene of the Old World are studied with cladistic analysis. Among the results is that *C. chioticus* occupies an intermediate position between the primitive early-middle Miocene *Choerolophodon kisumuensis* from Africa and the advanced late Miocene choerolophodont species, and that *C. anatolicus* consists sister group of (*Choerolophodon corrugatus, C. pentelici*).

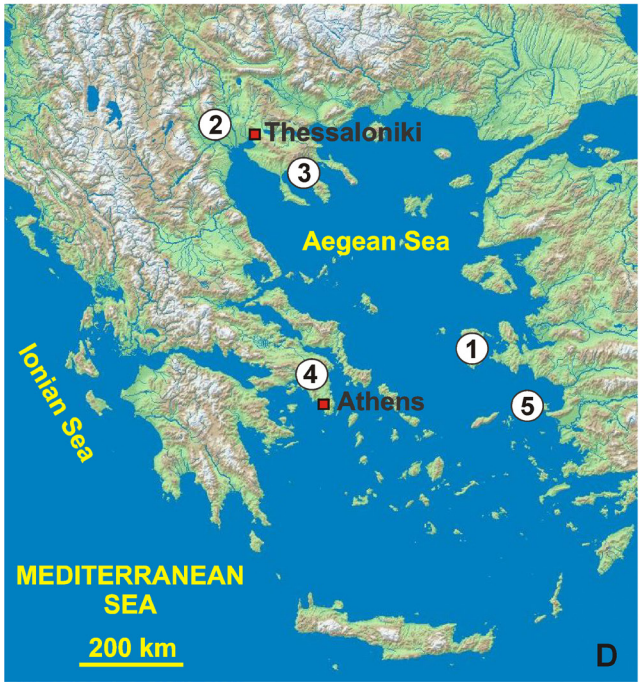
Although the middle Miocene *C. chioticus* appears to have inhabited more closed ecosystems, late Miocene choerolophodons were adapted to open environments, as the dental microwear analysis suggests. The microwear study of choerolophodont teeth from the late Miocene of Northern Greece indicates that its dominant diet were graminoids. This type of vegetation is abundant in open environments, which were quite widespread in the region, especially along the Axios Valley. These results are concordant with the existing palaeoecological reconstructions of Greece for this period (Merceron et al., 2005; Koufos et al., 2009 and ref. cited). The abundance of *Choerolophodon* in the late Miocene localities of Greece is probably due to the fact that it was well adapted to these environmental conditions.

The absence of *Zygolophodon* and *Tetralophodon* from the Vallesian deposits of Axios Valley and the wider region is attributed to the different palaeoecological conditions between Central and Southeastern Europe. Respectively, *Choerolophodon*, although widespread in Southeastern Europe, did not succeed to migrate to Central Europe; rather it was constrained in the Greco-Iranian Province. During the Turolian *Choerolophodon* remained again restricted in the southeastern part of Europe. However, all other contemporary proboscideans of this region, *Deinotherium*, "*Mammut*" and the tetralophodont shovel-tusker *Konobelodon*, entered Central Europe (Konidaris et al., in press). Probably *Choerolophodon* was well adapted in the southeastern part of Europe, so that even minor ecological differences prohibited its north-western expansion. The coexistence of the various proboscidean species is attributed to the different ecological niches that they occupied. Although *Choerolophodon*



A

B



E

Time	Faunal units	Faunal zones (MN)	Bio-stratigraphic range	Localities: Greece	Localities: Bulgaria, Iran, Turkey
6	TUROLIAN	13	*C. pentelici* (advanced)	DIT DKO	
7		12		PIK,VTK PXM,MTLB	MAR,HD AK,KTA-B
8		11		RZO NIK	KTD
9	VALLE-SIAN	10	*C. pentelici* (primitive)	XIR,RPI, RZ1	
10		9	*C. anatolicus*	PNT	AS12, YAS,EA
11					
12	ASTARACIAN	7+8			
13					
14		6			
15	ORLEANIAN	5	*C. chioticus*	THY	
16					
17		4			
18					
19		3			
20					

Fig. 1. **A**, juvenile skull and mandible, lateral view, *Choerolophodon pentelici*, RZO; **B**, right second molar, occlusal view, *Choerolophodon anatolicus*, PNT; **C**, right upper tusk in situ, *Choerolophodon pentelici*, NIK; **D**, map of Greece indicating the most important occurrences of *Choerolophodon*. The map was taken from www.shaded-relief.com. 1, Thymiana; 2, Axios Valley; 3, Nikiti; 4, Pikermi; 5, Samos Island; **E**, biostratigraphic distribution of *Choerolophodon* in the peri-Mediterranean region.

Abbreviations: AK, Akkaşdağı ; AS12, Ankara Sinap 12; DIT, Dytiko-2; DKO, Dytiko-3; EA, Eşme Akçaköy; HD, Hadjidimovo; KTA-B-D, Kemiklitepe-A-B-D; MAR, Maragheh; MTLB, Mytilinii-1B, Samos; NIK, Nikiti-2; PIK, Pikermi; PNT, Pentalophos; PXM, Prochoma-1; RPI, Ravin de la Pluie; RZ1, Ravin des Zouaves-1; RZO, Ravin des Zouaves-5; THY, Thymiana; VTK, Vathylakkos-2; XIR, Xirochori; YAS, Yassiören.

persisted in Greece during the late Turolian (MN 13), when a gradual transition towards more humid conditions took place, it could not survive during the Pliocene, when more forested environments were established.

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