First report of cf. *Protanancus* (Mammalia, Proboscidea, Amebelodontidae) from Europe

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ABSTRACT
Three molars from northeast Bulgaria are attributed to cf. *Protanancus* sp., based on their distinctive morphology. These are the first finds from Europe referable to the amebelodontid genus *Protanancus*, hitherto known from Africa and Asia. The material from NE Bulgaria differs from both named species of the genus, *P. macinnesi* and *P. chinjiensis*, displaying a combination of derived and primitive characters.

KEYWORDS
Mammalia,
Proboscidea,
Amebelodontidae,
Protanancus,
Miocene,
Europe,
Bulgaria.

RÉSUMÉ
Mise en évidence de cf. Protanancus *(Mammalia, Proboscidea, Amebelodontidae) en Europe.*
La morphologie distinctive de trois molaires du nord-est de la Bulgarie permet de les rapporter à cf. *Protanancus* sp. Ce sont les premiers spécimens européens qu'on puisse rattacher à l'amébélodontidé *Protanancus*, connu en Afrique et en Asie. Le matériel de Bulgarie du NE, par le mélange de caractères primitifs et dérivés, diffère des deux espèces nommées de ce genre, *P. macinnesi* et *P. chinjiensis*.

MOTS CLÉS
Mammalia,
Proboscidea,
Amebelodontidae,
Protanancus,
Miocène,
Europe,
Bulgarie.

Fig. 1. — Geographic position of Vetren (Bulgaria), and localities with cf. *Protanancus* Arambourg, 1945 in Turkey and Moldova mentioned in the text.

INTRODUCTION

Fossil proboscideans of pre-Turolian age are quite rare in Bulgaria, and are mostly known from the northeast of the country (see Markov 2008, for a discussion and revision of the materials from the vicinities of Varna stored in the collections of the Palaeontology Museum of the Sofia University). Additional specimens, from the Varna region as well as from other localities in NE Bulgaria, are stored in the palaeontological collection of the Varna Regional Museum of History – Department of Natural History. Below, we describe three previously unpublished molars (all from the same individual) found near Vetren, a village situated close to Silistra on the Danube (Fig. 1). As with many other proboscidean finds from Bulgaria, the molars are an accidental find and were not obtained during systematic excavations, so there is no information about the stratigraphy of the locality.

Institutional abbreviations

NHM Natural History Museum, London;
VRMH Varna Regional Museum of History, Department of Natural History.

MATERIAL AND METHODS

Material

Left M2 (VRMH 158), left M3 (VRMH 159) and right M3 (VRMH 160) from Vetren near Silistra, NE Bulgaria.

Methods

Dental nomenclature follows Tassy (1996). Measurements are in mm.

SYSTEMATICS

Order PROBOSCIDEA Illiger, 1811
Suborder ELEPHANTIFORMES Tassy, 1988
Superfamily Elephantoidea Gray, 1821
Family Amebelodontidae Barbour, 1927
Genus indet. cf. *Protanancus* Arambourg, 1945

cf. ***Protanancus*** sp.

Description

All three molars were found together and apparently belong to the same individual.

VRMH 158, the left M2 (Fig. 2), is preserved together with a portion of the maxilla. The crown is intact, and roots are preserved on the buccal side (the anterior only partially), lingually, the roots are damaged near the cervical line. The tooth is trilophodont, with a small posterior talon comprising four cusps. The crown is curved, with a concave lingual and a convex buccal side. Dentine is exposed on all three lophs. Anterior pretrite conules are strongly developed on the second and third lophs, pretrite mesoconelets are separated from the anterior conules. Posterior pretrite conules are reduced (on the second loph, the posterior pretrite conule is clearly separated from the mesoconelet). On the posttrite side, the posterior conule is well pronounced on the first loph, and weak but visible on the second. An anterior posttrite conule is present on the third loph. Both interlophs are very narrow, with cement. Clear pseudo-anancoid contacts are observable, involving the anterior pretrite and posterior posttrite conules (contact in the second interloph involving the posterior pretrite conule

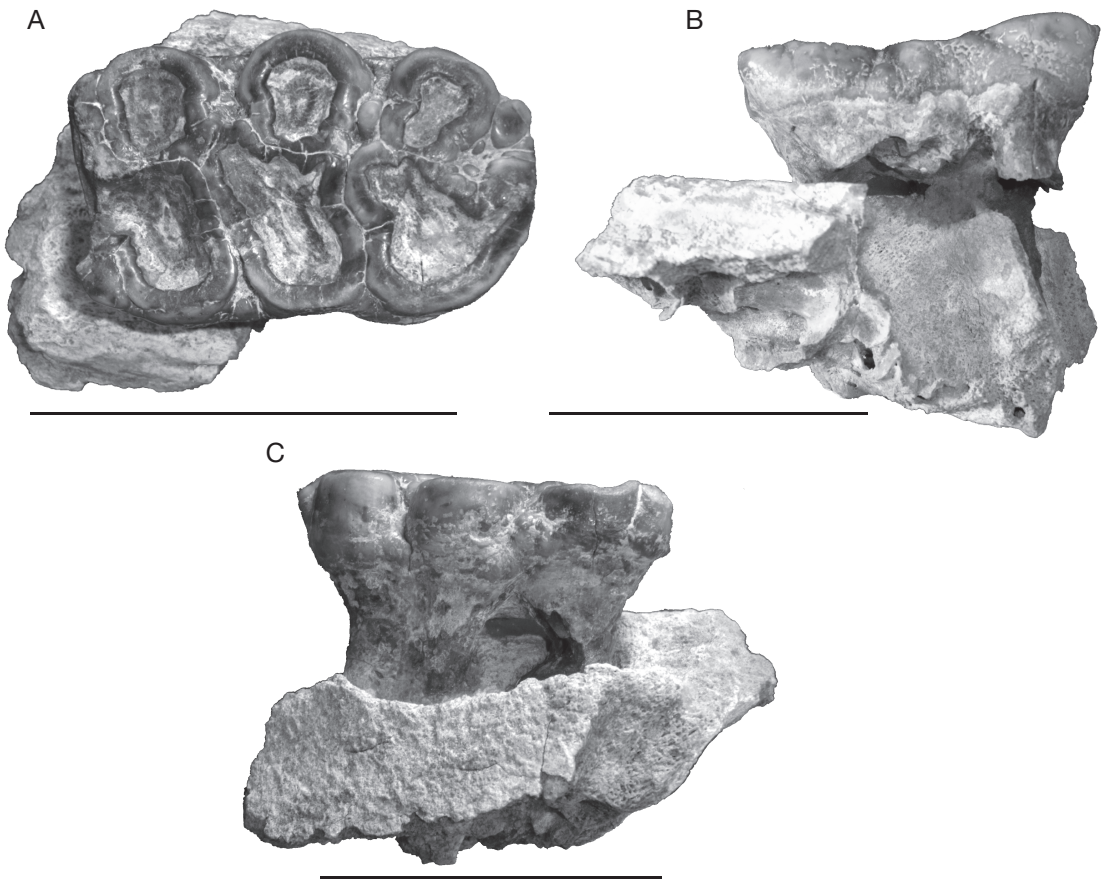

FIG. 2. — Cf. *Protanancus* sp. maxillary fragment with left M2, Vetren, Bulgaria (VRMH 158): **A**, occlusal view; **B**, lingual view; **C**, buccal view. Scale bars: 10 cm.

of the second loph as well). The enamel is slightly folded. L: 110; W: 68/68/66.5; ET: 5.5.

VRMH 159, the left M3 (Fig. 3), has four lophs and a small posterior talon built of four cusps. The fourth loph is weakly developed. The molar is at an early stage of wear, with traces of occlusion only on the anterior cingulum and the first loph, with no dentine exposed. The interlophs are very narrow, filled with cement. Alternation of the semilophs is weak but visible on the third and fourth lophs. The pretrite trefoil is well developed on the second loph, with the mesoconelet clearly separated from the main cone, and doubled anterior and posterior pretrite conules. Doubled anterior pretrite conule of the second loph is much stronger than the posterior one and contacts the small posterior posttrite conule of the first. Anterior and posterior pretrite conules are weak on the first pretrite semiloph, smaller than the clearly separated mesoconelet. On the third pretrite semiloph, there is a single cusp positioned mesio-adaxially to the main cone, contacting the posterior pretrite conule of the second loph. The fourth pretrite is built of three cusps aligned in a mesio-adaxial direction and contacts the third posttrite semiloph. There are weak posterior posttrite conules on the first and second lophs, and additional cusps in the first and second interlophs, on the posttrite side. Posttrite mesoconelets are doubled. The fourth posttrite is low, of nearly the same height as the posterior talon but is clearly separated from it. L: 143; W: 79/77.5/72.5/51; H: 58.

FIG. 3. — Cf. *Protanancus* sp., left M3, Vetren, Bulgaria (VRMH 159), occlusal view. Scale bar: 10 cm.

VRMH 160, the right M3 (Fig. 4), has four lophs and a posterior talon which is slightly larger than in the left M3 and is built of two cusps. As in VRMH 159, the fourth loph is weak but clearly separated from the third by an ento- and ectoflexus. The anterior talon is high and massive. Alternation of the semilophs is visible on second to fourth lophs and is more pronounced in comparison with the left M3, as are the pseudo-anancoid contacts. A full pretrite trefoil pattern is observable on the second loph, with a reduced but present posterior conule and a strong anterior one, contacting the posterior posttrite conule of the first loph. Posterior posttrite conules of the first and second lophs are somewhat better developed in comparison with the left M3, as are the additional cusps in the second interloph, on the posttrite side. L: 147; W: 77.5/77/74/52.

DISCUSSION

Attribution of VRMH 158-160 to *Protanancus* is supported by the combination of alternating semilophs, pseudo-anancoid contacts, cementodonty and posttrite ornamentation (see Tassy 1983, 1984, 1986). Primitive morphology of the M3's precludes relations to other (derived) amebelodontid taxa in which pseudo-anancoidy occurs, such as *Platybelodon grangeri* (Osborn, 1929). Superficial similarity between teeth of *Protanancus* and *Choerolophodon* Schlesinger, 1917 is well known (see e.g., Tassy 1983, 1986) but presence of pretrite trefoils on the Vetren molars, combined with the wear pattern displayed by the M2, VRMH 158 (confluent wear facets of the anterior conule/mesoconelet and of the main pretrite cusp of the third loph), rules out affinities with choerolophodons. Compared to the two named species of the genus *Protanancus*, *P. macinnesi* Arambourg, 1945 and *P. chinjiensis* (Pilgrim, 1913), the Vetren amebelodontid displays a mixture of primitive and derived characters.

Pseudo-anancoidy observed in VRMH 158, the M2, is stronger than in the upper second molars of both *P. macinnesi* and *P. chinjiensis*; morphology of the third molars, in contrast, and especially the feeble development of the fourth loph, is primitive in comparison with these species. The M2 is shorter than M2 of *P. chinjiensis* (see Tassy 1983) and wider than M2 of *P. macinnesi* (see Tassy 1986). Length of the third molars is below (but very close to) the observed range in *P. chinjiensis* and near the lower range in *P. macinnesi*. They are absolutely, as well as proportionally, wider than *P. macinnesi* but narrower than *P. chinjiensis*, and their width index (W/L × 100) is within the range observed in *P. chinjiensis* (see Fig. 5).

In the feeble development of the fourth loph, Vetren M3's resemble material from Arrisdrift, Namibia, referred by Pickford (2003) to his new genus and species *Afromastodon coppensi* Pickford, 2003. The status of the latter taxon is not entirely clear: Arrisdrift material was referred to *P. macinnesi* by Tassy (1986), and validity of *Afromastodon* heavily depends on presumed association of *Protanancus*-like molars with lower tusks of oval cross-section (Pickford 2003). If this is indeed the case, *Afromastodon* could be an elephantoid paralleling *Protanancus* in dental characters – a possibility obviously influencing the allocation of isolated teeth such as those from Vetren. Alternatively, if the hypodigm of *Afromastodon coppensi* is hetero-

geneous, the type might well belong in *Protanancus* – probably representing a species different from (and somewhat more primitive than) *P. macinnesi*. Metrically, Arrisdrift material plots close to *P. chinjiensis* rather than *P. macinnesi* (Fig. 5), so it seems to be distinct from the latter at least at the species level (or, variation in *P. macinnesi* would be much greater than presumed). None of the M2's referred to *Afromastodon coppensi* by Pickford (2003) shows the strong pseudo-anancoidy observed in VRMH 158, however, and Vetren material appears more derived in that aspect.

Morphologically (and geographically) Vetren M3's are close to an M3 from the Turkish locality Yürükali near the Sea of Marmara coast, published by Gaziry (1976: pl. 4, fig. 5) as "*Amebelodon* (*Amebelodon*) cf. *fricki*". A tusk from the same locality attributed by Gaziry (1976) to the same taxon, most probably belongs in *Protanancus*, according to Tassy (1983, 1984). Although the molar and the tusk are not directly associated, they could well belong to the same taxon, as suggested by Gaziry (1976). In the Yürükali molar, the fourth loph is underdeveloped as in the specimens from Vetren; pseudo-anancoidy, as far as can be judged from the photo, is weak to non-existent (but it can be very weak in some molars referred to *Protanancus macinnesi*). While morphologically the Yürükali molar is more primitive even than the material from Sind, Pakistan, referred by Tassy (1983) to cf. *Protanancus* (see also Tassy 1985: fig. 247A), the width index for the molars from Sind and Yürükali is extremely close (see Fig. 5). As with Vetren, Yürükali has yielded no additional fauna, and its age can only be broadly estimated as middle Miocene. Tassy (1984) was certainly correct in his more cautious estimation of Yürükali age as middle or late Miocene, but primitive morphology of the Yürükali molar, and middle Miocene age of Araplı on the opposite coast of the Marmara Sea (from which *Platybelodon* cf. *danovi* Borissiak, 1928 is known: Gaziry 1976; Tassy 1984), make a similar age for Yürükali plausible.

Apart from Yürükali, cf. *Protanancus* sp. has been reported from two more middle Miocene Turkish localities – Çandır in Central Anatolia (Geraads & Güleç 2003) and Mordoğan in Western Turkey (Kaya *et al.* 2003). Material is scarce at both localities,

FIG. 4. — Cf. *Protanancus* sp., right M3, Vetren, Bulgaria (VRMH 160), occlusal view. Scale bar: 10 cm.

and no direct comparison is possible with Vetren (or Yürükali) but conspecifity of VRMH 158-160 and finds from the three Turkish localities is likely. The age of Çandır has been discussed at length by Begun *et al.* (2003) who favour an age of about 16 to 16.5 Myr, mid MN5, in contrast to van der Made (2003) who placed the locality late in MN6. The age of Mordoğan, according to Kaya *et al.* (2003), is very close to that of Çandır. As said, absence of other fauna does not permit precise estimation of the age of Yürükali and Vetren but middle Miocene seems a plausible correlation. Apparently, a species more primitive than both *P. macinnesi* and *P. chinjiensis* appeared in the middle Miocene of Asia Minor and the eastern Balkans, probably within the middle Miocene proboscidean migration that included *Choerolophodon chioticus* Tobien, 1980, *Platybelodon* cf. *danovi*, *Tetralophodon* Falconer, 1857, *Deinotherium* Kaup, 1829, as well as perhaps *Prodeinotherium bavaricum* (von Meyer, 1831) (s.s., excluding *P. cuvieri* (Kaup, 1832)), and *Gomphotherium angustidens* (Cuvier, 1817) (see Tassy 1990; Markov 2008). Two more finds might indicate the presence of *Protanancus* in Eastern Europe: a lower

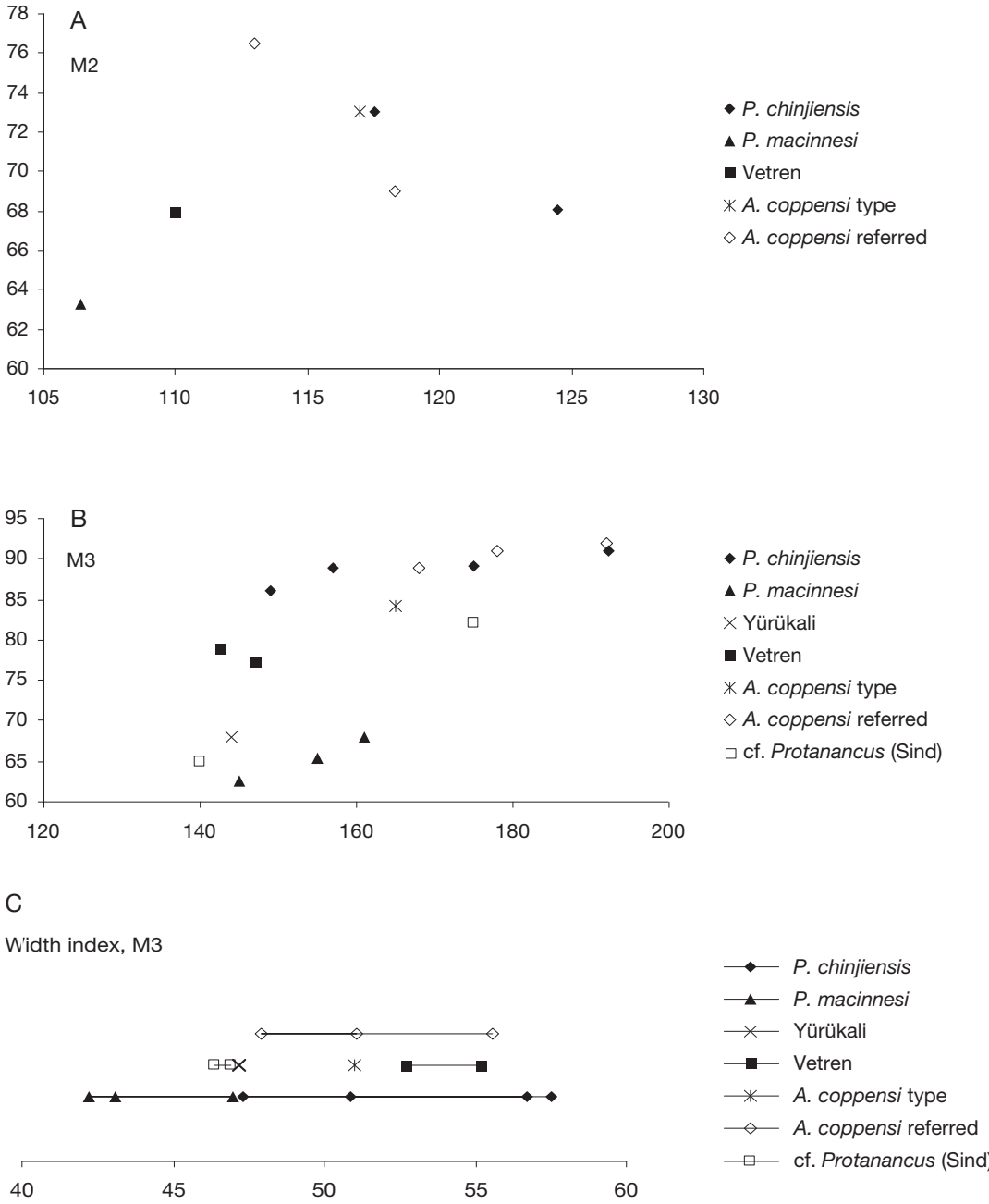

FIG. 5. — Bivariate plots of upper second (**A**) and third (**B**) molar measurements in Vetren (NE Bulgaria) and potentially related elephantoids. Variation range for the M3 width index (W/L × 100) is graphically presented in **C**. Data on *P. chinjiensis* (Pilgrim, 1913) and cf. *Protanancus* (Sind) from Tassy (1983); *Protanancus macinnesi* Arambourg, 1945 from Tassy (1986) and own measurements (NHM 2006); Yürükali from Gaziry (1976); *A. coppensi* from Pickford (2003).

tusk fragment from the river Prut near Ungheni, Moldova, attributed by Obadă (2005: pl. 1, figs 5, 6) to *Amebelodon* sp., and an amebelodontid molar from Galata, Varna, NE Bulgaria, recently discussed by Markov (2008) who referred it to ?*Platybelodon* cf. *danovi* with *Protanancus* as an alternative identification that could not be entirely ruled out.

While nothing in the morphology and metrics of VRMH 158-160 precludes their attribution to *Protanancus*, the elephantoid from Vetren obviously differs from the two named species, *P. macinnesi* and *P. chinjiensis* (as well as from *Afromastodon coppensi*, potentially another species within the genus). Considering the scarcity of material, the absence of information on the shape and structure of the lower tusks, and the unknown stratigraphy and age of Vetren, however, we refrain from formally naming a new species and attribute the molars from Vetren to cf. *Protanancus* sp. – a designation also used for the Turkish material which might be conspecific with the Bulgarian finds. Technically, this is the first report of the genus in Europe (not to mention so-called "*Protanancus estremadurensis*", on which see e.g., Tassy 1985) but with *Protanancus* present at Yürükali in Western Turkey its occurrence in Northeast Bulgaria is not too surprising. Still, finds from Vetren contribute to Miocene elephantoid diversity, and broaden the known distribution area for *Protanancus*, a genus ranging from Africa to Southeast Asia (the middle Miocene proboscidean assemblage at Tha Chang sandpits, Northeast Thailand, includes *Protanancus*: Saegusa *et al.* 2005), and, probably, China, with material attributed to *Amebelodon* sp. and *Serbelodon zhongningensis* Guan, 1988 (Markov 2008).

SUMMARY AND CONCLUSIONS

Morphology of the elephantoid molars from Vetren near Silistra in northeast Bulgaria agrees with the amebelodontid genus *Protanancus*, previously known only from Africa and Asia. The material from Vetren differs from the type species of the genus, *P. macinnesi*, as well as from *P. chinjiensis*, displaying a mixture of derived and primitive characters, and apparently represents a new species. It seems plausible that the finds from Vetren and three middle Miocene localities in Turkey, Yürükali, Mordoğan and Çandır are conspecific. Direct comparison, however, is possible only with a molar from Yürükali near the Sea of Marmara coast, and material from all four localities in Bulgaria and Turkey is too scarce for adequate conclusions. Since shape and structure of the lower tusks are not known for the Vetren elephantoid, and stratigraphy and age of the locality are unclear, we refrain from formally naming a new species and tentatively refer VRMH 158-160 to cf. *Protanancus* sp., a designation also used for the Turkish material. An isolated amebelodontid m3 from Galata, Varna, northeast Bulgaria, might also belong to *Protanancus*, but its precise identification is not possible.

The elephantoid from Vetren suggests a middle Miocene age for the locality. Pre-Turolian vertebrates are very rare in Bulgaria, and, together with the area around Varna, Vetren near Silistra is of strong potential interest for future research.

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