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The fossil proboscideans of Bulgaria and the importance of some Bulgarian finds – a brief review

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Abstract. The paper summarizes briefly the current data on Bulgarian fossil proboscideans, revised by the author. Finds of special interest and importance for different problems of proboscideanology are discussed, with some paleozoogeographical notes.

Key words: Proboscidea, Neogene, Bulgaria, Systematics

Introduction

The following text is a brief summary of the results obtained during a PhD research (2000-2003; thesis in preparation) on the fossil proboscideans of Bulgaria. Various Bulgarian collections stock several hundred specimens of fossil proboscideans from more than a hundred localities in the country. BAKALOV & NIKOLOV (1962; 1964) summarized most of the finds collected from the beginning of the 20th century to the 1960s, the first of the cited papers dealing with deinotheres, mammutids and gomphotheres *sensu lato*, the second – with elephantids. Sporadic publications from the 1970s have added more material.

During the 1980s and the 1990s there were practically no studies by Bulgarian authors describing new material or revising the proboscidean fossils already published. Bulgarian material has been discussed by TASSY (1983; 1999), TOBIEN (1976; 1978; 1986; 1988), METZ-MULLER (1995; 1996a,b; 2000), and more recently by MARKOV et al. (2002), HUTTUNEN (2002a,b), HUTTUNEN & GÖHLICH (2002), LISTER & van ESSEN (2003), and MARKOV & SPASSOV (2003a,b).

During the last two decades, a large amount of unpublished material was gathered, and many of the previously published finds needed a serious revision. A study of Bulgarian fossil proboscideans by the author has yielded the following results:

Four families (three of them elephantoids *sensu* TASSY, 1988) are represented in the fossil record of the country: Deinotheriidae, Mammutidae, Gomphotheriidae *sensu lato* and Elephantidae. (Here Gomphotheriidae is used for convenience as = "bunodont mastodons", i.e. including choerolophodons, amebelodons and "tetralophodont gomphotheres" *sensu* Tassy, although this approach of mine certainly makes the family paraphyletic).

Family Deinotheriidae Bonaparte, 1845

Both *Prodeinotherium* Ehik, 1930 and *Deinotherium* Kaup, 1829 are present in Bulgarian fossil fauna. In older Bulgarian literature, "*Deinotherium giganteum* race minor" has been used for prodeinotheres, and "*Deinotherium giganteum* race maior" for deinotheres proper. Since the very first paper on Bulgarian deinotheres by BAKALOW (1914, Taf. I-VI), however, finds from Nessebar have been erroneously referred to "race minor", i.e. *Prodeinotherium bavaricum* (von Meyer, 1833). Instead, these are juvenile remains of the largest and latest European deinothere, *Deinotherium gigantissimum* Stefanescu, 1892 (MARKOV, in prep.).

Originally described from Romania, this latter species has long been considered a synonym of *Deinotherium giganteum* Kaup, 1829 (e.g. HARRIS, 1978; SHOSHANI et al., 1996), although some European authors believed it to be a separate species or have at least accepted such a possibility (GRÄF, 1957; TOBIEN, 1988; TARABUKIN, 1974). A skeleton from Ezerovo, South Bulgaria, still unpublished (photo in TOBIEN, 1986; some dental measurements in TOBIEN, 1988) shows cranial differences from the Eppelsheim skull and provides good evidence for the separate status of *D. gigantissimum* (MARKOV et al., 2002)[1].

The juvenile remains from Nessebar, mentioned above, the Ezerovo skeleton, as well as other separate dental finds largely increase our knowledge of *D. gigantissimum* – up till now no data was available on some loci, including the deciduous teeth. The skull of this species was unknown too.

Family Mammutidae Hay, 1922

According to earlier authors, two mammutid species are known from Bulgaria: "*Zygolophodon tapiroides*" (i.e. *Z. turicensis*) and *Z. borsoni*. Two of the three finds referred to "*Z. tapiroides*" by BAKALOV & NIKOLOV (1962, Pl. LX, LXI) have been revised by me as belonging to "*Mammut*" *borsoni* (Hays, 1834). *Zygolophodon turicensis* (Schinz, 1824) is represented in the Bulgarian fossil fauna by a single find, if at all – a hemimandible from Butan, North Bulgaria.

Known for decades under the binomen *Zygolophodon borsoni*, Borson's mastodon is usually referred to as *Mammut borsoni* in more recent literature. This seems to be strongly influenced by the works of TOBIEN (1976, etc.) who, nevertheless, assumed an independent origin for *M. borsoni* from Eurasian zygolophodons and for *M. americanum* (type species of the genus) from American Miocene mammutids, objecting to the hypothesis of SCHLESINGER (1922) who suggested a European ancestor for *M. americanum*. Such an approach makes the genus *Mammut* obviously polyphyletic. If *M. borsoni* and *M. americanum* are regarded indeed as belonging to the same genus, this implies a second mammutid migration to North America – a fair enough option. If, however, *M. americanum* is believed to be the ultimate representative of an autochthonous American lineage starting with so-called *Miomastodon* (i.e. *Zygolophodon proavus*), as for example by SAUNDERS & TASSY (1989) and SAUNDERS (1996), then using the generic name *Mammut* for Borson's mastodon is not justified.

[1] Eichwald's names *D. proavum*, *D. podolicum* and *D. uralense* seem to refer to the same East European Turolian species. Although they all precede *D. gigantissimum* and thus should have priority, there are some problems around them concerning types and synonymy with each other. *D. gigantissimum* on the other hand is a well established name, and I agree with Martin Pickford (in lit.) that it would be better to keep it in use: a case for the ICZN.

I personally tend to support the idea that Borson's mastodon evolved in the Old World in parallel with *M. americanum*, and agree with authors who separate it from *Zygolophodon*. Unfortunately, too little is known about this animal apart from its dentition, which makes the description of yet another genus with *Mastodon borsoni* as its type species undesirable in the present state of our knowledge. For this reason, and following the recent trend to some extent, I do not use the binomen *Zygolophodon borsoni*, but "*Mammut*" *borsoni* (with the generic name in quotation marks) as a provisional solution to its taxonomy.

As pointed out by ALEXEEVA (1965), probably under the name "*Mammut*" *borsoni* more than one species is mixed – brevirostrine "*M*". *borsoni* proper from the Pliocene and a closely related longirostrine form from the Late Miocene. There is Bulgarian material from localities of both Late Miocene and Pliocene age, and – as expected – no obvious dental features help to separate the two forms. I provisionally refer all the material to "*M*". *borsoni*, with one exception: a mandible from Ahmatovo, South Bulgaria, published by NIKOLOV & KOVACEV (1966) as *Zygolophodon borsoni*. The mandible has a long rostrum, slightly curving downwards, with alveoli for lower tusks obviously larger than those in the Pliocene form. The age of Ahmatovo is believed to be Turolian (SPASSOV, 2002). A proper name for this find would be "*Mammut*" cf. *borsoni*, as used by TASSY (1985) for finds from Pikermi (Greece), a locality of similar age and in the same geographic region. It is very possible that a senior synonym for the longirostrine form called here "*Mammut*" cf. *borsoni* is "*M*". *praetypicum* – further research is needed to clarify this, and the Ahmatovo mandible is of importance for the understanding of European Late Miocene mammutids.

Family Gomphotheriidae Hay, 1922

As said above, I use the name Gomphotheriidae in its broadest sense for convenience, including here all so-called "bunodont mastodons".

Choerolophodon pentelici (Gaudry & Lartet, 1856)

The species is really well represented in the fossil fauna of Bulgaria, including a skull and several mandibles of adult individuals, which are rare in the fossil record. All finds referred to "*Trilophodon*" *angustidens* by BAKALOV & NIKOLOV (1962) are in fact choerolophodons, as has been pointed out by TASSY (1983). According to our present views, a single species is present in the Late Miocene of Southeastern Europe (TASSY, 1994). This seems indeed to be the best taxonomic solution for the time being. Most of the Bulgarian material comes from localities of assumed MN12 age. A dp3 from Kocherinovo, Southwest Bulgaria, however, shows strong affinities to a deciduous tooth from the lower level (KTD) of Kemiklitepe, Turkey, described by TASSY (1994), thus suggesting an earlier, MN11 age.

Platybelodon cf. *Platybelodon danovi* Borissiak, 1928

This taxon is rare in Bulgaria. A catalogue by NIKOLOV (1985) lists *Platybelodon* sp. from Varna, on the Black Sea coast, but without any details. According to Spassov (pers. comm.), a mandible of platybelodont affinities was indeed pictured in a newspaper in the 1970s and was apparently brought to Nikolov for determination. No description of such a specimen has ever been published though, and the present location of the mandible is unknown. However, there is another find from Varna, originally described by BAKALOW (1911, Pl. VIII, Fig. 2)[1]

as a second molar of *Tetralophodon longirostris* and revised by me as a third lower molar of *Platybelodon* cf. *danovi*.

"*Mastodon*" *grandincisivus* Schlesinger, 1917

I follow TASSY (1985) in regarding this obscure species as an amebelodont, standing quite apart from both *Tetralophodon* and *Stegotetrabelodon*, two genera to which it has been referred by OSBORN (1936) and TOBIEN (1976), respectively.

"*Mastodon*" *grandincisivus* is extremely poorly known (see TASSY, 1999 for specimens belonging to this species). Bulgarian material is probably the most abundant. BAKALOV & NIKOLOV (1962) have described from Orjachovo, North Bulgaria, a mandible with both m3s and lower tusks, two upper tusks and an upper M3. According to TOBIEN (1976), this is the best preserved "*M*". *grandincivus* mandible (note, however, that parts of it are reconstructed).

An unpublished juvenile mandible from Hadjidimovo, Southwest Bulgaria, has been determined by me as probably belonging to "*M*". *grandincisivus*. If so, this is the sole juvenile mandible of this species known so far. It visibly differs from another juvenile mandible of tetralophodont grade from the same locality, referred by me to *Tetralophodon atticus* (see below). The age of Hadjidimovo is believed to be around the MN11/MN12 boundary (SPASSOV, 2002), an age quite in accordance with our knowledge on the distribution of "*M*". *grandincisivus*.

An unpublished "*M*". *grandincisivus* adult skull from South Bulgaria (preliminary determination by D. Kovachev and N. Spassov, kindly confirmed by P. Tassy) is a unique find.

Gomphotherium angustidens (Cuvier, 1817)

As already said, the finds referred to this species in the older Bulgarian literature are actually choerolophodons. Nevertheless, *G. angustidens* is indeed present in the fossil fauna of the country with a single find – an m2 dext labeled Seltzi (South Bulgaria). Seltzi and nearby localities have yielded only Turolian fauna up till now, but to claim that *G. angustidens*, known to range between MN5 and MN9 (TASSY, 1996) survived to a later age in the region would be too far-fetched. The precise place where this specimen was found is not known, so it could come from layers of different age near Seltzi – or from a different locality.

Tetralophodon longirostris (Kaup, 1832) and *Tetralophodon atticus* (Wagner, 1857)

Numerous finds from the country have been referred to *Tetralophodon longirostris* by previous Bulgarian authors. However, the revision of the material showed that most of the finds have been erroneously determined. Many show characters typical of *Anancus*, and one is actually a *Platybelodon* as pointed out above. Part of the Bulgarian material does indeed belong to the genus *Tetralophodon*, but it is another species of the genus, *T. atticus*, that is present in the country (previously unpublished material, see below). Juvenile *Tetralophodon* remains from Bulgaria (a mandible from Hadjidimovo with a broken symphysis, some upper deciduous teeth from the same locality, and a skull from Kalimantsi) are of special interest.

According to TASSY (1986) and METZ-MULLER (1996a), juvenile tetralophodons are known in Europe from Eppelsheim and Laaerberg, Pikermi, Taraklia and Novaya Emetovka

[1] Published again by BAKALOV & NIKOLOV (1962, Pl. LXIV, Fig.2)

(details and references in the two cited works). There is more juvenile material however, published in the literature but gone unnoticed for various reasons. A photo of a DP2-4 tooth row from Pikermi, the type locality of *T. atticus*, has been published without any comments by MARINOS & SYMEONIDIS (1974), erroneously determined as "*M. pentelicus*" (i.e. *Choerolophodon pentelici*), although the four lophs of DP4 indicate a tetralophodont gomphothere. More than ten other specimens (upper and lower milk teeth, mandibular and maxillary fragments) are known from roughly contemporaneous localities (MN11-12) near the northern coast of the Black Sea on the two banks of the Dniester. Today the localities are in Moldova and Ukraine, but the finds have been described by Romanian, Ukrainian and Russian authors – due to the complicated history of the region (for details see Markov in prep.). Bearing in mind the age of these localities, their geographic position and opinions about the similarity between the material from at least two of them and *T. atticus* from Pikermi (TASSY, 1985; BURCHAK-ABRAMOVICH, 1940) it seems logical to assume that all the material from the Turolian of Southeastern Europe (plus Turolian material from Austria and Hungary described by SCHLESINGER, 1917; 1922) represents one species, *T. atticus*.

It seems reasonable to add the roughly contemporaneous juvenile material from Hadjidimovo and Kalimantsi to the rest of the finds from the Turolian of the region and refer it to *T. atticus*. Too little is known about this species, and the finds from Bulgaria, together with those from the localities at the North- Black Sea coast, could play a key role. Whatever its specific status, the Kalimantsi specimen is the only complete juvenile tetralophodont skull known so far.

Anancus arvernensis (Croizet & Jobert, 1828)

Bulgarian finds of *A. arvernensis* also have some importance beyond the regional level. It seems that Bulgarian *Anancus* finds are among the earliest in Europe (METZ-MULLER, 2000; note however that not all Bulgarian localities cited there as MN12/13 are indeed that early). The locality of Dorkovo (MN14) has yielded one of the most abundant samples of this species (now at the MNHN-Paris), superbly treated by METZ-MULLER (1995; 1996b; 2000). One of Metz-Muller's important results was demonstrating that m2's of *A. arvernensis* may reach pentalophodonty – a condition previously unknown from European material (METZ-MULLER, 1996b).

As found out during my research, some finds from Bulgaria of supposed Late Miocene age do show characters typical for *Anancus*, but not *A. arvernensis*. Further research is needed on their specific status (see METZ-MULLER, 2000 on early *Anancus* from Western Europe and Asia).

Gomphotheriidae gen. et sp. indet.

Two finds published by previous authors deserve special attention in my opinion. One is a hemimandible with m3 from Vidin, Northwest Bulgaria, referred by BAKALOW (1911, Pl. V, Fig. 1)[1] to *Tetralophodon longirostris*. It is apparently brevirostrine, and (contrary to the original description) there are no traces of a tusk alveolus. The other is a brevirostrine hemimandible with m3 from Lozenets, Sofia, referred by NIKOLOV (1962, Pl. X) to *A. arvernensis* but – in my opinion – differing markedly from this taxon. The age and the precise locality of the Vidin specimen is unknown, the age of Lozenets is estimated as the beginning of MN14 (SPASSOV, in press). The brevirostrine gomphotheriid genus *Sinomastodon* (described from the Late Miocene

to Pleistocene of China by TOBIEN et al., 1986) has never been found in Europe, although such a find wouldn't be entirely absurd from a palaeozoogeographical viewpoint: SPASSOV (2003) described from Bulgaria finds belonging to a *Nyctereutes* species previously unknown outside China (and a locality in Greece), and none of the other proboscidean genera known from China is restricted only to this area. However, according to Haruo Saegusa (pers. comm. 2004), each of the two specimens has dental characters different from those observed in typical *Sinomastodon*. It is not clear if the two specimens belong to the same taxon or not, and in the absence of m2 in both cases (i.e. no data on tri- or tetralophodont condition) I regard both as Gomphotheriidae gen. et sp. indet.

Family Elephantidae Gray, 1821

Most of the elephantid remains from Bulgaria are stored at the Museum of Russe Region (Russe is a town on the Danube, Northeast Bulgaria) and have not been published yet. Elephantids published by BAKALOV & NIKOLOV (1964) have been partly revised by MARKOV & SPASSOV (2003b) and by me during my PhD research. There are five elephantid species in the Bulgarian fossil fauna: *Elephas antiquus*, *Mammuthus rumanus*, *M. meridionalis*, *M. trogontherii* and *M. primigenius*.

Elephas antiquus Falconer & Cautley, 1845

Until recently, this species was known in Bulgaria only from three finds, published by BAKALOV & NIKOLOV (1964). My research added several specimens from the bottom of the Danube. Unfortunately, the original three specimens are isolated finds, and the rest, as said, come from the bottom of the Danube, so nothing can be said about their precise age.

Mammuthus rumanus (Stefanescu, 1924)

Regarded for decades as a junior synonym of *M. meridionalis* (e.g. MAGLIO, 1973), recent research strongly supports a separate specific status for the most ancient European mammoths (LISTER & van ESSEN, 2003; MARKOV & SPASSOV, 2003a). The first of these two papers provides evidence for the independent status of the species, revising Pliocene mammoth material from Europe and proposing a neotype. The second, describing Bulgarian material that can be referred to *M. rumanus*, suggests a migration path for *Mammuthus* via the Levant and not Gibraltar, *contra* MAGLIO (1973), and discusses probable affinities with African material. A mandible from Bossilkovtsi, near Russe, referred by us to *M. rumanus* is probably the only mandible of this species known so far and thus the most important elephantid fossil from Bulgaria.

Mammuthus meridionalis (Nesti, 1825)

The species is relatively well represented in the country. Material from Northwest Bulgaria described by BAKALOV & NIKOLOV (1964) as "*Elephas* (*Archidiscodon* [sic]) *planifrons*" has been referred by MARKOV & SPASSOV (2003b) to Maglio's "Laiatico Stage" of *M. meridionalis*. This paper was submitted in 2001 (before the two above mentioned papers on *M. rumanus* appeared) and as, according to LISTER & van ESSEN (2003), the Laiatico Stage itself needs

[1] See also BAKALOV & NIKOLOV (1962, Pl. LXII).

revision, this material, or part of it, could turn out to belong to *M. rumanus* (MARKOV & SPASSOV, 2003a). Unfortunately, it is too scarce and without known stratigraphy.

Mammuthus trogontherii (Pohlig, 1881)

This species has not previously been reported from Bulgaria. Part of the remains described by BAKALOV & NIKOLOV (1964) as *M. primigenius* are referred by me to *M. trogontherii* instead; and new unpublished material from the Russe region belongs to this species too. Again, the precise age of the finds is unknown.

Mammuthus primigenius (Blumenbach, 1799)

Separate teeth and a few mandibles, mainly from North Bulgaria, demonstrate the presence of the species in the country. Again, these are isolated finds without other fauna, and the interesting problem of the last occurrence of this species in Bulgaria remains unresolved.

To summarize:
The following proboscidean species are known from Bulgaria:

Family Deinotheriidae:
Prodeinotherium bavaricum
Deinotherium giganteum
Deinotherium gigantissimum

Superfamily Elephantoidea:

Family Mammutidae:
Zygolophodon turicensis
"*Mammut*" *borsoni*
"*Mammut*" cf. *borsoni* (?= "*M*". *praetypicum*)

Family Gomphotheriidae s.l.
Choerolophodon pentelici
Platybelodon cf. *danovi*
"*Mastodon*" *grandincisivus*
Gomphotherium angustidens
Tetralophodon atticus
Anancus arvernensis
Anancus sp. (primitive form of probable Late Miocene age)

Family Elephantidae
Elephas antiquus
Mammuthus rumanus
Mammuthus meridionalis
Mammuthus trogontherii
Mammuthus primigenius

Some of the Bulgarian proboscidean finds add to our knowledge on different problems of proboscideanology as a whole. These are:

– A maxilla and two mandibles, juvenile, of *Deinotherium gigantissimum* – the only ones known so far; a skeleton with both skull and mandible of the same species, providing strong evidence for its separate taxonomic status.
– A longirostrine Late Miocene mandible of "*Mammut*" cf. *borsoni*.
– Adult mandibles and skull of *Choerolophodon pentelici*.
– An adult mandible of the obscure species "*Mastodon*" *grandincisivus*, a unique adult skull, and a juvenile mandible of the same species which is the only one known so far.
– Juvenile *Tetralophodon* material (mandible, skull and upper tooth rows).
– One of the largest samples of *Anancus arvernensis* (currently at the MNHN-Paris), showing that pentalophodonty occurs in European *Anancus* (METZ-MULLER, 1996b).
– Primitive *Anancus* of probable Late Miocene age, differing from typical *A. arvernensis*.
– A mandible of *Mammuthus rumanus*, the only one known so far.

Bulgarian material permits the following observation of palaeozoogeographical interest: in the Turolian, there is an association of five proboscidean species (so-called "Pikermian proboscidean fauna": Markov, in prep.) – *Deinotherium gigantissimum*, "*Mammut*" cf. *borsoni* (?= "*M*". *praetypicum*), *Choerolophodon pentelici*, "*Mastodon*" *grandincisivus* and *Tetralophodon atticus*. The "PPF" is represented in a vast area from Eastern Austria and Hungary through former Yugoslavia, Bulgaria, Romania, the northern Black Sea coast, Greece and Turkey, to Iran and Afghanistan. Not all the taxa have been reported from all mentioned countries, due, I believe, to lack of finds or imprecise taxonomical interpretations. There is one notable exception: *Choerolophodon pentelici* is unknown from the northwest part of this area (former Yugoslavia except Macedonia; Hungary and Austria), which most probably reflects its actual absence from this territory. The "PPF" area corresponds more or less to the "East" block of FORTELIUS et al. (1996)[1]; while the border between the two "subareas" defined by the presence or absence of *Choerolophodon pentelici* corresponds to the border between the so-called "Central Paratethys Bioprovince" and the territories east and south of it (see BERNOR et al., 2003).

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[1] Thus extending the Southeast European – Southwest Asian "superprovince" (see BERNOR et al., 1996) to the northwest.

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Фосилните хоботни на България и значението на някои находки – кратък обзор

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(Резюме)

Статията представлява кратък синтез на съвременните данни върху фосилните хоботни на България. Тя обобщава резултатите от ревизията на материала от Proboscidea в различни колекции на страната, направена от автора през 2000-2003 г. Някои български находки представляват особен интерес от гледна точка на значението им за решаването на различни проблеми на разреда Proboscidea, като съществено разширяват знанията за слабо познати в световен мащаб таксони или спомагат за изясняването на статута на видове със спорно таксономично положение. Отбелязано е съществуването на асоциация от пет вида хоботни в турола на България. Накратко е дискутирано присъствието ѝ в Югоизточна Европа и Предна Азия и потенциалният интерес от палеозоогеографска гледна точка.