NOTA BREVE - SHORT NOTE

A NEW SPORADOTRAGUS (BOVIDAE, MAMMALIA)
FROM THE LATE MIocene OF BULGARIA

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Key words: Mammalia, Bovidae, systematics, late Miocene, Turolian, Bulgaria, Balkan-Iranian province.

Abstract. We provide a systematic revision of the late Miocene caprine genus Sporadotragus Kretzoi, 1968, the type-species of which was described from Samos under the specific epithet schaefferi. It is distinct from the poorly known Pseudotragus. Some specimens from Samos are rather distinctive, but the whole morphological variation there encompasses that of Palaeoryx parvidens from Pikierny, and we follow earlier authors in considering the two names as synonymous. New material from two late Miocene localities of south-western Bulgaria, Kalimantsi and Strumyani, is referred to a new species, S. vassilii, which is more primitive than the Greek one in some skull features, but not in the horn-core morphology.


Introduction

Around the village Kalimantsi in south-western Bulgaria, in the lower valley of the Struma River, several localities have yielded rich late Miocene faunas of Turolian age, which have been partly re-studied under the direction of one of us (N. S.). The main fossiliferous sites, except Kalimantsi-1 (perhaps of early Turolian age), are roughly contemporaneous with Pikierny in Greece. The bovid fauna includes Tragoprotax cf. amalthea, Miotragocerus (Pikermiceros) gaudryi cf. gaudryi, Gazella sp., Palaeoreas lindermayreni, Prostrepsi- ceros cf. houtumshidleri e Oioceros sp. (Geraads et al. 2003; Spassov et al. 2004; Spassov et al. in press, and our unpubl. observations). More to the north, in the same valley, the locality Strumyani (with two sub-contemporaneous fossiliferous sites) was recently found and excavated by us, but its fauna is not yet fully studied. From these two localities, we here describe another bovid species, which belongs to a genus previously known from a few Turolian sites of the Eastern Mediterranean, but the systematics of which was not clear.


Systematic paleontology

Order Artiodactyla Owen, 1848
Sub order Ruminantia Scopoli, 1777
Family Bovidae Gray, 1821
Genus Sporadotragus Kretzoi, 1968

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Microtragus Andree, 1926: 150 [non Microtragus White, 1846 (Coleoptera)]
Type-species: Microtragus schafferi Andree, 1926: 150.

Diagnosis (partly from Solounias 1981). A caprine of rather small size; supra-orbital pits small; ethmoidal fissure absent or vestigial; pre-orbital fossa small, mostly restricted to the lachrymal bone. Choanae far behind M3. Braincase long, its upper profile rounded, basioccipital rather square, with broad but not very prominent anterior tuber-osity; bulla mediolaterally compressed. Horn-cores long, moderately divergent, curved backwards, without torsion, not very compressed transversely, with flattened mediolateral surfaces and sometimes an incipient antero-medial keel. Teeth less caprine-like than in Pachytragus, metacone of upper molars convex, metastyle of M3 expanded.

Sporadotragus parvidens Gaudry, 1861

Palacoryx parvidens Gaudry, 1861: 241.
Microtragus schafferi Andree, 1926: 150.
Sporadotragus parvidens (Gaudry): Solounias 1981.

Holotype. Incompletely preserved skull, lacking the distal part of the horn-cores, and transversely compressed. MNHN-PIK-2435.

Type-locality. Pikermi.

Other localities: Samos, Molaymén.

Diagnosis. Face short, strongly angled on basioccipital, front of orbit above M3, sutures complex, mid-frontal suture elevated. Braincase making an obtuse angle with the occipital, occipital often low and broad. Horn cores large relative to skull size and with smooth surface.

Sporadotragus vasilli n. sp.

Pl. 1, Figs 1-3

Holotype. Incomplete skull K-5146.
Repository. NMNH (Pl. 1, Fig. 3).

Type-locality. Kalimanti, south-western Bulgaria.

Age. Late Miocene (Turolian Mammalian age).

Referenced material. About 10 specimens (list: table 2), the best of which are K-55612 (Pl. 1, Fig. 1 and Pl. 2, Fig. 2) and K-5147 (Pl. 1, Fig. 2), from the upper Kalimanti horizons, probably of middle Turolian age, all kept in NMNH; FM-2026 from Strumyani-1 (perhaps early Turolian age; Spassov et al. in press), housed in NMHS.

Derivatio nominis. Dedicated to Vasil Asimov, our host and friend in Kalimanti.

Diagnosis. Braincase less angled on the face than in S. parvidens; face longer and dorsal profile less concave. Mid-frontal and parieto-frontal sutures fused in adults. Horn-cores smaller, less curved, with strong longitudinal grooves, with a flattened anterior surface, and an incipient antero-medial keel.

Description of the material from Kalimanti and Strumyani

K-5146 (Pl. 1, Fig. 3) is an incomplete skull, without premaxilla and braincase. Only the posterior tips of the nasal bones are preserved. They form an acute point. The frontal bones are large. They are inflated in the supra-orbital area, and were probably hollowed by sinuses. They are intimately fused along the sagittal line, and the suture is no longer traceable. The supra-orbital pits are small and moderately wide apart. The poorly delimited ante-orbital fossa is restricted to the upper part of the face. The horn-cores are moderately curved backwards, but almost straight in anterior view; they diverge at an angle of about 25°, which slightly decreases towards the tip. Their most characteristic feature is the cross-section: it is not very compressed transversally, has a flat mediolateral surface, a broad anterior surface that is only slightly convex, and an antero-medial keel between them. Measurements are given in Tables 1 and 2.

We refer to the same species an almost complete skull with the base of the right horn-core preserved, but nothing of the left one, K-55612 (Pl. 1, Fig. 1). The face, frontal, and cross-section of the horn-core match those of the former specimen. The well-worn molars are the only preserved teeth. The protocone is angular and the labial face of the metacone is convex; the metastyle of M3 is somewhat expanded. Compared to the size of the face, the neurocranium is broad and long; its upper profile is convex, and makes an angle of about 100° with the occipital, which is semi-circular. The braincase is not much angled on the face, but the skull may have suffered some dorso-ventral compression. The basi-occipital is short and broad, with widely spaced but low anterior tuberosities. In ventral view, the bulla is kidney-shaped, strongly compressed transversally.

K-5147 (Pl. 1, Fig. 2) is a frontal from Kalimantisi-Prehvarloka, with the same features.

FM-2026 from Strumyani-1 (Pl. 2, Fig. 1) is again a frontal with the bases of the horn-cores; the face is strongly inclined on the braincase, but less so than in S. parvidens. The preserved parts of the horn cores indicate a slight backward curvature. They have a fully flattened anterior surface and strong longitudinal relief.

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PLATE 1

Fig. 1 - Sporadotragus vasilli n. sp., skull K-55612 (formerly labelled K-5145) from Kalimanti, a: dorsal view of the braincase; b: lateral view; c: ventral view of the cranial base; d: occipital view.
Fig. 2 - S. vasilli n. sp., K-5147 from Kalimanti, anterior view of frontal.
Fig. 3 - S. vasilli n. sp., holotype skull, K-5146 from Kalimanti, a: cross-section of the right horn-core (reversed); the anterior side is towards the top of the page, the medial side to the right; b: anterior view; c: lateral view.
Fig. 4 - S. parvidens, skull SMF-M-1975 from Samos, a: ventral view of the cranial base; b: occipital view.
Fig. 5 - S. parvidens, skull BMNH-M-13083 from Pikermi, a: ventral view of the cranial base; b: occipital view. Scale bar = 15 cm for Figs 2, 3b, and 3e, 10 cm for all others.
Tab. 1 - Skull measurements of Sporadotragus parvidens and Sporadotragus vasilii n. sp.

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L of horn-core along anterior curve 220° | - | - | - | 310° | 260° | 300° |
Horn-core antero-posterior diameter 38.5 | 38.3-40 | 47 | 52 | 46.8* | 45.3* | 50.5 |
Horn-core transverse diameter 30.5 | 33.2-30.3 | 38 | 37.5 | 38.6* | 36.8* | 40.5 |
Width over pedicles 88 | 86.5 | 83.5 | 84 | 88 | 95 | - | 98.5 |
Width over middle of supra-oral pits 36 | 33 | 37.5 | 36.5 | 40.5 | 40 | 48.3 | - | 45 |
Minimum braincase width - | - | 66.5 | - | 66.5 | 70 | - | 75.5 |
Occipital width - | - | 80 | - | 72.5 | 72.5+ | 78.2 | 75.3 | 88 | 72.5+ | - | 74 | - | 857 |
Occipital height, from top of f. magnun - | - | 37 | - | 30 | 27.5 | 26.3 | 30 | 33 | 34.5 | - | - | - | 36.5 |
Length from condyle to M3 - | - | 105 | - | 96 | - | 101 | 96 | - | 92 | - | - | - |
L from front of pedicles to nuchal crest - | - | 100 | - | ca.133 | 120 | - | 119 | 120 | 108 | - | 107 | - | 114 |
W over ant. tuberosities of basioccipital - | - | - | - | 27 | 28 | 33.8 | - | 26.5 | 25.5 | - | - | - | 22+ |
W over post. tuberosities of basioccipital - | - | 32.5 | - | 28 | 28 | 30 | - | 29.5 | 32 | - | - | - |

* mean of left and right HCs. ** type of S. vasilii *** type of S. "schafferi" **** type of S. parvidens

Tab. 2 - Measurements of frontlets and horn-cores of Sporadotragus vasilii n. sp.

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<td>Width over pedicles</td>
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<td>-</td>
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<td>84.5</td>
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<tr>
<td>Width across supra-oral pits</td>
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<td>32</td>
<td>-</td>
<td>-</td>
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of alternating ridges and grooves as well as a clear antero-medial keel.

Comparisons

The contents and even the validity of the late Miocene genus Sporadotragus have been disputed, so that it is useful to re-state the main features of the

Fig. 1 - Sporadotragus vasilii n. sp., frontlet FM-2026 from Strumyani, a: anterior view; b: left lateral view.
Fig. 2 - Sporadotragus vasilii n. sp., upper molar row of skull K-55612 from Kalamiani.
Fig. 3 - Sporadotragus parvidens, upper tooth-row of skull SMF-M-1975 from Samos.
Fig. 4 - Sporadotragus parvidens, upper tooth-row of skull MNHN-PIK-2453 (holotype) from Pikermi.
Scale bar = 10 cm for Fig. 1, 5 cm for Figs. 2-4.

PLATE 2
well-preserved type-specimen of *Microtragus schafferi*, type-species of *Sporadotragus*, from an unknown quarry in Samos, 1911-V-1 in NHMW. These are:

- the small size, compared to the members of the *Protoryx - Pachytragus* group;
- the cross-section of the horn-cores, which is very characteristic, and quite unlike that of other late Miocene Mediterranean bovids. There is a flat medial surface, and a poorly convex broad anterior surface, with a keel between them; this is a clear similarity with some modern caprines, such as *Capra ibex*. The main axis of the cross-section, from the keel to the postero-lateral angle, is thus strongly angled with respect to the sagittal plane;
- the smooth surface of the horn-cores;
- the broad frontals with small supra-orbital pits and an elevated mid-frontal suture;
- the curved dorsal profile of the braincase, continuing almost without angulation into the occipital.

Andree's figure (1926, pl. 14, fig. 6) is quite incorrect in this regard, as it shows a straight brain-case profile markedly angled on the occipital;

- the very low and broad occipital;
- the broad but low anterior tuberosities of the basioccipital;
- the upper teeth with rather prominent styles, especially the metastyle of M3, but labial walls less flattened, and premolars less shortened (Pl. 2, Figs. 2-4, and Tab. 3), than in *Pachytragus*.

Other specimens from Samos, also of unknown stratigraphic origin, display some differences from the type. The most conspicuous ones are the shape and proportions of the occipital, and the shape of the horn-cores cross-section. On skull SMF-M1975, the horn-cores suffered some deformation, but they were certainly only slightly flattened anteriorly, and there is no antero-medial keel. The occipital is even lower and wider than in the type (Pl. 1, Fig. 4b); there are two large ligament scars on the nuchal crest, on either side of the midline; the mastoid exposure is quite small, and the paroccipital processes are short and stout, separated from the condyles by shallow depressions (Pl. 1, Fig. 4a). On this well-preserved specimen, the ventral borders of the pterygoids look almost straight, from the lateral border of the choanae to the medial side of the bulla. The latter is transversally compressed, almost with a ventral keel.

A brain-case with horn-cores, PIUM-130, mentioned by Andree (1926, p. 150), also has a very broad and low occipital. On the frontlet SMF-M1971, the horn-cores are clearly flattened anteriorly, and there is a hint of an antero-medial keel. On skull SMF-M1977, the pterygoid wings probably had a straight ventral edge, and the paroccipital processes are stout, as in SMF-M1975, but the occipital is less low and wide. The horn cores are somewhat distorted, but some anterior flattening certainly occurred.

Another brain-case from Samos, S1098 in MCGL, is somewhat crushed postero-dorsally to antero-ventrally. It is of slightly larger size, and has a very low and broad occipital, strongly inclined on the frontoparietal plane. Only the bases of the horn-cores are preserved. The main axis of the cross-section is more oblique than in *Pachytragus*, bringing the antero-lateral surface to an almost anterior orientation, but there is no antero-medial keel. It may not belong to *Sporadotragus*.

While acknowledging that they had not seen its holotype, Pilgrim & Hopwood (1928) included *Palaeanoryx parvidens* Gaudry, 1861, from Pikermi, in the same genus as *Microtragus schafferi*. The material from Pikermi is less well preserved than that from Samos.

On the holotype skull (MNHN PIK-2453) of *P. parvidens*, the horn-cores are incomplete, and the skull is transversely crushed, so that several features cannot be reliably ascertained. The horn-cores are not very compressed; they lack an antero-medial keel, but there is some tendency towards flattening of the anterior and medial surfaces. The crushed occipital now looks triangular; it might be distorted but was certainly not very low and broad. The large size of the horn-cores, especially relative to the size of the teeth, is a resemblance to the Samos specimens.

Four more or less complete skulls and a frontlet from Pikermi in the BMNH certainly belong to Gaudry's species. Crushing precludes detailed comparison of the cross-sections, but although the horn-cores lack an antero-medial keel, they have a flattened medial surface and a broadened anterior face, in the same plane as the inter-orbital part of the frontal. On the whole, this frontal part of the skull recalls that of the Samos form, and we take this as a major distinctive feature of *Sporadotragus*. However, none of the Pikermi specimens has the extremely broad and low occipital of some of the Samos skulls (compare Pl. 1, Fig. 4b and 5b). This is not linked to sexual dimorphism, because (besides the fact that, in this case, all Pikermi specimens would be female) there is no relation between the shape of the occipital and the size or shape of the horn-cores. Solounias (1981) considered the hornless skull of *Otoceros? proanoe* Schlosser, 1904 to be the female of *S. parvidens*, but this is doubtful because it has a long face, in contrast to *S. parvidens*. Alternatively, one might refer the *S*-

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Tab. 3 - Ocular lengths of upper tooth segments of *Sporadotragus parvidens*.
mos form to *Sporadotragus schafferi*, and the Pikeremi one to *S. parvidens*, but the distinction between both groups is far from being clear-cut, and we prefer to include them in the same species.

The Bulgarian form has horn-cores more like those of the Samos type of *S. schafferi*, but several other features make it clearly distinct. The cranio-facial angle is more obtuse (although FM-2026 from Strumyany is not very different), the inter-frontal suture is closed (not a result of greater ontogenic age, as the type of *S. schafferi* is old), the only known occipital is not very broad (compare Pl. 1, Fig. 1d, to Pl. 1 Figs. 4b-5b), the anterior tuberosities of the basi-occipital are weaker (compare Pl. 1, Fig. 1c, to Pl. 1 Figs. 4a-5a), the posterior end of the nasal bones tapers gently instead of being short and broad, and the horns from Kalimantsi and Strumyany are shorter, less curved, and more deeply grooved. The Bulgarian and Aegean forms share the features that we have taken as characteristic of the genus, the unusual outline of the horn-core cross-section being the most convincing synapomorphy, but the Kalimantsi form is definitely more primitive in its weaker cranio-facial flexion.

**Conclusion: contents of the genus *Sporadotragus***

The genus was recognised as distinct by Gentry (1971) and Solounias (1981) who both placed it into the Caprini. Later, the species *parvidens* and *schafferi* were transferred by Köhler (1987) to *Pseudotragus*, a genus erected by Schlosser (1904) for his new species *P. capricornis* from Samos. The lectotype (Pilgrim & Hopwood 1928, p. 39; BMNH M4193), figured by Schlosser (1904, pl. 10, fig. 7) has elliptical horn-cores, much larger and more compressed (basal index 62 x 38; the cross-section was illustrated by Bohlin 1936, fig. 4a) than in *Sporadotragus*, and the basi- cranial angle is much less bent. We can see no reason for including *parvidens* in the same genus as *capricornis*, the type-specimen of which is so poorly preserved that the name *Pseudotragus* should not, in our opinion, be used for any other specimen.

Köhler (1987) referred some fragmentary specimens from Turkey to "*Pseudotragus* parvidens", but the upper molars have a flat metacone, in contrast to those of *Sporadotragus* (Pl. 2, Figs. 2-4), and the identification is therefore doubtful. Bouvrain (1994) assigned a few horn-cores from Kemikliitepe-D (Turkey) to the same species but, in contrast to the Aegean material, the horn-cores are rather small compared to skull size, as inferred from the frontal, which is also less bent (meaning a larger cranio-facial angle). These are both similarities with *S. vasili*, but the material is too fragmentary for definite identification. Kemikliitepe-D is probably earlier than Kalimantsi, but perhaps closer to Strumyany. The relative chronological placement of all these localities is not known with enough precision to decide whether both species were contemporaneous.

*Prototryx tadjikistanica* Dmitrieva, 1977, from the Turolian of Sor, shows some resemblances to *Sporadotragus* in the size, strong cranial flexure, short face, and course of the horn-cores. The horn-cores are slightly more compressed, and the illustration (Dmitrieva 1977, fig. 15b) shows lateral flattening and posterior position of the maximum transverse diameter, but the description mentions a flat anterior face. We have not seen the material, but if *P. tadjikistanica* does belong to *Sporadotragus*, it may be closer to the Pikeremi variety. *Sporadotragus* is also present in the Turolian of Molyan, Afghanistan; the material is under study by G. Bouvrain.

*Paraprototryx minor* Bohlin, 1935 from the Turolian of Baode, China, has horn-cores that are similar in cross-section to those of *Sporadotragus*, but the only known partial skull is larger, the facial angle is significantly more open, the notch between condyle and paroccipital process is deeper, and the bulla is less compressed; still, *Paraprototryx* might be related to *Sporadotragus*.

Thus, although *Sporadotragus* is a typical component of the Balkan-Afghan province, there are several signs of the occurrence of related forms outside this area, and as far as China. Thus, its distribution is similar to that of a few other late Miocene large mammals, such as the rhino *Chilothenium*, the giraffid *Samotherium* and, among bovids, *Sinotragus* and the *Plesiaddax-Urmiatherium* group (Geraads et al. 2002). All of them are open-country forms, unknown West of Macedonia.

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