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Euthyceros thessalicus, a new bovid from the Late Pliocene of Sésklo (Thessaly, Greece)

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With 8 figures and 4 tables

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Abstract: The locality of Sésklo has yielded a fauna of Late Pliocene age (MN17). The Bovids, the most frequent elements, comprise mainly the genera *Gazella* and *Gazellospira*. *Euthyceros thessalicus* n. g. n. sp., a form of odd morphology and as yet unknown affinities is characterised by considerably straight horn cores of almost semicircular cross-section. Internally, the horn cores contain many and large sinuses from their base to the apex. A weak keel is present. Some dental remains of corresponding size are plausibly associated to this species. The taxonomy of the species is discussed.

Zusammenfassung: Die Lokalität Sésklo hat eine oberpliozäne (MN17) Säugetierfauna geliefert. Bovidae sind zahlreich, besonders *Gazella* und *Gazellospira*. *Euthyceros thessalicus* n. g. n. sp., eine Art mit noch unbekannten phylogenetischen Beziehungen hat eine außergewöhnliche Morphologie: Die Hörner sind gerade mit fast halbkreisrundem Querschnitt und einer schwachen Kante. Innen sind sie nicht kompakt, sondern es gibt zahlreiche und große Sinus-Hohlräume. Einige odontologische Funde von passender Größe gehören wohl zu dieser Art. Die Taxonomie der Art wird diskutiert.

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Introduction

The locality of Sésklo (Magnesia, Thessaly, Greece - Fig. 1) is situated about 10 km west of the town of Vólos, the capital of the Magnesia district. It is located in a basin filled with Neogene fluvio-lacustrine clay sediments. The basement of the basin is formed of metamorphic rocks (peridotites, serpentinites and slates with marble and ophiolite intercalations) that tectonically overlie a formation of Jurassic slates and Triassic-Jurassic marbles (SYMEONIDIS & TATARIS 1983). The clays that fill the basin are red coloured, about 100 m thick and inclined to the SE. Lithologically they are very uniform; the uppermost layers have, though, some pebble intercalations.

A part of the basin is used by the local cement industry as a clay pit. It was during the works in the pit in the years 1971-1991 that the fossils were found. Four fossiliferous sites were found in the basin. Unfortunately, none of them is now available for field studies, due to the quarry development.

The fossil fauna of Sésklo was already described in other papers (SYMEONIDIS & TATARIS 1983; SYMEONIDIS 1992; ATHANASSIOU 1996; KOSTOPOULOS & ATHANASSIOU 1997; ATHANASSIOU, in press). The faunal list, given by ATHANASSIOU (1996) (and, concerning the gazelles, revised by KOSTOPOULOS & ATHANASSIOU 1997), includes Carnivora [*Nyctereutes megamastoides* (POMEL, 1843), *Vulpes* cf. *alopecoides* FORSYTH MAJOR,

Fig. 1. Geographical position of the locality of Sésklo.

1875, *Homotherium crenatidens* FABRINI, 1890], Proboscidea [*Anancus arvernensis* (CROIZET & JOBERT, 1828), *Mammuthus meridionalis* (NESTI, 1825)], Perissodactyla [*Equus stenonis* COCCHI 1867, *Stephanorhinus* sp.] and Artiodactyla [cf. *Croizetoceros ramosus* (CROIZET & JOBERT, 1828), cf. *Eucladoceros* sp., *Macedonitherium martinii* SICKENBERG, 1967, *Gazella borbonica* DEPÉRET, 1884, *Gazella bouvrainae* KOSTOPOULOS, 1996, *Gazella* sp., *Gazellospira torticornis* (AYMARD, 1854)], as well as some unusual, mainly large sized forms, assigned to Caprini and Ovibovini, which are revised here. The postcranial material previously referred to Ovibovini indet. (ATHANASSIOU 1996) is morphologically and metrically identical to the material of the big *Gallogoral meneghinii* (RÜTIMEYER, 1878) form from Vólax, documented in this locality by a complete skull (KOSTOPOULOS 1996). This implies also the presence of *G. meneghinii* at Sésklo, though not well documented. The faunal assemblage is of "Villafranchian type" and suggests a lower MN 17 (MNQ17) age (ATHANASSIOU 1996).

Systematics

Order Artiodactyla OWEN, 1848
Family Bovidae GRAY, 1821
Subfamily ? Caprinae GILL, 1872

Genus *Euthyceros* n. g.

Type species: *Euthyceros thessalicus* n. sp.

Diagnosis: Relatively short and straight horn cores of semicircular cross-section, flat lateral side, and convex medial side. Extreme pneumatisation of the cores and the frontals. Dentition of wide, rather brachyodont, teeth with long premolar section. Upper and lower premolars of large size, molarised P_4. Lower molars with narrow fossettes, feeble lingual stylids and relatively flat lingual wall, with small sized mesostylids (basal pillars). M_3 with large third lobe.

Euthyceros thessalicus n. g. n. sp.

Type locality: Sésklo (Magnesia, Thessaly, Greece).

Age: Late Pliocene (Lower MN17).

Holotypus: Left horn core, Σ-408.

Derivatio nominis: The genus name Euthyceros comes from the Greek εὐθύς (= straight) and κέρας (= horn). The species is named after the province of Thessaly.

Diagnosis: As for the genus.

Synonymy: ?Ovibovini gen. et sp. indet. ATHANASSIOU (1996: 159) - pro parte; ?Caprinae gen. et sp. indet. ATHANASSIOU (1996: 170).

Table 1. Upper dentition measurements of *Euthyceros thessalicus* n. g. n. sp. from Sésklo.

Upper dentition	D^2		D^3		P^3		P^4		M^1	
	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width
Σ-396	–	–	–	–	17.5	18.3	17.0	20.0	–	21.6
Σ-711	15.1	9.1	>17.5	13.5	–	–	–	–	–	–

Table 2. Lower dentition measurements of *Euthyceros thessalicus* n. g. n. sp. from Sésklo.

Lower dentition	P_2		P_3		P_4		M_1		M_2		M_3	
	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width	Length	Width
Σ-396	13.9	8.8	16.3	10.5	19.5	13.0	19.7	>16	24.0	17.6	–	–
Σ-386	–	–	–	–	–	–	–	–	24.4	17.7	34.0	14.8
Σ-388	–	–	–	–	–	–	–	–	26.2	15.1	35	14.0
Σ-2006	–	–	–	–	17.0	11.0	18.8	14.5	23.0	16.0	–	14.0

Material: Left horn core, Σ-90; part of left maxilla with P^3, P^4 and part of M^1 and part of left mandible with P_2-M_2: Σ-396; part of right maxilla with D^2 and D^3: Σ-711; part of right mandible with M_2 and M_3: Σ-386; part of left mandible with M_2 and M_3: Σ-388; part of right mandible with P_4-M_3: Σ-2006; distal part of left metacarpal III-IV: Σ-1186; proximal part of right metatarsal III-IV: Σ-191.

The studied specimens come from a single site (excavation of 1982), except for Σ-2006 that was found elsewhere, during a small excavation in 1991. The material belongs to the collections of the Museum of Geology and Palaeontology, National and Kapodistrian University of Athens, Greece.

Description

Horn cores

The horn cores have quite uncommon morphology (Fig. 2a, 2b, 4). They are relatively short and notably straight with an almost semicircular cross section, which remains constant from the base to the apex in the preserved parts of the horn cores. They also form a weak keel, especially near their base. The presence of a small part of the parietofrontal suture in Σ-408, as well as of the anterior part of the brain case in the same specimen, where the

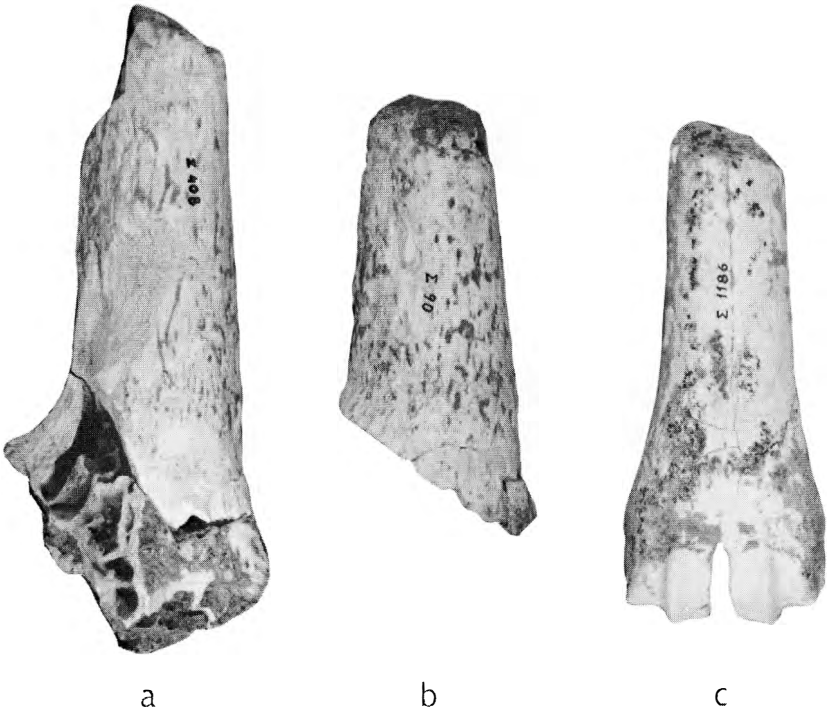

Fig. 2. *Euthyceros thessalicus* n. g. n. sp. **a:** left horn core, Σ-408 (holotype), antero-medial view; **b:** left horn core, Σ-90, antero-medial view; **c:** distal metacarpal III-IV part, Σ-1186, dorsal view. All photographs x 1/2.

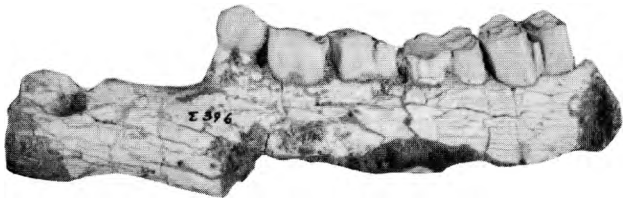

Fig. 3. *Euthyceros thessalicus* n. g. n. sp. Part of left mandible with P_2-M_2: Σ-396, lateral view. x 1/2.

trace of the *fissura rhinalis* (that separates the neocortex and the palaeocortex) can be identified, are good indicators of the orientation of the horns. According to these indicators, the horns were inclined towards the lateral side and the keel was directed posteriorly and medially, towards the sagittal plane. The postero-lateral side of the cores is practically flat, showing only a slight convexity. The antero-medial side is convex. The core surface is rather smooth; so it is slightly distinguishable from the pedicel surface. The most distinctive character is, though, their extremely high pneumatisation. The

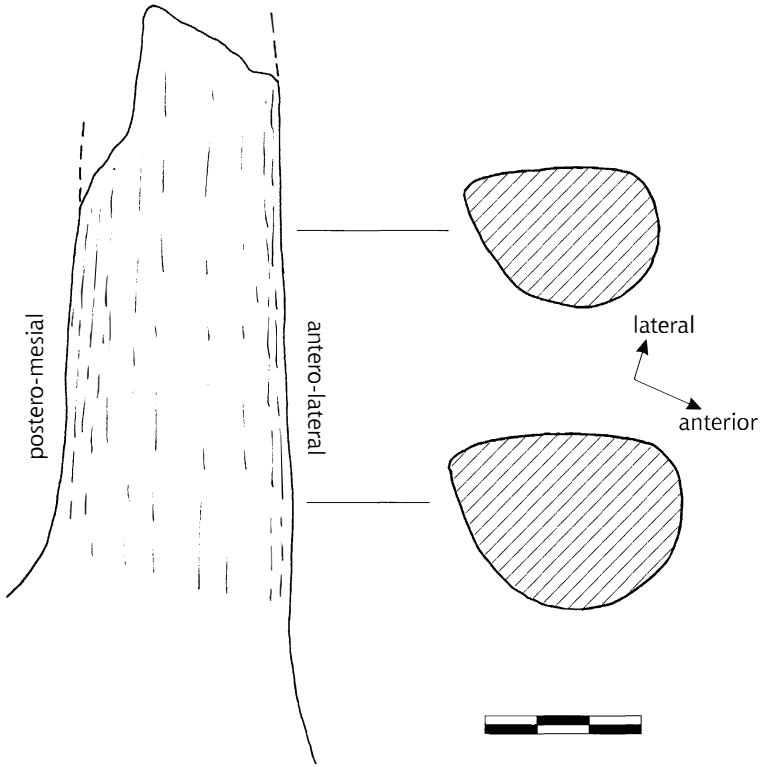

Fig. 4. *Euthyceros thessalicus* n. g. n. sp. Antero-medial view sketch and cross-sections of the horn core Σ-408 (holotype). Scale: 30 mm.

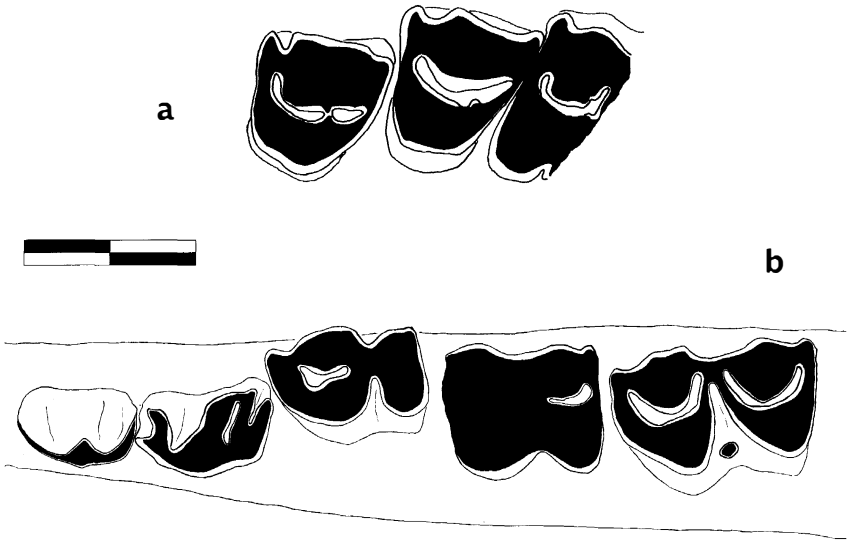

Fig. 5. *Euthyceros thessalicus* n. g. n. sp. Occlusal view of the upper (**a**) and lower (**b**) dentition of Σ-396. Scale: 20 mm.

whole interior of the horn cores, from their base to their apex, is full of sinuses; there is no solid bone. The same is observed in the small preserved parts of the cranium bones, which are thick and strong.

Dental material

A collection of large sized teeth are considered as plausibly related to the horn cores. There is no direct evidence for such a relation, as there is no skull in the available material. However, these teeth also have an unusual morphology that makes them distinct among the known Plio-Pleistocene bovids.

The available upper jaw specimen is a very small maxillary fragment with very worn teeth (Fig. 5a). The enamel of M^1 is almost totally worn. The premolars (P^3 and P^4) show abnormal attrition and they are also worn almost to the base of the crown. P^3 is larger than P^4. The enamel of all teeth is thin. The styles (in the buccal side of the tooth) are feeble; the parastyle is however well separated from the paracone (especially in P^3) by a valley that runs

through the whole crown height. The labial wall of the paracone is only slightly convex. The fossettes between the buccal and the lingual cones are very narrow in all preserved teeth. The premolar lingual wall is not evenly convex, but there is a week longitudinal depression in the whole retained height of the crown, especially in P^3. All preserved teeth are very wide.

The deciduous teeth that are referred to the species have prominent labial styles and cones. The lingual walls are convex.

The main characters of the lower dentition (Fig. 3, 5b) are the long premolar row, the considerable tooth width and the molarisation of P_4. The total tooth-row length is estimated to be 129 mm (combined measurement in the specimens Σ-386 and Σ-396 that plausibly belong to the same individual), while the premolar and molar lengths (measured on the occlusal surface) are 49 mm and 78 mm respectively. The $L_{P2\text{-}P4} / L_{M1\text{-}M3}$ ratio is 63 %, while the $L_{P2\text{-}P4} / L_{P2\text{-}M3}$ ratio is 38 %. The morphology of P_2 and P_3 is typical. The P_2 has large dimensions (it is only a little smaller than P_3) . The P_3 has a long metaconid that is inclined to the rear (forming with the paraconid a very wide valley) and it is partly fused with the entoconid, at least at the base of the crown. The P_4 seems to be totally molarised, although the available specimens (Σ-396 and Σ-2006) do not allow exact observations of the cusp fusion in the distal part of this premolar. The general appearance of the tooth is bilobe. The paraconid and the metaconid are fused. The distal lobe is considerably smaller, especially in Σ-2006. A fusion of the entoconid and the entostylid is very possible, as the lingual wall of the tooth is totally closed. The molars have almost flat lingual borders, because of the relatively weak stylids and the low convexity of the lingual borders of metaconid and entoconid. However, the stylids are much more prominent in the fresh teeth. In the buccal side of the molars the cusps are more acute, so that the lobes have triangular shapes.

A small ectostylid is in all cases present buccally, between the molar lobes. There is neither a goatfold medially, nor any enamel islets between the lobes in the occlusal surface. The fossettes are narrow with simple borders, except for M_3, where a small fold in the distal fossette is observed. The third lobe of M_3 is of large size, extending mainly labially. Distally it forms an edge along the height of the crown, especially in the upper part of the tooth. The hypsodonty index of an M_2 and an M_3 is estimated to about 120, but an exact measurement of the crown height is not possible on any tooth.

Postcranial material

Among the available material, the group of postcranial bones that fits to the size of the dental material comprises only two metapodial parts of unknown

relationship to each other. The distal metacarpal part (Σ-1186, Fig. 2c) has a wide and rather flat articulation. The dorsal surface is slightly convex, almost flat distally, and has a very weak median groove. The palmar surface is flat. The trochleae are robust, separated by a moderately wide incision. The proximal metatarsal part (Σ-191) has an almost circular articulation. The two large surfaces for the articulation with the third cuneiform and the scapho-cuboid are more or less equal in size. The posterior articular surface for the scaphocuboid is triangular in shape. There is no vascular foramen.

Discussion

The quite unusual morphology and internal structure of the horn cores has no counterpart in the known fossil or extant Bovidae. Among the known large sized Plio-Pleistocene bovids of Europe, only the genus *Pliotragus* KRETZOI, 1941 (formerly also referred to as *Deperetia* SCHAUB, 1923) has more or less straight horn cores, at least near their base. However, they are bigger with more rugged surface and they have a larger cross-section of elliptical shape. *Gallogoral* GUÉRIN, 1965 has cores of smaller diameter, about the size of the studied specimens, but again they are somewhat longer, fairly curved and of elliptical cross-section. The other known big bovids of the Plio-Pleistocene, *Megalovis* SCHAUB, 1923 and *Leptobos* RÜTIMEYER, 1877, are larger with more massive, curved cores, of elliptical cross-section.

Similarly, when comparing the available dental material, there are no sufficient similarities that could allow the identification after one of the known genera and species. The main difference is usually the great length of the premolar section relatively to that of the molar section, as well as the considerable width of all teeth. However, some similarities are observed when comparing to the rupicaprin *Gallogoral meneghinii* and to the possibly ovibovin *Pliotragus ardeus* (DEPÉRET, 1883). The teeth of *Gallogoral* are smaller, especially in width (GUÉRIN 1965). The big size of P^3 relatively to P^4 in Σ-396 is a character normally not found in *Gallogoral*. The relative size of the lower premolars (Fig. 6, Table 3) is, though, similar. Other small differences of the lower dentition of *Gallogoral*, compared to the specimens from Sésklo, are the absence of ectostylids, the fairly more developed lingual stylids in M_2 and M_3, the rather wider fossettes and the morphology of the third lobe of M_3, which is more elliptical, without distal edge. The rather big form of this species, described from the locality Vólax and referred by KOSTOPOULOS (1996) to a new subspecies (*Gallogoral meneghinii sickenbergi*), does not differ morphologically from the West European population, but is larger, having about the size of the studied material. A detailed comparison between the dental specimens from Sésklo and Vólax is

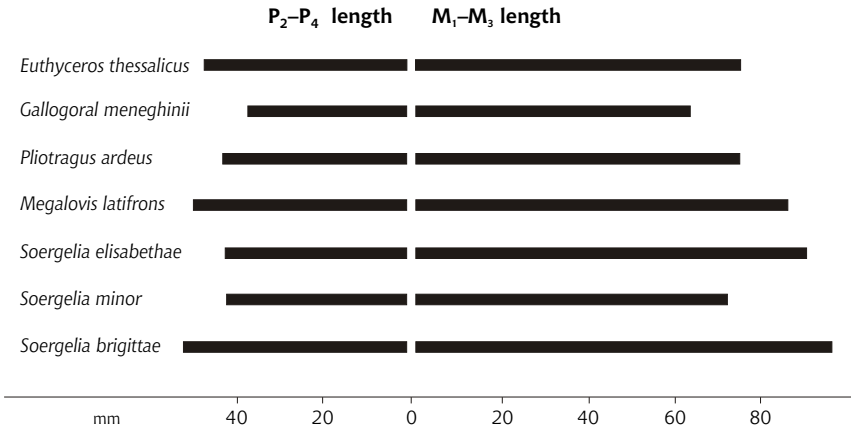

Fig. 6. Comparative diagram of the lower dentition molar and premolar series length of big Plio-Pleistocene bovids. Data according to SCHAUB (1923, 1951), GUÉRIN (1965), KAHLKE (1969), MOYÀ-SOLÀ (1987), DUVERNOIS & GUÉRIN (1989) and KOSTOPOULOS (1996).

Table 3. Lower dentition measurements of *Euthyceros thessalicus* n. g. n. sp. from Sésklo in comparison to other big Plio-Pleistocene bovids. Data according to SCHAUB (1923, 1951), GUÉRIN (1965), KAHLKE (1969); DUVERNOIS & GUÉRIN (1989) and KOSTOPOULOS (1996). L: tooth-row length, L_P: premolar section length, L_M: molar section length.

Lower dentition	L	L P	L M	L P/L %	L P/LM %
Euthyceros thessalicus	(129)	49	(78)	38	63
Gallogoral meneghinii	103.6-110	38	–	35.8-36.6	–
Pliotragus ardeus	–	44	76.5-79.0	–	59
Megalovis latifrons	–	51	89	36	–
Soergelia elisabethae	132-148.8	41-45.8	85.3-101.6	30.8-31	45.1-48
Soergelia brigittae	143-156.8	50.3-54.0	92.6-102.5	–	52-56

not possible, as the lower tooth material is scarce in the latter locality. The main differences are found in the larger tooth width and in the absence of lingual stylids in the specimens from Sésklo.

In comparison to *Pliotragus ardeus*, the upper teeth from Sésklo are bigger, especially in width (DUVERNOIS & GUÉRIN 1989). The lower tooth-row has a total length comparable to that of *Pliotragus*, but a somewhat superior premolar/molar ratio. The molar row in the mandibles from Sésklo is within the metrical range given for *Pliotragus*, while the premolar row is somewhat longer (Fig. 6, Table 3). Again, the P_2 from Sésklo is distinguished by its unusually large size in relation to the other teeth, which is far outside the metrical range for *Pliotragus* (DUVERNOIS & GUÉRIN 1989). The P_3 from Sésklo is less aberrant, but its length is also out of the *Pliotragus* range. The dimensions of P_4 are equal to the maximum values, while the molar dimensions are generally inside the range of *Pliotragus*.

Another big Villafranchian bovid, *Megalovis*, has fewer similarities with the studied dental material, as it is considerably bigger with a proportionally shorter premolar section (Fig. 6, Table 3). It also has more prominent stylids (especially the metastylid) and a goatfold in M_1 (paratypus Se-401, conserved in Basel).

Some resemblance in the dental morphology is also found in the Pleistocene genus *Soergelia* SCHAUB, 1951, as the flat lingual wall of the lower teeth and the molarised P_4. However, the tooth-row of this genus is generally longer, while the premolar section is short in relation to the molars (Fig. 6, Table 3). The lower toothrow of the small species *Soergelia minor* MOYÀ-SOLÀ, 1987 is metrically closer to *Euthyceros thessalicus*, but, again, it has a shorter premolar row. The teeth width is also much smaller, especially in M_1 and M_2 (MOYÀ-SOLÀ 1987).

The distal metacarpal Σ-1186 is about 10 % larger than the dimensions for *Hesperoceras* (a genus that has been considered as a junior synonym of *Pliotragus* – DUVERNOIS & GUÉRIN 1989) given by DE GIULI & MASINI (1983). The metapodials that are attributed to *Megalovis* are generally bigger, with the exception of a specimen from Sangkan-ho, described by TEILHARD DE CHARDIN & PIVETEAU (1930), which has practically the same dimensions. The specimen Süß-1965-2568 from Süßenborn, which is attributed by KAHLKE (1969) to *Soergelia elisabethae* SCHAUB, 1951, is comparable in the size of the distal articulation, but it seems to be shorter and more robust.

The metatarsal Σ-191 also has metrical affinities to *Soergelia elisabethae*, as the dimensions of the proximal articulation and the supposed total length are comparable to those of the paratype D-373 of the species from Süßenborn (SCHAUB 1951). Other specimens referred to the species (Süß-1965-2569 from Süßenborn – KAHLKE 1969 – and one from Bugiuleşti – RADULESCO & SAMSON 1965) have somewhat smaller (about 10 %) pro-

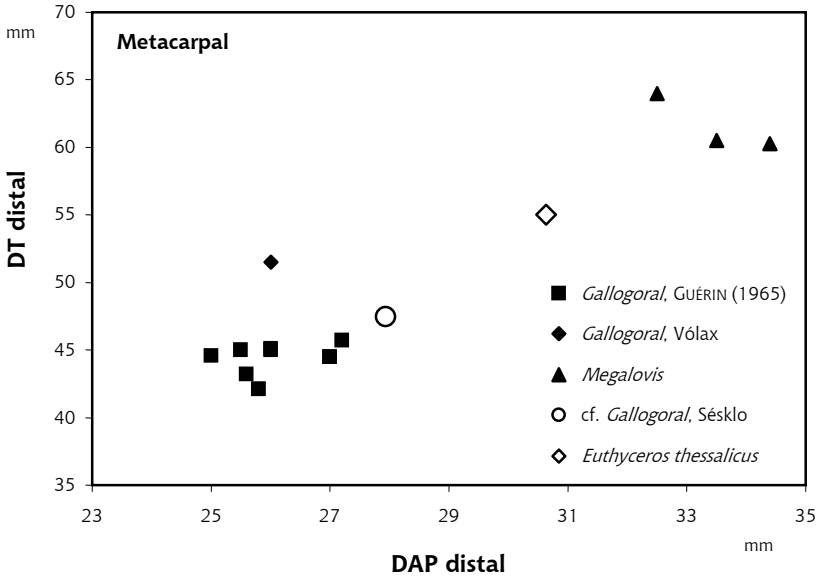

Fig. 7. Scatter plot of metacarpal III-IV articular measurements. Data according to Teilhard de Chardin & Piveteau (1930), Guérin (1965), Radulesco & Samson (1962), De Giuli & Masini (1983) and Kostopoulos (1996).

ximal articulation and seem to be a little longer. Similar to Σ-191 is also the metatarsal 16894 of the Natural History Museum in Lyon, which is referred by Guérin (1965) to *Megalovis*.

Taxonomic position

The studied material raises a taxonomical problem, mainly because of the peculiar morphology of the horn cores. The presence of the internal sinuses could indicate a relation with the Caprini, but the straightness of the cores and their semicircular cross-section are characters that are not found in this tribe. The dentition may have some resemblance with that of Ovibovini, as large size and molarisation of P^4, but on the other hand the teeth are not hypsodont, they have basal pillars between the lobes of the molars and the premolar section is long. The postcranial bones have no clear morphological

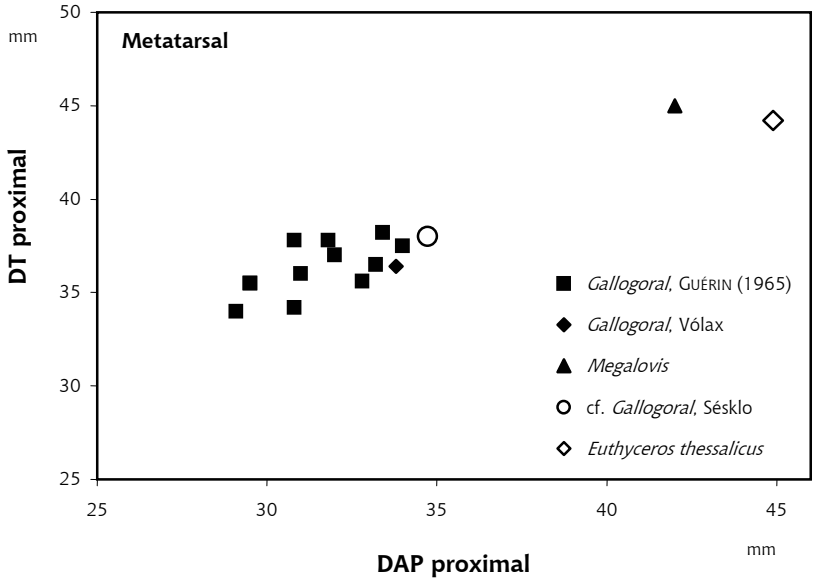

Fig. 8. Scatter plot of metatarsal III-IV articular measurements. Data according to GUÉRIN (1965) and KOSTOPOULOS (1996).

affinities, though the wide distal articulation may also indicate a relation with Ovibovini. *Euthyceros thessalicus* could provisionally be placed in the subfamily Caprinae, hoping that new material will enlighten the taxonomic position of this species.

Conclusion

The horn cores Σ-383 and Σ-90, characterised by relatively short and straight shape, semicircular cross-section and full pneumatisation, can be assigned to a new genus and a new species, namely *Euthyceros thessalicus* n. g. n. sp. A collection of dental material can be associated with this species, on the basis of their size and their unlikeness to any known big bovid dental characters. The postcranial skeleton is not well known, as the available material is scarce.

Table 4. Metapodial III-IV measurements of *Euthyceros thessalicus* n.g. n.sp. from Sésklo in comparison to other big Plio-Pleistocene bovids. Data according to TEILHARD DE CHARDIN & PIVETEAU (1930), SCHAUB (1951), GUÉRIN (1965), RADULESCO & SAMSON (1962), KAHLKE (1969), DE GIULI & MASINI (1983), MOYÀ-SOLÀ (1987) and KOSTOPOULOS (1996).

Metacarpal III-IV	**shaft**	**distal articulation**	
	minimal DT	**DAP**	**DT**
Euthyceros thessalicus (Σ-1186)	32.2	30.7	54.8
Gallogoral meneghinii	23.7-27.8	21.0-27.0	42.3-45.7
G. meneghinii sickenbergi	29.6	24.8	50.0
Megalovis latifrons	32.7-38.9	32.5-33.5	54.0-64.0
"*Hesperoceras merlae*"	(32)	–	(49)
Soergelia elisabethae	29.3	29.3	56.6
Soergelia minor	24.3-29.0	24.6-29.6	46.0-54.0
Soergelia brigittae	31.2	29.3	55.8

Metatarsal III-IV	**proximal articulation**		**shaft**
	DAP	**DT**	**minimal DT**
Euthyceros thessalicus (Σ-191)	45.0	44.0	23.2-25.0
Gallogoral meneghinii	29.5-34.0	34.0-40.6	20.6-26.9
G. meneghinii sickenbergi	33.6	37.2	26.3
Megalovis latifrons	42.0	45.0	28.6
Soergelia elisabethae	42.2	39.6-43.7	25.7-27.0
Soergelia minor	33.0-38.7	31.5-42.2	21.5-24.5
Soergelia brigittae	42.4-44.4	44.5	28.8-29.3

Achnowledgements

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