

SHORT NOTE - NOTA BREVE

***EOSTYLOCEROS* CF. *PIDOPLITSCHKOI* KOROTKEVITSCH 1964 (CERVIDAE, MUNTIACINAE): NEW ELEMENT IN THE NEOGENE MAMMAL ASSEMBLAGE OF LOWER VALDARNO (TUSCANY, CENTRAL ITALY)**LAURA ABBAZZI¹ & ROMAN CROITOR²*Received September 16, 2002; accepted March 28, 2003*

Key-words: Cervidae, Muntiacinae, *Eostyloceros*, Systematic Paleontology, Lower Valdarno, Tuscany, Early to Middle Pliocene.

Abstract. An *Eostyloceros* antler fragment is described. The specimen makes part of the Montopoli (Lower Valdarno, Tuscany) collection preserved in the Geo-Paleontological section of the Natural History Museum of Florence. This site is the type locality of the homonymous Faunal Unit of the Italian Biochronological scheme; it includes the latest Early Villafranchian Mammal Age faunas. The occurrence of an *Eostyloceros* species among this material however, is in disagreement with the age of the Montopoli local fauna, which has been correlated with the Gauss-Matuyama boundary and thus dated to about 2.6 Ma. The youngest remains of this genus come from sites of eastern Europe Early Pliocene in age (Ruscinian Mammal Age). The possibil-

ity that the antler is an external element to the Montopoli assemblage is therefore contemplated.

Riassunto. Nel presente lavoro viene riportata per la prima volta la presenza della specie *Eostyloceros* cf. *pidoplitschkoii* Korotkevitsch tra il materiale rinvenuto nella località Montopoli. Montopoli, nel Valdarno inferiore (Toscana), è una località fossilifera nota fin dall'800, in cui sono stati rinvenuti resti di mammiferi che rappresentano un punto di riferimento per la biocronologia italiana. La fauna locale di Montopoli, calibrata in prossimità del passaggio tra i Magnetocroni Gauss e Matuyama, è stata infatti utilizzata per definire la parte alta dell'età a mammiferi Villafranchiano inferiore. La presenza di *Eostyloceros* costituisce un dato nuovo per l'Italia e contemporaneamente pone dei problemi biocronologici in quanto le segnalazioni più recenti dei suoi rappresen-

tanti provengono da località dell'Europa orientale riferite al Pliocene inferiore (Età a Mammiferi Rusciniano). Per giustificare la presenza di questo Muntiacino tra il materiale fossile di Montopoli vengono prese in considerazione due ipotesi: secondo la prima il palco analizzato è rimaneggiato e proviene dall'elaborazione di depositi di origine continentale di età Pliocene inferiore; sulla base della seconda ipotesi si suggerisce che il reperto non sia stato raccolto a Montopoli, ma provenga in realtà da un'area adiacente in cui affiorano terreni continentali del Pliocene inferiore.

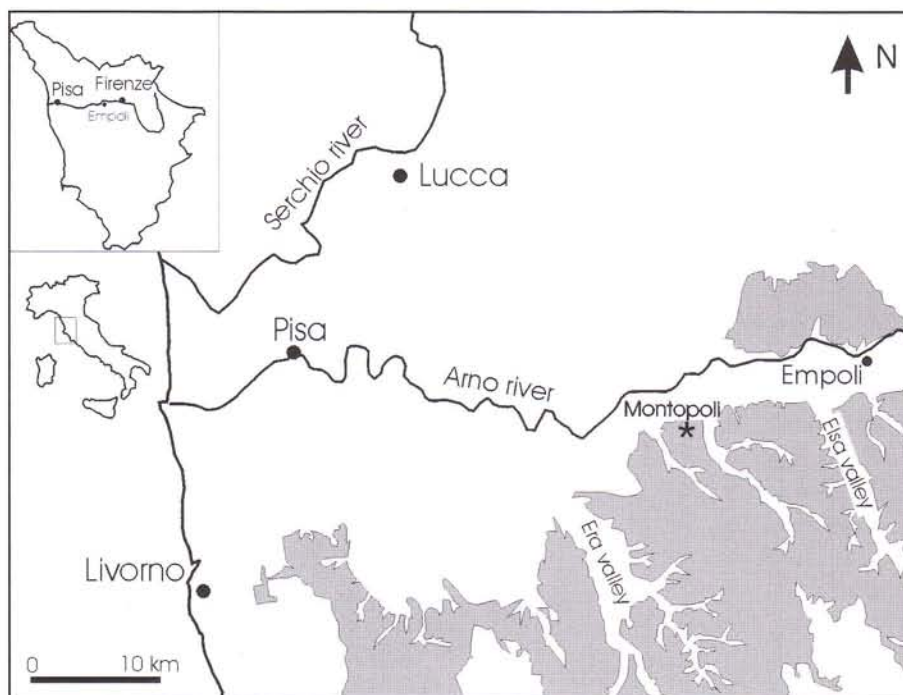


Fig. 1 - Location map of the Montopoli site. The extension of Lower and Middle Pliocene marine deposits is shown.

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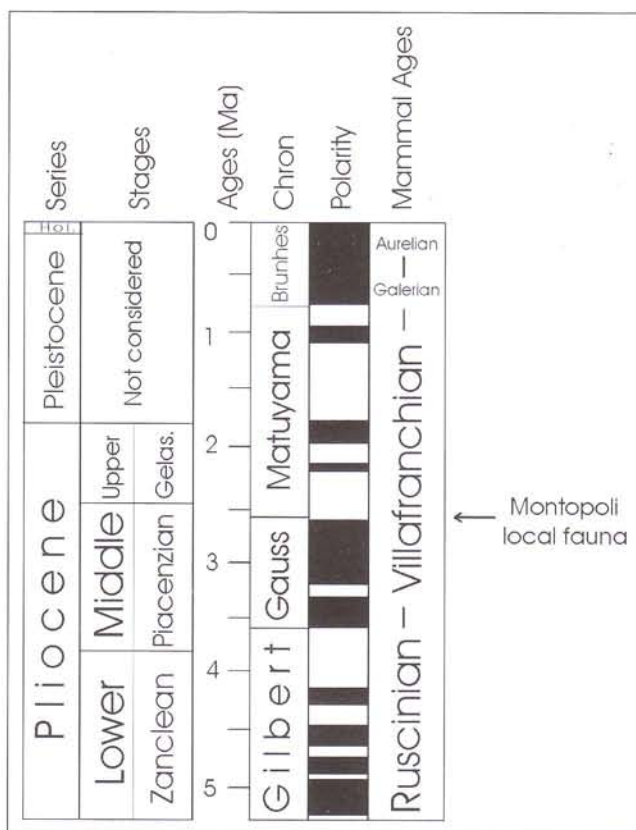


Fig. 2 - Chronological scheme.

Introduction

A fragment of a shed antler of *Eostyloceros* cf. *pidoplitschkoi* Korotkevitch was found during the inspection of fossil deer material from the locality Montopoli (Lower Valdarno, Tuscany, Central Italy, Fig. 1), stored in the Geo-Paleontological section of the Natural History Museum of Florence University. The fossil was apparently recovered by Forsyth-Mayor in the 1880, as suggested by an original hand-written note, but its exact stratigraphic provenance is unknown.

Montopoli is celebrated (Weithofer 1893; Forsyth-Major 1877, 1885; Azzaroli 1977) for the high number of fossil mammal remains it yielded from Middle Pliocene shallow marine deposits (De Giuli et al. 1983; Benvenuti et al. 1995). The fossil-bearing beds have been calibrated to the Gauss-Matuyama boundary and thus dated to about 2.6 Ma (Lindsay et al. 1980). Though the specimens do not all come from the same stratigraphic level, they are altogether considered as a local fauna (De Giuli & Heintz 1974a) representative of the homonymous Faunal Unit which defines the latest part of the Early Villafranchian Mammal Age (Azzaroli 1970, 1977; Gliozzi et al. 1997; Fig. 2).

The unpublished antler fragment, object of the present work, differs from all other Montopoli cervids, which include: *Eucladoceros* sp., *Pseudodama* cf. *lyra*, *Procapreolus cusanus* and *Croizetoceros ramosus* (De Giuli & Heintz 1974b; Azzaroli 1977, 1992).

The presence of an *Eostyloceros* representative in Lower Valdarno opens an intriguing biochronological problem, since *Eostyloceros* is reported from various eastern European and Asian latest Miocene and Early Pliocene localities (Ruscinian Mammal Age; Vislobokova 1983, 1990; Vislobokova et al. 1993), unless we do not believe it is a Ruscinian holdover in Middle Pliocene times. This however contrasts with the acknowledged disappearance of Ruscinian elements that marks the transition to the Montopoli fauna. This significant faunal turnover, known as the Elephant-*Equus* event (Lindsay et al. 1980), was due to a global climatic change that gave rise to a generalised cooling and increasing aridity, which occurred at the time of the Gauss-Matuyama transition.

Comparative diffractometric analyses of the sediments covering the *Eostyloceros* antler and two "*Pseudodama*" *lyra* jaw fragments from the Montopoli assemblage were carried out with the intent of knowing more about the possible source of the *Eostyloceros*. The two matrices significantly differ, suggesting a different provenance.

The silty-sandy sediment on the *Eostyloceros* antler is characterised by the dominance of calcite and quartz and by a low content of feldspars, while that on both *Pseudodama* mandibles is low in calcite but high in feldspars (N. Cipriani pers. com.). Moreover, the *Eostyloceros* antler is slightly polished indicating a certain degree of transport, while the Montopoli fossils are generally unabraded, and show evidence of pre-burial weathering and of root etching (Mazza pers. com.).

These accumulated evidence suggests that the antler of *Eostyloceros* might be extraneous to the Montopoli mammal assemblage. Two alternatives could explain its occurrence:

- 1) Lower Pliocene continental or shallow marine deposits are more widespread than previously supposed, as suggested by recent investigations in nearby areas (e.g. Valdelsa and Val di Pesa Basins, Benvenuti & Degli Innocenti 2001; Rook et al. 2001; Tangocci 2001), and therefore the *Eostyloceros* remain could have been re-worked from those deposits;
- 2) alternatively, the antler might have not been recovered at the Montopoli site, but somewhere else in the surroundings, wherein Lower Pliocene continental deposits outcrop.

Systematic palaeontology

- Order Artiodactyla Owen, 1848
- Suborder Ruminantia Scopoli, 1777
- Infraorder Pecora Linnaeus, 1758
- Family Cervidae Gray, 1821
- Subfamily Muntiacinae Pocock, 1923
- Genus *Eostyloceros* Zdansky, 1925

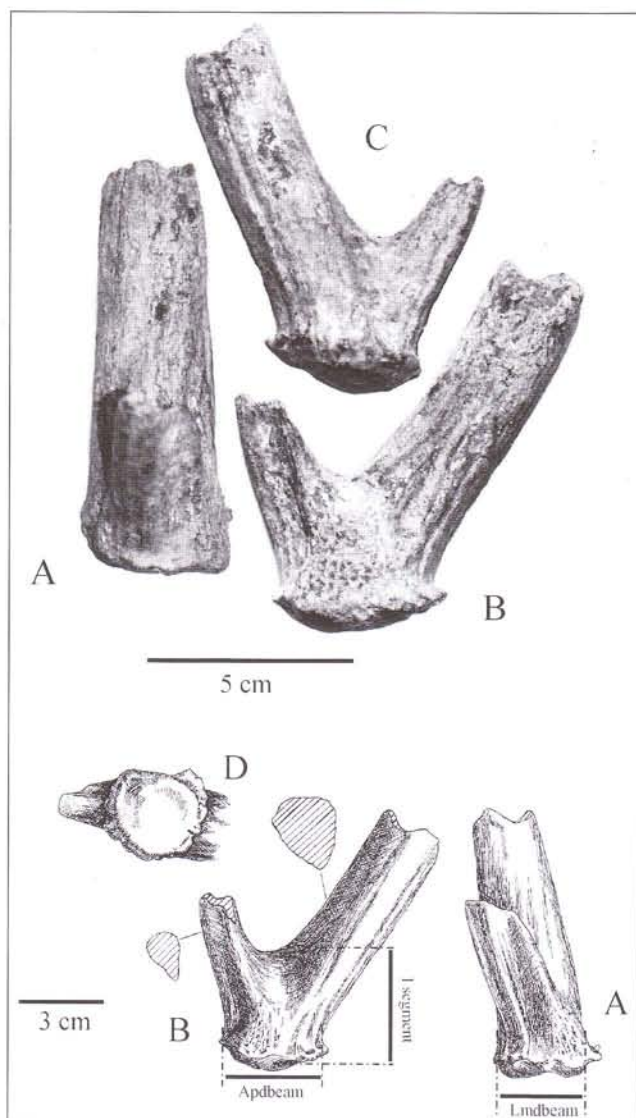


Fig. 3 - *Eostyloceros cf. pidoplitschkoi* IGF8218v from Lower Valdarno. A - frontal view, B - medial view, C - lateral view, D - ventral view of burr.

***Eostyloceros cf. pidoplitschkoi* Korotkevitch, 1964**

Fig. 3

Material. A right shed antler IGF8218v (Fig. 3, Tab. 1)

Description. The antler is two-pointed, with the bifurcation set close to the burr (Fig. 3; Tab. 1); the anterior tine is comparatively smaller than the posterior one, which is broken at about 10 cm from its base. The surface is streaked by well developed ridges and furrows. Close to the bifurcation, on the medial side, the surface is intensely pearly. The cross section of the anterior branch is triangular-shaped (Fig. 3B). The posterior branch has a triangular cross section too, which turns oval in the distal part (Fig. 3B). In frontal view the beam is straight. The anterior branch forms an angle of 45° with the posterior branch.

Discussion and Comparisons. The antler has a typical Muntiacine morphology. The short length, the dichotomous pattern with the splitting close to the burr and the disproportion between the branches are typical *Eostyloceros* traits (Fig. 3).

While Muntiacinae cervids are very common in the European mammal faunas during Middle and Late Miocene (see for example Azanza 2000), they decline considerably from the Early Pliocene, when their geographic distribution shrinks to include only eastern Europe and Asia, with only one fairly well documented western European genus, *Paracervulus*, which characterizes the Latest Turolian-Ruscinian faunas (Vislobokova 1992; Dong 1996; Abbazzi 2001; Abbazzi & Azanza 2000).

The Italian antler has been compared with muntiacine from latest Miocene-Early Pliocene European and Asiatic sites: *Eostyloceros pidoplitschkoi* (from Lower Pliocene deposits of Kuchurgan river at sites Novopetrovka, Yurievka, Voinich, and from Trifonesti type locality, south-eastern Moldova, Korotkevitch 1970), *Eostyloceros blainvillei* (latest Miocene of China and Mongolia, Korotkevitch 1970; Vislobokova 1983, 1990), and *Muntiacus pliocaenicus* (Early Pliocene of Ukraine, Korotkevitch 1970).

The comparison of the length of the first segment (lateral distance measured from the bifurcation to the burr, Fig. 3) with the antero-posterior diameter of the antler base (measured just above the burr, Fig. 3) is shown in Fig. 4a. In this diagram the points representing *E. blainvillei* form a quite separate cluster from those of *E. pidoplitschkoi*, thus attesting to a longer 1st segment. *Muntiacus pliocaenicus* is also separated from *Eostyloceros*, being significantly smaller-sized and having a higher bifurcation, like in Recent *Muntiacus*. The cloud of points relative to *E. pidoplitschkoi* from Ukraine evidences that the 1st segment and the dimensions of antler base are inversely correlated. The lower position of the bifurcation expands the antero-posterior diameter. The lowering of bifurcation is an ontogenetic character, older individuals having a smaller value in the 1st segment, as already pointed by Korotkevitch (1970). This feature is shared by other cervid genera as well.

Focusing on mere morphological differences, the index relating the 1st segment to the latero-medial diameter of antler base (1st segment/lmdbeam of antler base × 100, Fig. 3) is plotted against the index of flattening of antler base (apdbeam/lmdbeam × 100, Fig. 3) in Fig. 4b. The different morphology of *E. blainvillei* and *Muntiacus pliocaenicus* due to the higher position of bifurcation and more circular antler base is confirmed. The antler of Montopoli differs from that of *E. pidoplitschkoi* in the sub-circular cross-section of the antler base. On the basis of the accumulated evidence, we can confidently refer the Italian antler to the genus *Eostyloceros*, while for its specific attribution we cautiously refer to it as to *E. cf. pidoplitschkoi*.

Taxon	Locality	apdburr	lmdburr	apdbeam	lmdbeam	I segm.	angle
<i>E. cf. pidoplitschkoi</i>	Tuscany	--	--	37.0	36.6	32.4	55°
<i>E. pidoplitschkoi</i>	Trifonesti	51.6	37.0	43.5	24.2	39.8	70°
<i>E. pidoplitschkoi</i>	Yurievka (Kuchurgan)	43.0	31.3	37.0	21.2	29.0	--
<i>E. pidoplitschkoi</i>	"	34.4	25.0	30.0	20.5	29.5	--
<i>E. pidoplitschkoi</i>	Voinich (Kuchurgan)	40.0	31.5	39.6	27.2	27.8	--
<i>E. pidoplitschkoi</i>	"	29.8	26.7	30.0	24.0	33.0	--
<i>E. pidoplitschkoi</i>	Novopetrovka (Kuchurgan)	33.5	33.7	30.8	26.5	35.0	--
<i>E. pidoplitschkoi</i>	"	38.3	32.0	37.2	24.5	31.0	--
<i>E. pidoplitschkoi</i>	"	35.0	30.5	--	--	--	--
<i>E. pidoplitschkoi</i>	"	--	26.7	--	--	20.0	--
<i>E. pidoplitschkoi</i>	"	29.0	19.6	--	--	23.00	--
<i>E. pidoplitschkoi</i>	"	30.0	27.0	25.5	21.5	32.5	--
<i>E. pidoplitschkoi</i>	"	41.0	29.5	37.0	22.3	23.0	--
<i>E. pidoplitschkoi</i>	"	36.3	26.2	30.5	19.4	23.5	--
<i>E. pidoplitschkoi</i>	"	31.0	24.0	31.0	24.6	37.5	--
<i>E. blainvillei</i>	Cina	52.0	--	41.0	--	60.0	--
<i>E. blainvillei</i>	"	53.5	--	41.0	--	59.0	--
<i>E. blainvillei</i>	"	46.0	--	--	--	41.5	--
<i>E. blainvillei</i>	"	57.0	--	37.0	--	51.5	--
<i>E. blainvillei</i>	"	55.5	--	37	--	53.0	--
<i>E. cf. pidoplitschkoi</i>	Lucesti	47.4	48.8	40.5	33.0	29.0	90°
<i>M. pliocaenicus</i>	Kuchurgan	34.0	28.0	--	--	27.5	--
<i>M. pliocaenicus</i>	"	18.5	16.0	18.5	16.0	36.0	--
<i>M. pliocaenicus</i>	"	20.8	19.6	20.8	19.6	38.0	--

Tab. 1 - Measurements of antlers of *Eostyloceros* and *Muntiacus* species. All data are from Korotkevitch (1970). Legend: apdburr = antero-posterior diameter of burr; lmdburr = latero-medial diameter of burr; apdbeam = antero-posterior diameter of beam just above burr; lmdbeam = latero-medial diameter of beam just above burr; I segm. = first segment length; angle = angle of bifurcation.

Eostyloceros pidoplitschkoi Korotkevitch is the only species of the genus known from the Early Pliocene of Est Europe. The definition of this deer is based on the morphology of antlers, pedicles and frontal bones. The

type specimen (Nr 5634, stored in the National Museum of Natural History, Kiev, Fig. 5a), was discovered in the fossiliferous outcrop near Trifonesti, (eastern Moldova) from the "Pliocene Bessarabian sands" and the main part of the material ascribed to this species was found in the deposits of the Kuchurgan river valley (Fig. 5b). The other species of *Eostyloceros*, *E. blainvillei* Zdansky, *E. triangularis* Zdansky, *E. propria* Abdrahmanova and *E. maci* Vislobokova are described from the Latest Miocene-Early Pliocene of China, Mongolia and Kazakhstan, and from the Early Pliocene of Baikal region of Russia (Zdansky 1925; Abdrahmanova 1974; Vislobokova 1985, 1990).

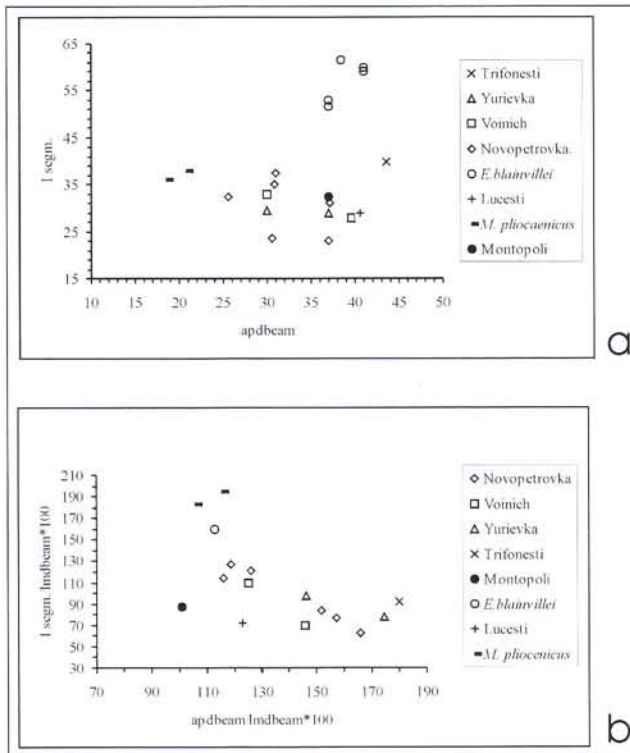


Fig. 4 - a) Scatter diagram of first segment against antero-posterior diameter of antler base (apdbeam) of *E. pidoplitschkoi* from Trifonesti, Yurievka, Voinich and Novopetrovka, *E. blainvillei* from Cina, *E. cf. pidoplitschkoi* from Lucesti and "Montopoli", and *M. pliocaenicus* from Kuchurgan river. b) Scatter diagram of first segment/latero-medial diameter of antler base*100 against antero-posterior diameter of antler base/latero-medial diameter of antler base*100 of *E. pidoplitschkoi* from Trifonesti, Yurievka, Voinich and Novopetrovka, *E. blainvillei* from Cina, *E. cf. pidoplitschkoi* from Lucesti and "Montopoli", and *M. pliocaenicus* from Kuchurgan river.

Conclusion

The occurrence of *Eostyloceros* in Italy represents a significant westward expansion of the known Pliocene geographic distribution of this genus.

Unfortunately the unknown stratigraphical context prevents any further conclusions about the occurrence of this genus. The accompanying fauna at Kuchurgan, where Korotkevitch (1964) first discovered the finds of *E. pidoplitschkoi*, is different from that of Montopoli, and contains species as *Muntiacus pliocaenicus* Korotkevitch, *Pliocervus kutchurganicus* Korotkevitch, *Paracervulus australis* (de Serres), *Procapreolus cf. cusanus* (Croizet et Jobert) which indicate a Ruscinian Age (see also Korotkevitch 1965).

Therefore, also with the support of the sedimentological evidence presented here, the antler fragment from Montopoli can be reasonably interpreted as an element stratigraphically incongruous to the rest of the Montopoli local fauna, possibly reworked from nearby lower Pliocene deposits, or the result of inappropriate recovery.

Nonetheless, the presence of an *Eostyloceros* representative in the Tuscan Paleontological collections urges

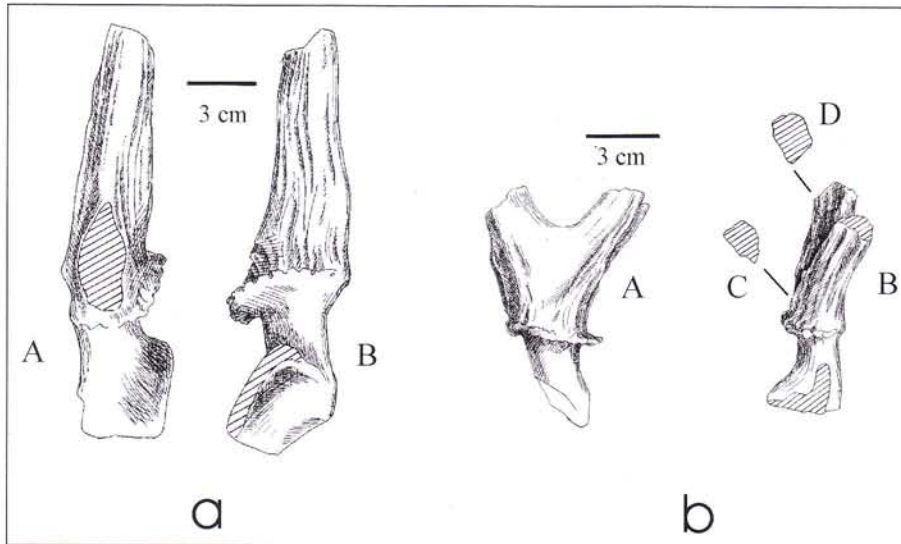


Fig. 5 - a) *Eostyloceros pidoplitschkoi* from Trifonesti (Moldavia) holotype, right antler on frontal bone n. 5635 (Paleontological Department of the National Museum of Natural History, Kiev), adapted from Korotkevitch (1964), A) frontal view, B) medial view; b) *Eostyloceros pidoplitschkoi* from Kuchurgan (Ukraine), left antler on frontal bone n. 1549 (Paleontological Department of the National Museum of Natural History, Kiev), A) medial view, B) anterior view, C) cross section of anterior branch, D) cross section of posterior branch.

to the adoption of multidisciplinary investigations in the reconstruction of the paleoenvironmental evolution of the Neogene of Tuscany.

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