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Early Pleistocene large mammals from Villa Spinola (Perugia, Central Italy)

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ABSTRACT – At the end of the 19th century, in the surroundings of Villa Spinola (Perugia), fossil mammal remains including proboscideans, rhinos, equids, suids, cervids, bovids and a panther were discovered. Unfortunately, most of these fossil bones were lost. The present work focuses on the still available fossil bones of *Panthera gombaszoegensis* and *Mammuthus meridionalis* (advanced form), stored at Perugia in the Cicioni and Bellucci Collections. Such analysis enables to point out considerations on the faunal assemblage biochronology and on the stratigraphy of the deposit, not visible anymore. The fauna can be referred to the Late Villafranchian (Early Pleistocene). Considerations on the fossilization suggest that the fossil bones come from a paleosol that has never been recognised before.

RIASSUNTO – [I grandi mammiferi del Pleistocene Inferiore di Villa Spinola (Perugia, Italia centrale)] – Alla fine del XIX secolo furono rinvenuti presso Villa Spinola (Perugia) resti di mammiferi fossili riferibili a proboscidei, rinoceronti, equidi, suidi, cervidi, bovidi e ad una pantera. Nel corso degli anni, purtroppo, gran parte di questi reperti sono andati perduti. In questo lavoro sono stati revisionati i fossili di *Panthera gombaszoegensis* e *Mammuthus meridionalis* (forma evoluta) ancora disponibili, conservati a Perugia nelle Collezioni Cicioni e Bellucci. L'analisi di tali resti ha permesso considerazioni sulla biochronologia della fauna e sulla stratigrafia del deposito, oggi non più visibile. La fauna è riferibile al Villafranchiano superiore (Pleistocene Inferiore). Considerazioni sul tipo di fossilizzazione inducono ad ipotizzare che le ossa fossili provengano da un paleosuolo, mai segnalato in precedenza.

INTRODUCTION

"Sul versante orientale della collina di Perugia a sud della città, dove il Tevere uscito dalla stretta di S. Giovanni, si allarga nella Valle tra M. Malbe e Deruta, poco a monte della confluenza con il Chiascio, si trova Villa Spinola nei pressi di S. Martinello" (Text-fig. 1).

With these words Tuccimei described the fossiliferous locality, not far from Perugia, where in 1894-95 Marquise Virginia Spinola found several mammal bones. He produced the following faunal list: *Felis arvernensis*, *Elephas meridionalis*, *Rhinoceros etruscus*, *Bos* sp., *Equus* sp., *Sus* sp. and *Cervus* sp.

The fossil bones were distributed among Marquises Spinola themselves, the St. Apollinare Museum in Roma, the Cicioni Collection and the Bellucci Collection in Perugia.

The large felid bones are part of the Cicioni Collection, today stored at the University of Perugia, the mammoth remains belong to the Bellucci Collection, today in the custody of the Soprintendenza per i Beni Archeologici dell'Umbria.

The geological section of S. Martinello, described by Tuccimei (1895), included from the bottom to the top, blue marls, blue marly sands, yellow sands and not well cemented gravels; the deposits were subhorizontal or slightly tilted. The section was exposed on the south side of the hill, towards the Tiber River

Valley and Ponte S. Giovanni and could be seen from Villa Spinola.

The fossil bones were probably discovered during the construction of the Roma–Perugia railway (Cioci, 2001). For this reason it is possible to delimit the fossiliferous deposit exposure to the right side of the Tiber River, in the area between S. Martinello and Piscille (today included in Perugia) that is part of the wide Marquises Spinola estate. Today the area is strongly urbanised and the stratigraphic succession is not exposed anymore.

Field observations and data inferred from literature suggest that the fossiliferous deposit can be considered as part of a fluvial sequence correlatable with the S. Maria di Ciciliano Formation (Basilici, 1995), which widely outcrops in the south-western branch of the Tiber river basin.

Several remains of *Mammuthus meridionalis* were found in 1894-'95: fragments of a skull, a tusk and a hemimandible, some ribs and vertebrae, partially destroyed during the excavations. All the bones are referable to an old male (the well restored tusk was stored at Villa Spinola).

The skeleton elements came from the yellow sands; the top of the tusk reached the overlying gravels (Tuccimei, 1895). Later on fossil remains belonging to a young specimen of the same species, together with a hemimandible of a rhino, referred by Tuccimei to *Rhinoceros etruscus*, were found and

stored at the St. Apollinare Museum (Tuccimei, 1896). Other isolated teeth, which Tuccimei generically referred to *Bos* sp., *Equus* sp., *Sus* sp. and *Cervus* sp., were collected and stored at the scientific cabinet of the Archiepiscopal Seminary in Perugia (Tuccimei, 1896).

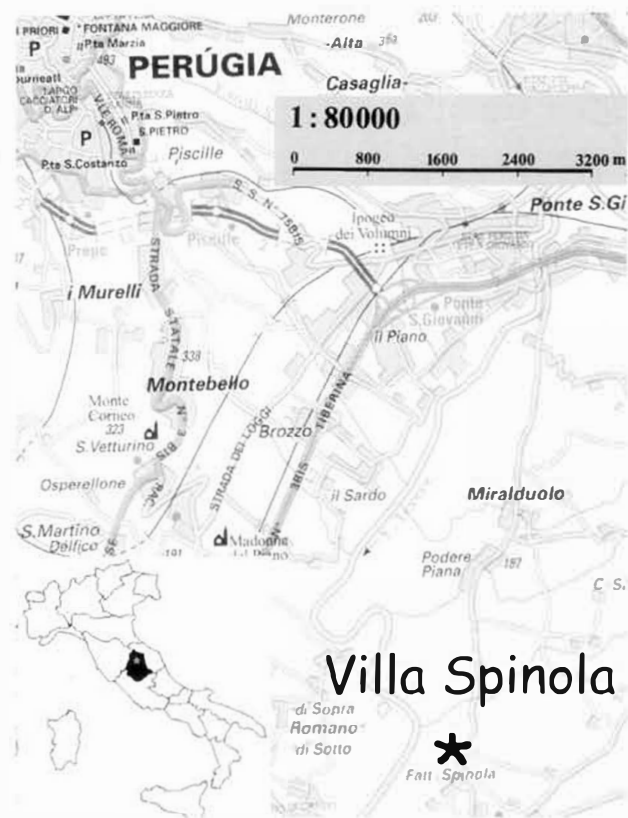
The fossil mammal remains of Villa Spinola needed a systematic revision that could allow a correct and updated biochronological definition. Unfortunately most of the remains were lost so the Authors could revise only part of the fossil collection.

THE EURASIAN JAGUAR *PANTHERA GOMBASZOEGENSIS*

The first occurrence of *Panthera gombaszoegensis* Kretzoi [= *Panthera toscana* (Schaub)] has been considered by Azzaroli (1977) as one of the main bio-events of the beginning of the Pleistocene (Late Villafranchian, Olivola F.U.). At present, Olivola F.U. is referred to the latest Pliocene (Gliozzi *et al.*, 1997). This large felid probably appeared in Asia during Pliocene and spread over Europe at the beginning of the Pleistocene, until the end of the Middle Pleistocene; however, an African origin of this taxon cannot be ruled out (Hemmer, 1971; Hemmer *et al.*, 2001). *Panthera gombaszoegensis* occurs in Italy at Olivola (Magra Valley), in several localities of the Upper Valdarno (Tuscany), in Val di Chiana (Tuscany) (Ficcarelli & Torre, 1968), in the Tiber River basin (Umbria) at Pantalla (Gentili *et al.*, 1997) and at Ellera di Corciano (Ambrosetti *et al.*, 1995), in the Tavernelle basin (Umbria) at Pietrafitta (Gentili *et al.*, 1997), and at Pirro Nord (Apulia) (*Panthera* sp. in Beaumont, 1979 and unpublished data) in Late Villafranchian faunas. The Eurasian jaguar is still present in Galerian faunas at Monte Peglia (Umbria) (Piperno *et al.*, 1984) and Slivia (Friuli Venezia Giulia) (Ambrosetti *et al.*, 1979; Bon *et al.*, 1992). The occurrence of *Panthera pardus* in a Late Villafranchian faunal assemblage from Argentario (Tuscany) was pointed out by Baschieri & Segre (1958). The fossil material of this locality needs to be revised but it is possible that the fossil referred to the leopard could be related to *Panthera gombaszoegensis*.

This large felid is not very frequent in Italy; its chronological distribution includes the Late Villafranchian and the Early Galerian (Gliozzi *et al.*, 1997). In Europe this species was recorded in several localities with Villafranchian and Galerian faunas: Tegelen (Netherlands) (Koenigswald, 1960), Mygdonia basin (Greece) (Koufos, 1992), Westbury (England), Untermassfeld and Mosbach (Germany), Atapuerca (Spain) and L'Escafe (France) (Turner, 1997, with references), Koneprusy (Czech Republic) (unpublished data), Gombaszoeg and Vertésszolos (Hungary) (Janossy, 1990).

Recent works focused the systematics of this large felid (Hemmer *et al.*, 2001; O'Regan, 2003).



Text-fig. 1 - Location map of Villa Spinola.

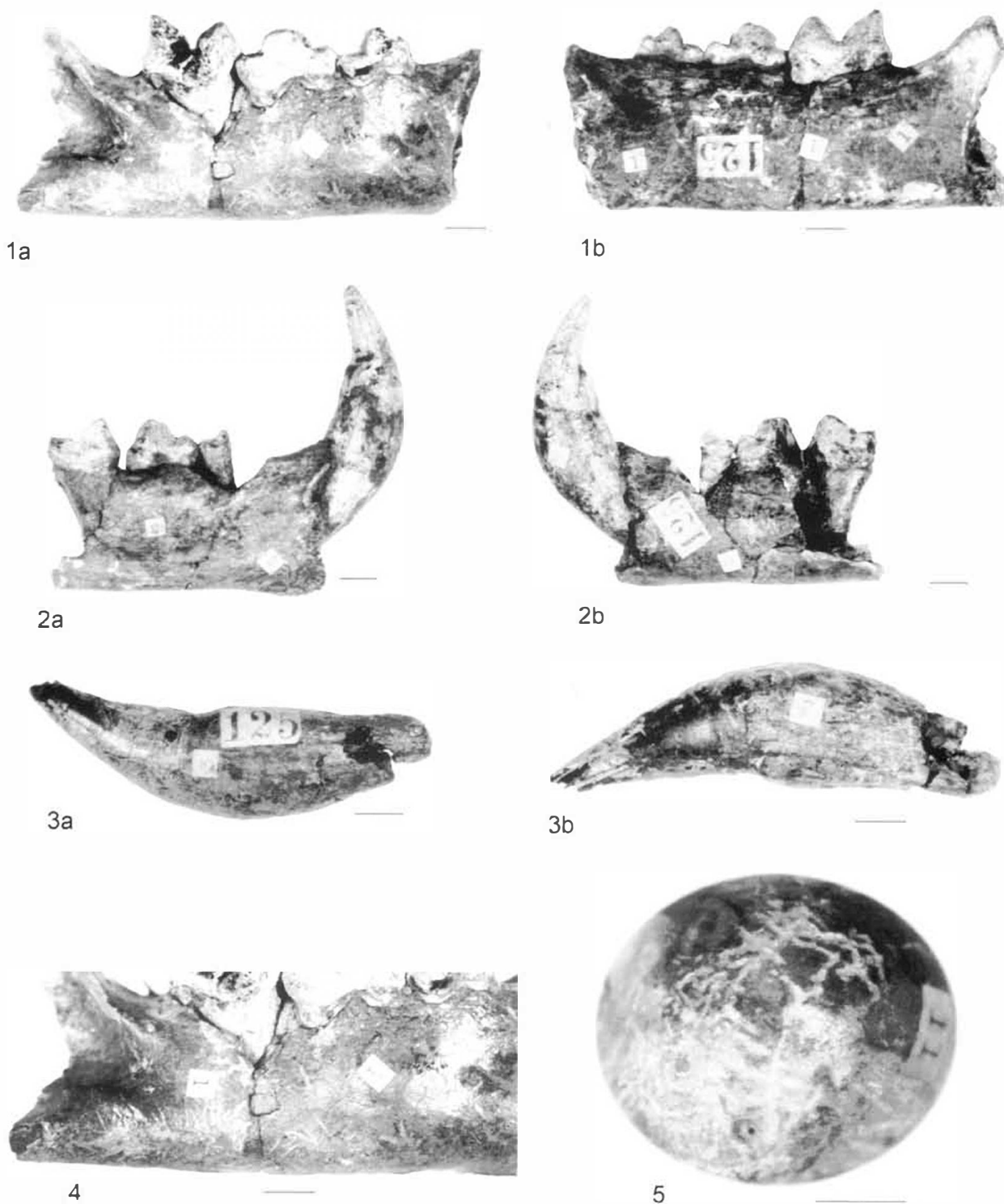
Hemmer *et al.* (2001) refer the Late Villafranchian and Galerian fossil remains of this pantherine cat to European chronosubspecies of the jaguar *Panthera onca* (*Panthera onca toscana* for the Late Villafranchian specimens and *Panthera onca gombaszoegensis* for the Galerian ones).

In this paper the use of the taxonomical term *Panthera gombaszoegensis* is preferred because, even if both Eurasian and American jaguars show strong affinities, the fragmentary nature and the scantiness of the remains cannot exclude a specific distinction between the two groups.

The fossil remains from Villa Spinola belong to one specimen, represented by isolated canines, the two hemimandibles, the second cervical vertebra, some thoracic vertebrae and fragments of the left and right femurs (Pl. 1, figs. 1-5).

The canines are developed, conical, with the typical longitudinal grooves, the jugal teeth show P_3 - P_4 and P_4 - M_1 indexes falling in the range of the late Villafranchian Eurasian jaguar. The morphology of the jugal teeth is similar to that of modern large felids, the lower carnassial shows a weak ralonid, with the protoconid and paraconid divided by a quite wide furrow, larger than in other Pleistocene species referable to the genus *Panthera* (Argent, 1991).

The specimen from Villa Spinola shows a strong



EXPLANATION OF PLATE 1

Figs. 1-5 - *Panthera gombaszoegensis* Kretzoi from Villa Spinola.

1 - left mandible: a) labial view, b) lingual view; 2 - right mandible: a) labial view, b) lingual view; 3 - upper right canine: a) labial view, b) lingual view; 4 - particular view of the traces of the vegetable roots on the mandible; 5 - particular view of the traces of the vegetable roots on the left caput femuri.
Scale bars = 1 cm.

Measures	Villa Spinola
L. upper right C	17.6
W upper right C	15.7
Height of the mandible at C-P/3 diastema	33.5
Height of the mandible behind M/1	33.4
L. left jugal teeth series	61.2
L. lower left C	17.5
W lower left C	14.2
L. left P/3	16.7
W left P/3	9.7
L. left P/4	23.0
W left P/4	10.0
L. left M/1	24.0
W left M/1	12.0

Tab. 1 – Measures (mm) of the remains of *Panthera gombaszogensis* from Villa Spinola. L = length; W = width.

P₃ and is larger than the Late Villafranchian panthers from Olivola and Upper Valdarno (Tab. 1), but it is smaller than the Galerian European ones. According to Hemmer *et al.* (2001), such characters have a biochronological significance, thus the specimen from Villa Spinola can be placed in the late Villafranchian group (referred by these Authors to *P. onca toscana*).

THE SOUTHERN MAMMOTH *MAMMUTHUS MERIDIONALIS*

The southern mammoth, or a closely related form (Palombo, 1994; Ferretti, 1998), first occurred in Europe in Late Pliocene. It became widespread throughout the Northern Hemisphere (including North America) in the Early Pleistocene (Late Villafranchian, Tasso F.U.) with the subspecies *Mammuthus meridionalis meridionalis* (Azzaroli, 1977; Lister, 1996; Ferretti, 1998). European specimens younger than those of the Tasso F.U. seem to testify the occurrence of two distinct lineages of southern mammoths, derived from *M. meridionalis meridionalis* (Ferretti, 1999). The first lineage is represented in Italy by *M. meridionalis vestinus* Azzaroli, 1977 and related forms, as the one occurring at Pietrafitta (Ikome, 1995; Gentili *et al.*, 1996), in a mammal fauna referable to the Farneta F.U. These specimens are large-sized with particularly large tusks and specialised skull morphology; the molars do not show any noteworthy difference from those of *M. meridionalis meridionalis*. Fragmentary remains seem to attest that this lineage survived in Italy until the beginning of the Middle Galerian (Slivia F.U., Middle Pleistocene; Ferretti, 1999).

The second evolutionary lineage, which is widely distributed, includes the material referred to *M. meridionalis* ex gr. *tamanensis* (= *voigtstedensis*)

(Siniaya Balka, Russia, Dubrovo, 1964; and Voigtstedt, Germany, Dietrich, 1958) that existed in the second part of Early Pleistocene (Foronova, 2001). This group has more hypsodont molars, with a higher number of plates; these features probably were an adaptation to a grass-rich diet. The forms belonging to this second group show metrical characters that are between *M. meridionalis meridionalis* and middle Pleistocene *M. trogontherii* (Pohlig, 1885). Their distribution in Western Europe is from the Colle Curti F.U. (Early Galerian) to the Slivia F.U. (Early Middle Galerian). In Italy the *Mammuthus* remains from Imola (Imola Sands Formation; Slivia F.U.; Ferretti 1999) may belong to this group.

M. meridionalis meridionalis is well represented in the Late Villafranchian (Olivola, Matassino, Tasso local faunas) of Tuscany. The Late Villafranchian mammal assemblages suggest the occurrence of a relatively cold climatic phase, with the diffusion of forest/parkland biotopes (Gliozzi *et al.*, 1997). In the younger faunal assemblages referable to the Farneta F.U. *M. meridionalis meridionalis* is replaced by *M. meridionalis vestinus*. This subspecies is considered a highly specialised feeder and its occurrence can be linked with the diffusion of savannah parkland with high trees, shrubs and grass (Ferretti & Croitor, 2001). At Pietrafitta the abundance of this advanced form of southern mammoth, together with the composition of the mammal assemblage, fit well with the occurrence of a palustrine environment, surrounded by grassland enriched with rare trees and shrubs (Ambrosetti *et al.*, 1992).

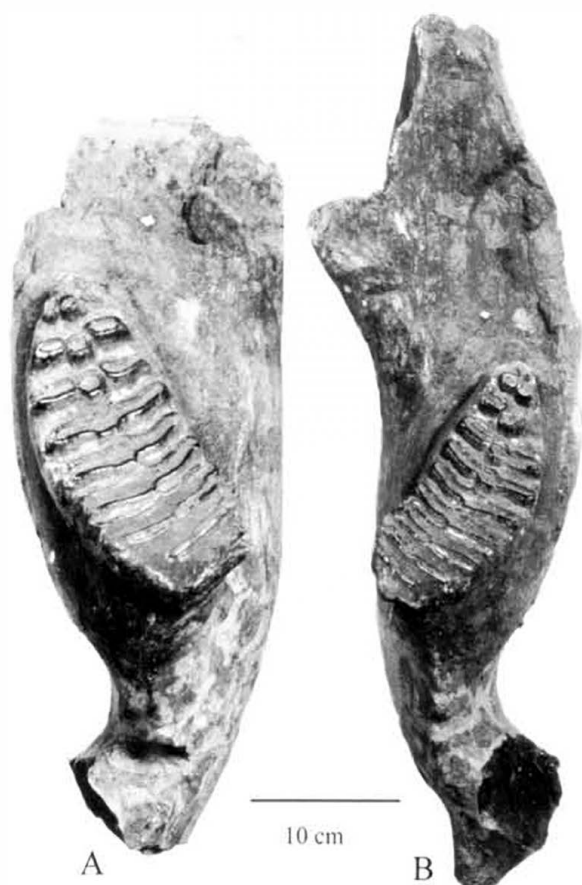
In Umbria this species was also found in a Middle Pleistocene deposit at Promano (Città di Castello) (unpublished data).

The tusk of the elephant, found by Tuccimei in 1894-'95, at Colonna Property, within the Villa Spinola estate, was discovered between the yellow sands and the gravels, and today is stored at the "Soprintendenza Archeologica per l'Umbria" (De Angelis, pers. comm.). The mandible, some ribs and other fragments of the same specimen were found near S. Martinello within the Villa Spinola estate (Perugia) (Calzoni, 1956).

The diameter of the tusk indicates that the specimen was an adult. The tusk is 3 m long, but now it is divided into three parts. The tusk is curved and twisted in the typical shape of *Mammuthus*. The revision of the tusk allows to refer it to *Mammuthus* cf. *M. meridionalis*.

The hemimandibles were restored and their fractures were filled at the time of the discovery. Such restoration does not allow the evaluation of the deformation degree of the fossil remains (Text-fig. 2).

The left hemimandible (Inv. N°. 291722) lacks the symphysis behind the posterior side of the alveolus. The tooth is M₂, the only one that was still working when the animal died. This tooth is rather worn-



Text-fig. 2 - *Mammuthus meridionalis* Nesti (advanced form) from Villa Spinola.
A) left mandible; B) right mandible.
Scale bar = 10 cm

out and some plates are lost. It has 9-10 plates, all in use. The plates show a complete enamel loop, except the last two; these are still divided into three rings each. The occlusal surface is narrow. The talon is damaged.

The right hemimandible (Inv. N°. 291721) lacks the symphysis and the ascending *ramus* and shows the typical features of *Mammuthus meridionalis*. The *corpus* is rather long with a lightly inflated labial side. The angle between the ascending *ramus* and the *corpus* is quite wide.

Measures	Villa Spinola right	Villa Spinola left
Length oral border of the alveolus	266	255
Height of the mandible at midpoint of cheektooth row	180	146

Tab. 2 - Measures (mm) of the mandible of *Mammuthus meridionalis* from Villa Spinola.

Measures	Villa Spinola right	Villa Spinola left
GL	245	228,5
FL	223	213?
GB	96	89
FB	86	85
PF	11	-10
QLI	22,2	22,8
DLI	4,4	4,3
GH	43	23
K	0,4	0,2
E	3,8	3,5

Tab. 3 - Measures (mm) of the molars of *Mammuthus meridionalis* from Villa Spinola: GL = greatest mesio-distal length; FL = occlusal length; GB = greatest bucco-lingual breadth; FB = occlusal breadth; PF = plate formula (including talons); QLI = ratio between GL and the number of plate; DLI = lamellar density index (PF/GL X100); GH = greatest height; K = hypsodonty index (GH/GB); E = medium thickness of the enamel of the plate (from Ferretti, 1999; Maccagno, 1962).

The molar placed in the mandible is M_2 , it is rather worn-out, with 11 plates. These plates show a complete enamel loop, except the last two ones, which are still divided into rings. The enamel is rather thick. The molar is narrow and concave, its height is reduced.

The metrical and morphological features of the specimen of Villa Spinola are within the variability range of *M. meridionalis*, with great affinities with the specimens from the Early Pleistocene (late Villafranchian - Farneta F.U.) deposits of Pietrafitta and Scoppito (L'Aquila, Abruzzi) (Maccagno, 1962). They are bigger than the Middle Pleistocene specimens from Oriolo (Emilia Romagna) (Ferretti, 1999) and Promano (Umbria) (unpublished data). The enamel frequency is quite high, similar to those of the Pietrafitta, Promano and Oriolo specimens. For these reasons, the specimen from Villa Spinola can be referred to *M. meridionalis* (advanced form).

CONCLUSIONS

According to the description given by Tuccimei (1896), the mammal fauna of Villa Spinola comes from a fluvio-lacustrine deposit correlatable with the S. Maria di Ciciliano Formation (Basilici, 1995). From the south-western branch of the Tiber River basin, Early Pleistocene vertebrate remains have been recorded in this formation, both from alluvial deposits and paleosoils (Sardella *et al.*, 1995; Gentili *et al.*, 1997; Petronio *et al.*, 2000-2002) and the occurrence of several late Villafranchian mammal assemblages and their biostratigraphical implications have been recently pointed out (Sardella *et al.*, in press). Moreover, the well-known mammal assemblage from Pietrafitta referred to the Farneta F.U.,

comes from a locality about 25 km from Perugia. The traces of chemical alterations on the skeletal remains were probably due to the action of the soil and of small plants. In particular, the right hemimandible and both *capiti* of the femur belonging to *Panthera gombaszoegensis* show typical traces of roots (see Behrensmeyer & Hill, 1980). Such kind of evidence suggests that the fossils came from a paleosol, which was not recognised by Tuccimei or other later researchers.

The analysis of the fossil material coming from Villa Spinola enables to refer it to Early Pleistocene. Unfortunately nothing can be said about the taxonomical position of the rhino, equids, suids, cervids and bovids recorded in the deposit, but the occurrence of a quite rich mammal assemblage can be testified.

Taking into account the evolutionary degree of the southern mammoth and the Eurasian jaguar the mammal assemblage from Villa Spinola can be referred to the late Villafranchian (probably Farneta F.U.), confirming the occurrence in the S. Maria di Ciciliano Formation of different mammal assemblages.

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