

BIOCHRONOLOGY OF THE PLEISTOCENE MAMMAL FAUNAS FROM ROME URBAN AREA

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ABSTRACT - *Biochronology of the Pleistocene mammal Faunas from Rome urban area.* - In the Rome area nowadays it is not possible to verify the stratigraphical references on the Pleistocene faunal assemblages in different times. The writers, considering the last biochronological model of the plio-pleistocene mammals of Italy, make many observations on the biochronological sequences of mammals in the roman urban area from Olivola F.U. (Mammal Age late Villafranchian: early Pleistocene) to Vitinia F.U. (Mammal Age middle Aurelian: middle late Pleistocene).

RIASSUNTO - *Biocronologia delle faune a mammiferi pleistocenici dell'area di Roma.* - Nell'area urbana di Roma attualmente è impossibile qualsiasi verifica sul terreno delle diverse situazioni stratigrafiche nei numerosi giacimenti a macromammiferi pleistocenici segnalati già dal secolo scorso nei sedimenti terrazzati del Tevere. Gli autori, applicando lo schema biocronologico proposto dalla maggior parte dei paleontologi dei vertebrati nel 1997, ricostruiscono la biocronologia dei mammiferi pleistocenici dell'area di Roma dall'Unità faunistica di Olivola (Età a mammiferi Villafranchiano superiore: Pleistocene inferiore) all'Unità faunistica di Vitinia (Età a mammiferi Aureliano medio: Pleistocene medio superiore).

Parole chiave: Biocronologia, Mammiferi, Pleistocene, Roma.
Key words: Biochronology, Mammals, Pleistocene, Rome.

INTRODUCTION

Nowadays it is not possible to verify the stratigraphical references on the faunal assemblages found in the Rome area (fig. 1) in different times. These references could allow to attribute the faunal remains to a specific chronological period but in most of sites we cannot do any direct observation of the lithological sequences for the human activities; in some other cases, therefore, the Authors of the past do not give useful stratigraphical information that could correspond to a modern model.

The stratigraphical, geological and structural pattern of the Rome urban area might be redefined with some work of modern Authors, like those of Conato *et al.* (1980) (fig. 2) and Marra & Rosa (1995) (fig. 3). Starting from these information, where available, and considering the last biochronological model of the plio-pleistocene mammals of Italy (Gliozzi *et al.*, 1997), we can make some observations on the biochronological sequences of mammals in the Rome area during the Pleistocene. These sequences demonstrate that in the roman urban area there are numerous local faunas in a wide time span, from the late Villafranchian faunas to the late Aurelian faunas (fig. 4).

Most of remains considered for the realization of

this paper are stored in the Paleontological Museum of the "La Sapienza" University of Rome and they are mostly edited in different times, from the end of the last century to today. We want also remember that we will consider as the basis for the first occurrences and the last occurrences of the various macromammal taxa, the scheme proposed by Gliozzi *et al.* (1997).

BIOCHRONOLOGY OF THE ROME URBAN AREA

Late Villafranchian

Olivola F. U. – Tasso F. U.

The most ancient remain found in the Rome area is molar attributed to *Mammuthus meridionalis* (Caloi & Palombo, 1988); it was recovered from the sands and salty clays of Monte Mario (figg.1, 2) referred to the Lower Pleistocene (Santernian). The morphological features of this remain are similar to those of *M. meridionalis meridionalis*, a form typically diffused in the faunal association from the middle Villafranchian to the Olivola and Tasso Faunal Units. These features, even if only a tooth has been found, do not testified the presence of *M. m. vestinus* which spreads from the Farneta F. U.

Pirro F. U.

Numerous mammal remains come from the gravel quarry of Redicicoli (fig. 1), in a different state of preservation, that have been studied only in recent works (Caloi *et al.*, 1980a; Caloi & Palombo, 1995).

According to the writers, the faunal assemblage is

constituted by typical villafranchian forms (*Mammuthus meridionalis* ssp., *Bison (Eobison) degiulii*) associated with galerian forms (*Stephanorhinus hundsheimensis*, *Megaceroides cf. solilhacus*, *Bison schoetensacki*) and with forms diffused in a wide biochronological span (*Euraxis eurygonos*, *Equus* aff. *Equus altidens*, *Hippopotamus antiquus*).



Fig. 1 - Map of Rome with the main Pleistocene mammal fauna sites.

Mappa dell'area urbana di Roma con i principali siti contenenti faune a Mammiferi del Pleistocene.

- | | | | | | |
|------------------------|-------------------------|----------------------------|-------------------------|------------------------|----------------------|
| 1 - Aventino | 8 - Cava Nera Molinaro | 15 - Monte Sacro | 22 - Porta Cavalleggeri | 29 - S. Agnese | 36 - Via del Tritone |
| 2 - Batteria Nomentana | 9 - Celio | 16 - Monte Verde | 23 - Porta Falmarina | 30 - S. Paolo | 37 - Via Nazionale |
| 3 - Boccea | 10 - Fondamenta BNL | 17 - Monti della Farnesina | 24 - Porta Pia | 31 - Saccopastore | 38 - Via Ostiense |
| 4 - Campidoglio | 11 - GRA km 2 | 18 - Parioli | 25 - Porta Salaria | 32 - Sedia del Diavolo | 39 - Via Portuense |
| 5 - Campo di Merlo | 12 - Monte Antenne | 19 - Pincio | 26 - Prati Fiscali | 33 - Tor di Quinto | 40 - Vigna S. Carlo |
| 6 - Casal dé Pazzi | 13 - Monte delle Picche | 20 - Ponte Mammolo | 27 - Quirinale | 34 - Via Aurelia | 41 - Vigne Torte |
| 7 - Castro Pretorio | 14 - Monte Mario | 21 - Ponte Molle | 28 - Redicicoli | 35 - Via Cassia | 42 - Villa Chigi |

This faunal assemblage has been referred to the Colle Curti F. U. (Caloi & Palombo, 1995), when some villafranchian elements still lived together galerian forms.

According to the writers, however, this hypothesis do not seems likely for some reasons:

1. *Bison (Eobison) degiulii* characterizes the Pirro F. U. and if we exclude its reference at Redicicoli, it has never been found in other Faunal Units;

2. *B. schoetensacki* is a typical galerian element, even in its primitive form, it occurs from the Slivia F. U. but it is widely diffused only from the Isernia F. U.; moreover, it is quite difficult to explain the contemporary presence of two bison species in a paleoecological point of view;

3. the presence of megacerine forms with slender limbs, attributed to *Megaceroides solilhacus* is referred only in the galerian faunas in the Italian peninsula, even if in Europe they are referred in late Villafranchian faunal association (Venta Micena – this attribution is however doubtful according to Azzaroli and Mazza, 1993), and they can be associated very hardly with *Bison (Eobison) degiulii*.

Nowadays it is not possible to reconstruct the exact position of the Redicicoli quarry and therefore its stratigraphy; some taphonomical observation on the different state of preservation of the remains (frequent fragmentation, flutiation, non-uniform post-depositional permineralization) make more complex the picture.

On the basis of all these consideration, however, it seems reasonable to separate the remains from Redicicoli into two faunal association: the older one (Redicicoli 1) of late Villafranchian age referable to the Pirro F. U. and characterized by the presence of *Bison (Eobison) degiulii*, *Equus* aff. *Equus altidens* and *Mammuthus meridionalis* ssp., and the younger one (Redicicoli 2) of middle Galerian age characterized by *Megaceroides* cf. *solilhacus*, *Stephanorhinus hundsheimensis* and *Bison schoetensacki*. The Isernia F. U. (*sensu* Petronio & Sardella, 1999) is characterized by *M. solilhacus*; the megacerine remains from Redicicoli 2 is represented only by a complete metacarpal with the biometrical and morphological features referable to a form with slender limbs very close to *M. solilhacus* (Di Stefano, unpublished data); however, the scarcity of the remains do not allow a more precise taxonomical attribution and therefore further biochronological considerations.

Galerian

Isernia F. U.

Numerous vertebrate remains have been collected from the so-called "Ponte Molle gravels" (fig. 1) and they are referred to three different periods (Capasso Barbato *et al.*, 1998).

A faunal assemblage referable to a middle

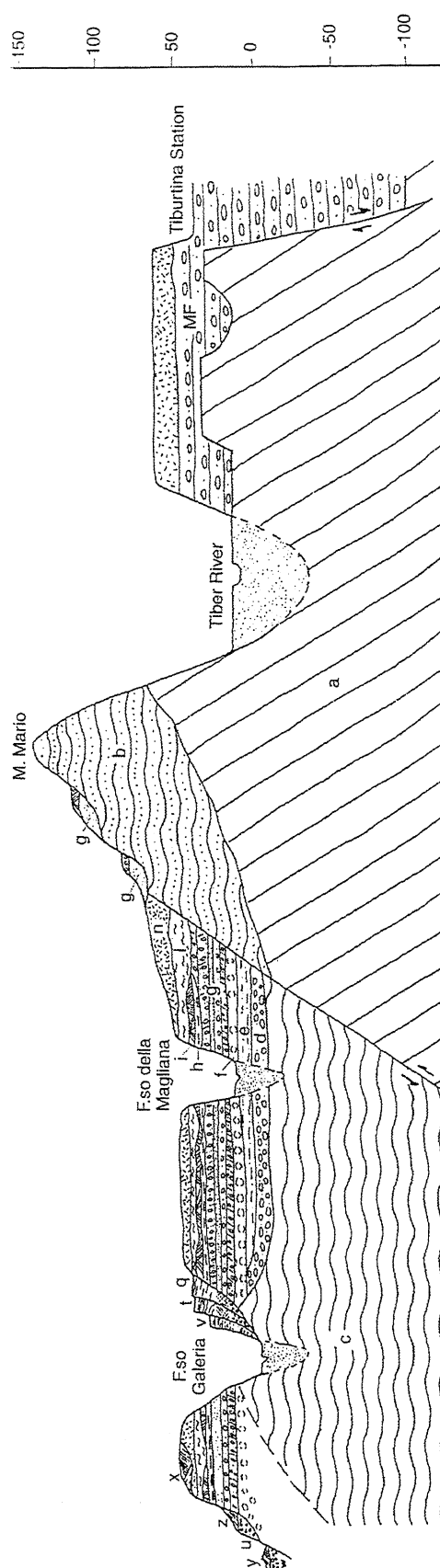


Fig. 2 - General outline of the stratigraphical relations of the Quaternary Formations on the right Tiber valley side: a) Early Pliocene; b) M. Mario Formation; c) M. Piche Series; d-n) P. Galeria Formation; d) river pebble and cobble conglomerates; e) blue-gray *Helicella*-bearing clays; f) beach conglomerates and bright yellow sands with *A. islandica*; g) pebble gravels and sands with frequent cross-lamination; h) *Venerupis senescens* clays; i) eolian salmon sands; j) lacustrine and marshy deposits; n) "tuffi di Sacrotano"; q) S. Cosimato Formation; t) Aurelian Formation; u) Eutyrrhenian deposits; v) Vitinian Formation; z) Older Dune; w) Neotyrrhenian deposits; y) Younger Dune (from Conato *et al.*, 1980, modified).

Schema generale dei rapporti stratigrafici delle Formazioni quaternarie nella riva destra della valle del Tevere: a) Pliocene inferiore; b) Formazione di M. Mario; c) Serie di M. delle Piche; d) ciottoli fluviali e conglomerati; e) argille blu-grigie ad *Helicella*; f) conglomerati di spiaggia e sabbie giallastre con *A. islandica*; g) ghiaie e sabbie con frequenti laminazioni incrociate; h) argille con *Venerupis senescens*; i) sabbie eoliche salmoneate; j) depositi lacustri e palustri; n) "tuffi di Sacrotano"; q) Formazione di S. Cosimato; t) Formazione Aurelia; u) depositi Eutyrrheniani; v) Formazione di Vitinia; v) Duna antica; w) Duna recente; (ridisegnato da Conato *et al.*, 1980).

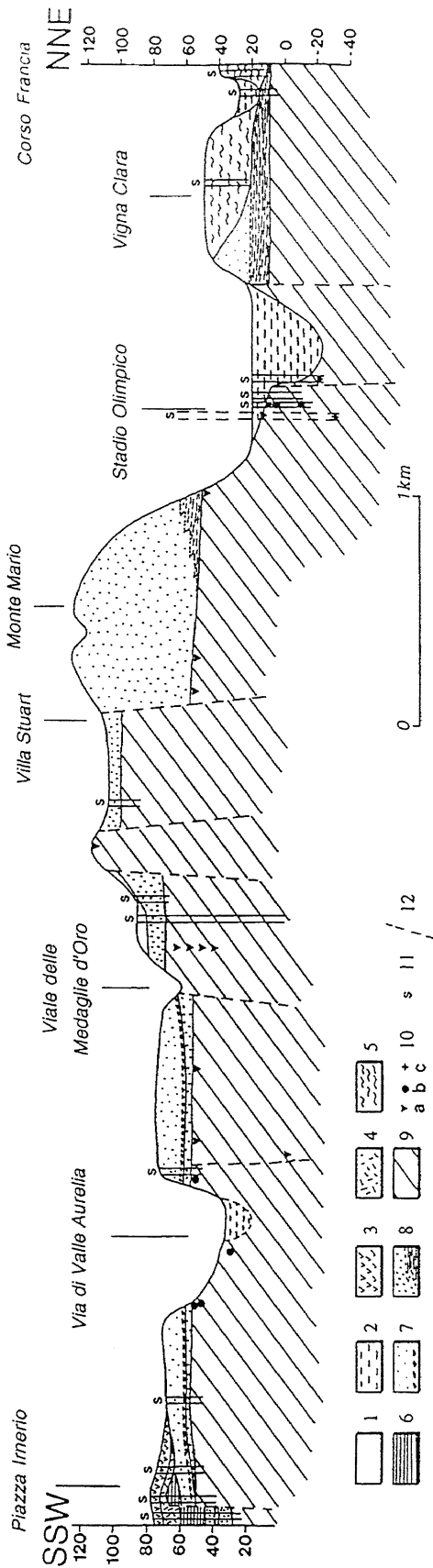


Fig. 3 - Geological section with the structural framework of the Plio-Pleistocene lithological Units in the right Tiber valley side. 1) anthropic reworked deposits; 2) recent alluvial deposits; 3) pyroclastic deposits; 4) Paleotevere U.; 5) Paleotevere U.; 6) Ponte Galeria U.; 7) Monte Ciocci U.; 8) Monte Mario U.; 9) Monte Ciocci U.; 10) Monte Vaticano U.; 11) perforazioni; 12) faglie. (modified from Marra *et al.*, 1995).

Sezione geologica con modello strutturale delle Unità litologiche del Plio-Pleistocene nella riva destra della valle del Tevere.

1) Depositi antropici di riporto; 2) depositi alluvionali recenti; 3) piroclastici; Unità di Ponte Galeria; 4) Unità del Paleotevere; 5) Unità di Monte delle Piche; 6) Unità di Monte Ciocci; 8) Unità di Monte Mario; 9) Unità di Monte Vaticano; 10) campioni a, b, c utilizzati da Marra & Rosa, 1995; 11) perforazioni; 12) faglie (modificato da Marra *et al.*, 1995).

Galerian faunal unit between the Slivia F. U. and the Isernia F. U. (because of biochronological considerations this last Faunal Unit is considered younger than what most of authors has written and subsequent to the Ponte Galeria F. U., Petronio & Sardella, 1999) is testified by *Cervus elaphus acoronatus* and *Euraxis eurygonos* (Di Stefano & Petronio, 1992; Capasso Barbato *et al.*, 1998); these cervids do not allow to attribute the remains to a definite Faunal Unit but the presence of volcanic elements on them may hypothesize their reference to the first volcanic period of the Sabatine area, which dates back to 600.000 years ago. This datation could allow to attribute the "Ponte Molle 1" fauna to the Isernia F. U..

As previously said, the faunal assemblage named Redicicoli 2, characterized by *Megaceroides cf. solilhacus*, *Stephanorhinus hundsheimensis* and *Bison schoetensacki*, could be referred to this biochronological span.

Fontana Ranuccio F. U.

The presence of this Faunal Unit in the Rome urban area is testified by the finding of an antler of *Cervus elaphus eastephanoceros* (Di Stefano & Petronio, 1993), in the site of Cava Nera Molinario, in the northern boundary of the city (fig. 1). This subspecies is an important evolutive phase for the red deer because, for first time, it shows the complete development of the crown in the upper part of the antler. From the stratigraphical point of view, the antler has been collected from volcanic tuffs which dates back to 500.000 years (fig. 5) (De Rita *et al.*, 1992; Di Stefano & Petronio, 1993). This datation is confirmed by biochronological considerations because *C. e. eastephanoceros* is exclusive and characterizes the late Galerian faunal assemblages of southern Europe (Hundsheim, Fontana Ranuccio, S. Cosimato ecc.) and it can be considered as a "marker" for this biochronological period (Gliozzi *et al.*, 1997).

The cervid remains from the "lionate lithoid tuff" of Sedia del Diavolo (figg. 1, 6) (named Sedia del Diavolo 1 in this paper) could belong to a phase a little younger than the Cava Nera Molinario fauna. It dates about 360.000 years (Caloi *et al.*, 1980b), but the remains, constituted in two female skulls, do not show any feature which allow to attribute them to a particular form of *C. elaphus*.

Aurelian

Torrimpietra F. U.

The aurelian faunas are highly represented in the Rome urban area. The lithotypes which characterize the Aurelia Formation, from the typical coastal zone of Via Aurelia (north-west Rome area) to the internal zones, are slowly substituted by tuffs and lacustrine silts,

Geochronology	Absolute age	Mammal ages	Faunal Units	Selected localities
Holocene				
Pleistocene	late	Aurelian	superiore	Saccopastore
			medio	Vitinia F.U. Ponte Molle II, Vigna S. Carlo, Casal de' Pazzi Sedia del Diavolo 3, Batteria Nomentana
			inferiore	Torre in Pietra F.U. Sedia del Diavolo 2 Sedia del Diavolo 1
	middle	Galerian	late	Fontana Ranuccio F.U. Cava Nera Molinario
			middle	Isernia F.U. Ponte Molle I Redicicoli 2
				Ponte Galeria F.U.
				Slivia F.U.
			early	Colle Curti F.U.
			early	Villafranchian
	Farneta F.U.			
	Tasso F.U. Monte Mario			
	Olivola F.U.			
	middle	Costa S. Giacomo F.U.		
	Pliocene	late		

Fig. 4 - Biochronological framework of the mammal faunas from the Rome area.

Modello biocronologico delle faune a Mammiferi dell'area di Roma.

rich of Sabatine and Alban volcanic elements and cutted by terraces of different order of the Tiber and Aniene rivers.

The faunal assemblage from the intermediate levels of Sedia del Diavolo (named Sedia del Diavolo 2 in this paper - fig. 6) - tuffs and yellow silts upon the lionate lithoid tuff, corresponding to the stage 9 of the paleotemperature scale (De Rita *et al.*, 1992; Gliozzi *et al.*, 1997) - could be referred to this Faunal Unit (Caloi *et al.*, 1980b). It also yields *Meles meles*, *Elephas antiquus*, *Stephanorhinus* cf. *hemitoechus*, *Dama* sp. and *Bos primigenius*.

Vitinia F. U.

The faunal assemblage from the so-called "upper gravels" of Sedia del Diavolo (named Sedia del Diavolo 3 in this paper) may be ascribed to the Vitinia Faunal Unit. The faunal association is characterized by *Canis*

sp., *Stephanorhinus* sp., *Equus* sp., *Equus caballus*, *Equus hydruntinus*, *Elephas antiquus*, *Sus scrofa*, *Hippopotamus amphibius*, *Dama dama tiberina*, *Dama* cf. *clactoniana*, *Cervus elaphus* and *Bos primigenius*. The presence of the archaic form of the species *Dama dama* (*Dama dama tiberina*, Di Stefano & Petronio, 1997) (fig. 7) allow to refer this fauna to the middle Aurelian. The fossiliferous level of Sedia del Diavolo 3 has been correlated with the upper levels of Vitinia (Caloi & Palombo, 1988, 1995), which have been referred to the stage 7 of the paleotemperature scale (Conato *et al.*, 1980; Malatesta & Zarlenga, 1988). The remains of *D. dama tiberina* are very abundant, even if often fragmented, and the antler remains, limb bones and teeth are strictly similar to the fossil material from Vitinia (that is stratigraphically correlatable) and to the holotype described by Di Stefano & Petronio (1997). The contemporary occurrence of *D. dama tiberina* and *D. clactoniana* is therefore recorded also in other localities (Vitinia upper levels, Grays Thurrock) (Di Stefano & Petronio, 1997).

Numerous vertebrate remains have been found along the Via Nomentana, next to the confluence of the Aniene river with the Tiber river, during the last century. The faunal assemblage, mostly unpublished, is characterized by the presence of *Dama dama tiberina*.

The site of Batteria Nomentana is completely correlatable with Sedia del Diavolo 3 which is, otherwise, only some hundreds of metres far. The few remains from some sites as Porta Salaria (where a fragmented mandibula of *Dama dama tiberina* has been collected) and Vigne Torte can be also referred to the same age.

Numerous mammals remains have been collected from the site of Vigna S. Carlo, now completely destroyed by the urbanization. Among these remains a large part of a left antler of *Dama dama tiberina* have also been found, from the trez tine until the complete palm. This antler is very similar to the antlers from Ponte Molle and Vitinia in its morphological and biometrical features.

The rich faunal assemblage from Casal de' Pazzi, which also includes *Elephas antiquus*, *Dama dama tiberina* and *Bos primigenius*, is referable to the Vitinia F. U. (Caloi & Palombo 1995); to the same Faunal Unit can be attributed the remains of *Mammuthus chosarichus* and *Cervus elaphus* ssp. collected from two neighbou-

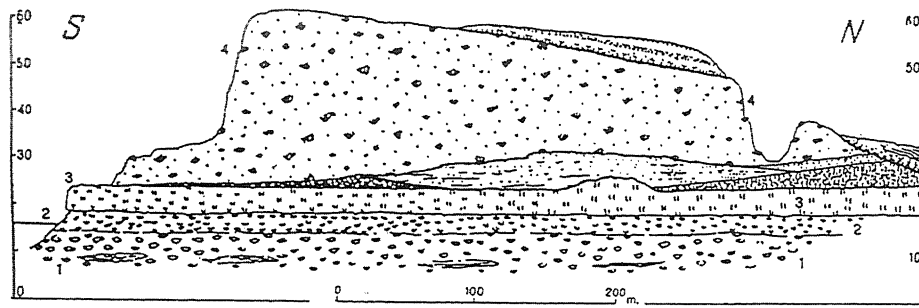
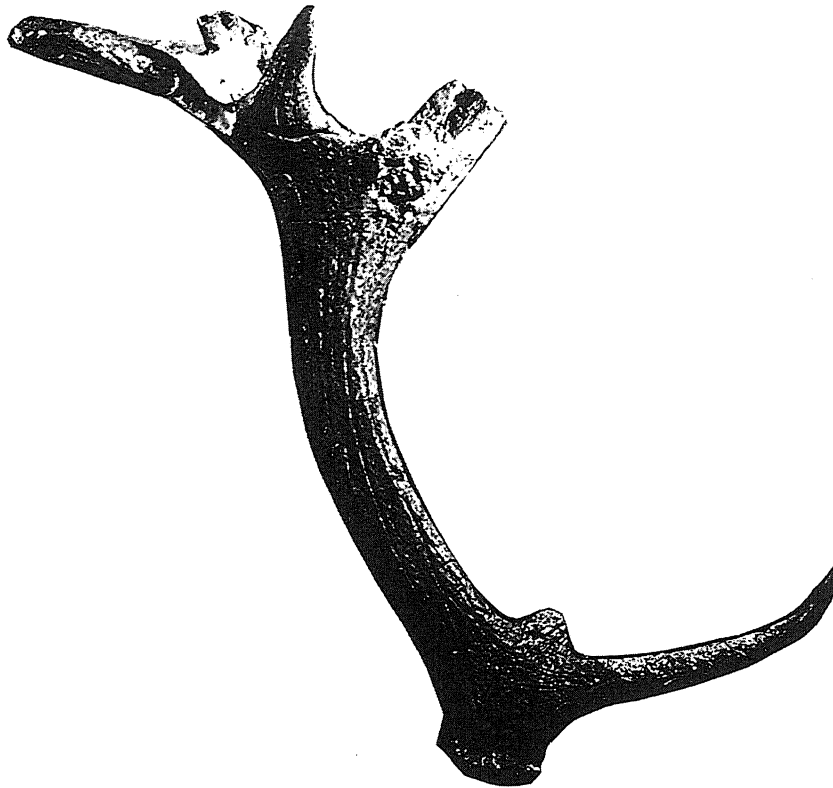


Fig. 5 - On the top - Stratigraphy of the Cava Nera Molinario section (Via Flaminia, Rome) the top, redrawn from Blanc et al. 1956): 1) fluvial gravels without volcanic minerals, 2) fluvial gravel with volcanic minerals, 3) grey lithoid tuff, 4) "tufo rosso a scorie nere".

On the bottom - Right antler of *Cervus elaphus eostephanoceros* Di Stefano & Petronio (1993) from Cava Nera Molinario.

In alto - Stratigrafia della sezione di Cava Nera Molinario (Via Flaminia, Roma) (ridisegnata da Blanc et al., 1956): 1) ghiaie fluviali senza elementi vulcanici, 2) ghiaie fluviali con elementi vulcanici, 3) tufo litoide grigio; 4) "tufo rosso a scorie nere".

In basso - palco destro di Cervus elaphus eostephanoceros Di Stefano & Petronio (1993) da Cava Nera Molinario.



ring sites at the km 7 and km 8 of the Via Flaminia (north-eastern zone of Rome) (Kotsakis *et al.*, 1978).

Late Aurelian

The faunal assemblage from Saccopastore can be referred to this biochronological unit. This site is famous because it yielded two skulls of *Homo neanderthalensis* s.l., but it also yielded numerous vertebrate remains among which *B. primigenius*, *E. antiquus*, *C. elaphus*, *D. dama* configure it as a typical faunal association of the first part of late Aurelian.

Nowadays we cannot attribute with certainty other faunal associations to the late Aurelian in the Rome urban area, because of their uncertain stratigraphical position and the scarce remains.

There are instead numerous sites which yielded holocene remains in the whole Rome urban area, but

they are not considered in this work.

Sites of uncertain age

In the Rome urban area there are numerous zones which yielded vertebrate remains which cannot be located in a biochronological model. This situation arise from the presence of uncertain faunal elements with wide biochronological range and/or belonging to faunal assemblages of different age and finally, as already said, because it is impossible to verify the stratigraphy with modern approach. It could be only possible for some sites to assign a lower and/or upper biochronological limit.

In the Tab. 1 are indicated the most important sites which yielded vertebrate remains, stored in the Paleontological Museum of the "La Sapienza" University.

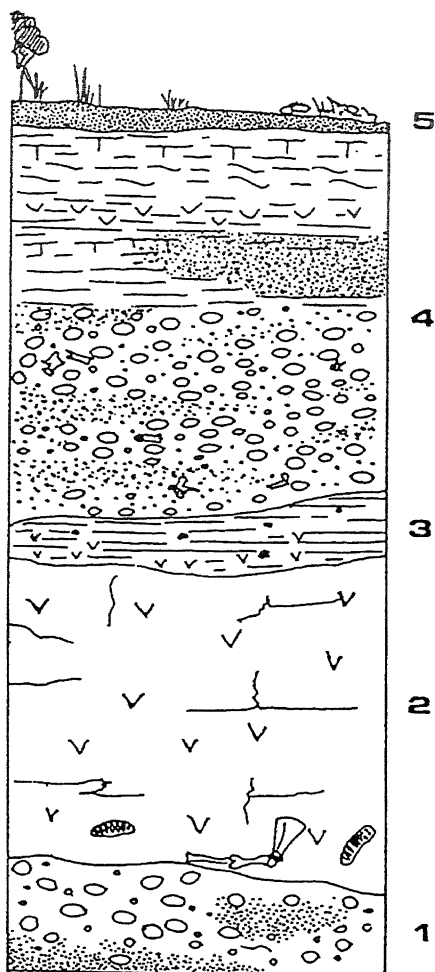


Fig. 6 - Stratigraphy of the Sedia del Diavolo section (Rome) (modified from Caloi *et al.*, 1997): 1) fluvial gravels, 2) "tufo litoide lionato" with Sedia del Diavolo 1 mammal fauna, 3) tuffitic deposit and yellow limes with "tufo rosso a scorie nere" elements reworked (Sedia del Diavolo 2 mammal fauna), 4) fluvio-lacustrine deposits (Sedia del Diavolo 3 comes from the upper part of the gravels), 5) humus.

Sezione stratigrafica di Sedia del Diavolo (Roma) (modificata da Caloi *et al.*, 1997): 1) ghiaie fluviali, 2) "tufo litoide lionato" contenente la fauna di Sedia del Diavolo 1, 3) deposito tuffitico e limi gialli con elementi rimaneggiati di "tufo rosso a scorie nere" contenente la fauna di Sedia del Diavolo 2, 4) depositi fluvio-lacustri (lafauna di Sedia del Diavolo 3 proviene dalla parte superiore delle ghiaie), 5) humus.

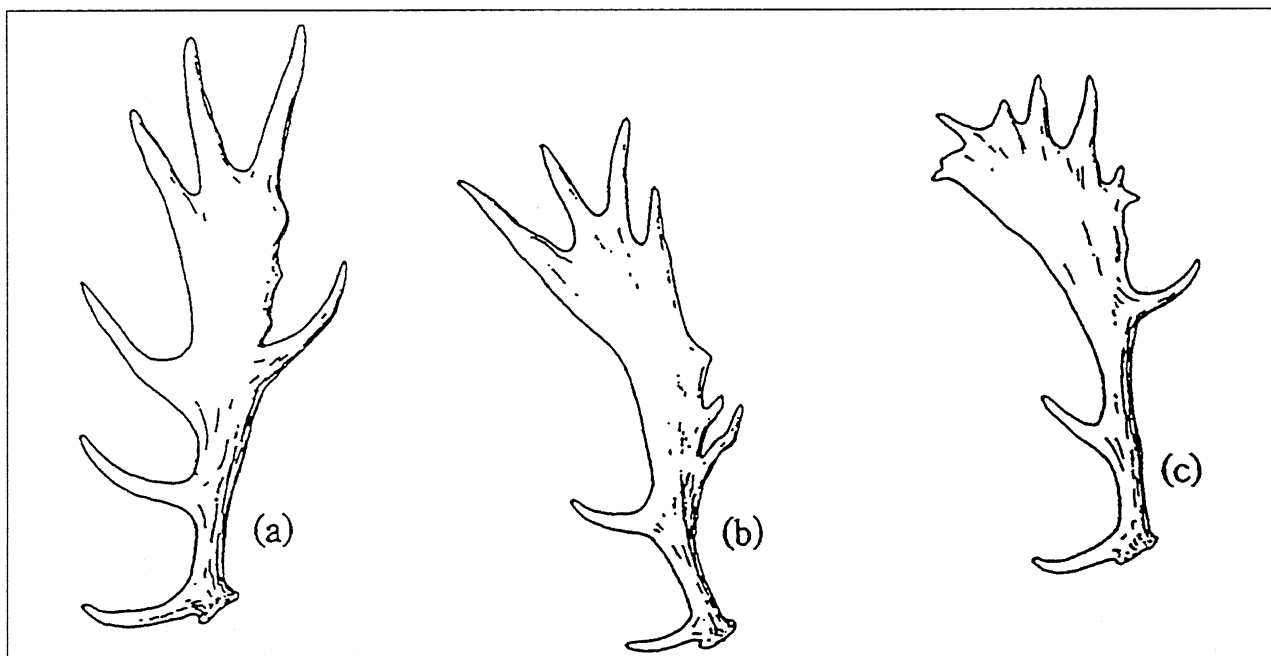


Fig. 7 - Antlers of: a) *Dama clactoniana* (middle Galerian - middle Aurelian), b) *Dama dama tiberina* (middle Aurelian), c) *Dama dama dama* (late Aurelian - Recent) (from Di Stefano & Petronio, 1997).

Palchi di: a) *Dama clactoniana* (Galeriano medio-Aureliano medio), b) *Dama dama tiberina* (Aureliano medio), c) *Dama dama dama* (Aureliano superiore-Recente) (da Di Stefano & Petronio, 1997).

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