

## NOTA - BREVE - SHORT NOTE

## BIOCHRONOLOGY OF THE PLEISTOCENE MAMMAL FAUNA FROM PONTE GALERIA (ROME) AND REMARKS ON THE MIDDLE GALERIAN FAUNAS

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Received March 19, 1998; accepted November 15, 1998

*Key-words:* Continental biochronology, Galerian Mammal Age, Pleistocene, Italy.

*Riassunto.* Il rinvenimento di una nuova specie di bovide nelle sabbie appena sottostanti le argille a *Venerupis senescens* della Formazione di Ponte Galeria (Roma, Italia) unitamente a resti di *Euraxis eurygonos*, *Equus altidens* e *Mammuthus trogontheri* danno lo spunto per definire meglio la collocazione biocronologica della fauna di Ponte Galeria, considerando anche i ritrovamenti di tutte le località che con certezza rientrano in questa successione.

Recentemente studi sul paleomagnetismo effettuati sulle argille a *Helicella ericetorum* e su quelle superiori a *Venerupis senescens*, consentono di dare una età compresa fra 800 e 750 mila anni alle sabbie e ghiaie che, nell'area in esame, sono intercalate fra le due formazioni argillose.

In funzione di questi rinvenimenti, della calibrazione magnetostatigrafica, della revisione delle associazioni faunistiche ritrovate in diversi tempi nell'area di Ponte Galeria e della composizione delle Unità faunistiche fino a questo momento riconosciute per l'età a Mammiferi Galeriano gli autori concludono che:

1) l'associazione faunistica di Isernia può considerarsi fortemente condizionata da caratteri ambientali e dall'influenza umana; allo stesso tempo sono ancora da chiarire il valore delle datazioni assolute e la presenza di *Arvicola cantiana* che in Europa occidentale si diffonde intorno ai 600 mila anni. Inoltre anche la posizione biocronologica delle associazioni di Valdemino, Visogliano e Venosa-Notarchirico necessiterebbe di ulteriore definizione; alla luce di queste considerazioni viene sottolineata la necessità di ridefinire l'Unità Faunistica di Isernia considerando comunque che esistono faune di età di poco superiore ai 500 mila anni, più arcaiche delle faune dell'U.F. di Fontana Ranuccio (circa 430 mila anni);

2) la fauna di Ponte Galeria, presenta una precisa collocazione cronologica e stratigrafica; per la presenza di *Bos galerianus*, di *Megaloceros savini*, per la probabile prima comparsa di *Elephas antiquus* e di *Mammuthus trogontherii* e infine, per la composizione complessiva merita, a nostro avviso, di essere considerata una Unità Faunistica a parte, più giovane di quella di Slivia e più antica della fauna di Isernia.

*Abstract.* Taking into account the fossil mammal material recently discovered at Cava di Breccia (sands outcropping at Ponte Galeria, Rome), the revised fossils from the area and the updated stratigraphical settings of the Ponte Galeria Formation (Rome), the Authors discuss the biochronology of the Middle Galerian faunal assemblages with a new definition of its Faunal Units.

1) The mammal fauna of Isernia in our opinion is strongly conditioned by palaeoenvironmental factors and by human influence. The occurrence at Isernia La Pineta of the rodent *Arvicola cantiana*, which was widespread in Western Europe from 0.6 MA, does not match with the biochronology of the fauna and with the absolute dating (0.736 MA). A new radiometric dating will be useful to determine the age of the Isernia La Pineta local fauna, which can be considered younger than 0.736 MA on the basis of its faunal assemblage.

2) The age of the faunal assemblage of Ponte Galeria is between 0.8 and 0.75 MA, approximately in correspondence with the Brunhes-Matuyama paleomagnetic reversal event. The first occurrence of *Bos galerianus* and *Megaloceros savini* testifies a faunal renewal in comparison with the faunal assemblage of Slivia. The megacerine cervids from Ponte Galeria are more primitive than those from Isernia La Pineta and Venosa-Notarchirico. The Ponte Galeria local fauna has to be considered as a distinct Faunal Unit, younger than Slivia F.U. and older than the Isernia La Pineta fauna.

### Introduction.

During the last year new fossil mammal remains from the area of Ponte Galeria (Rome) have been discovered. The fossil bones come from the upper part of the pebble gravels and sands of the P. Galeria Fm. (Middle Pleistocene) outcropping in the quarry called Cava di Breccia 1 of Casal Selce (Fig. 1). The most interesting remain is a fragmentary skull of *Bos galerianus* (Petronio & Sardella, 1998), previously unknown, some fragmentary teeth referred to *Mammuthus trogontherii*, cranial remains of the European axis *Euraxis eurygonos* (Di Stefano & Petronio, 1998) and a molar of *Equus altidens* have been recorded.

The study of these fossils allows to better define the composition of the Ponte Galeria Faunal Assemblage and its biochronological importance.

In the present paper the Authors, taking into account these new paleontological data, the revised fossil material and the updated stratigraphical settings, wish to discuss the biochronology of the Middle Galerian faunal assemblages with a new definition of its Faunal Units.

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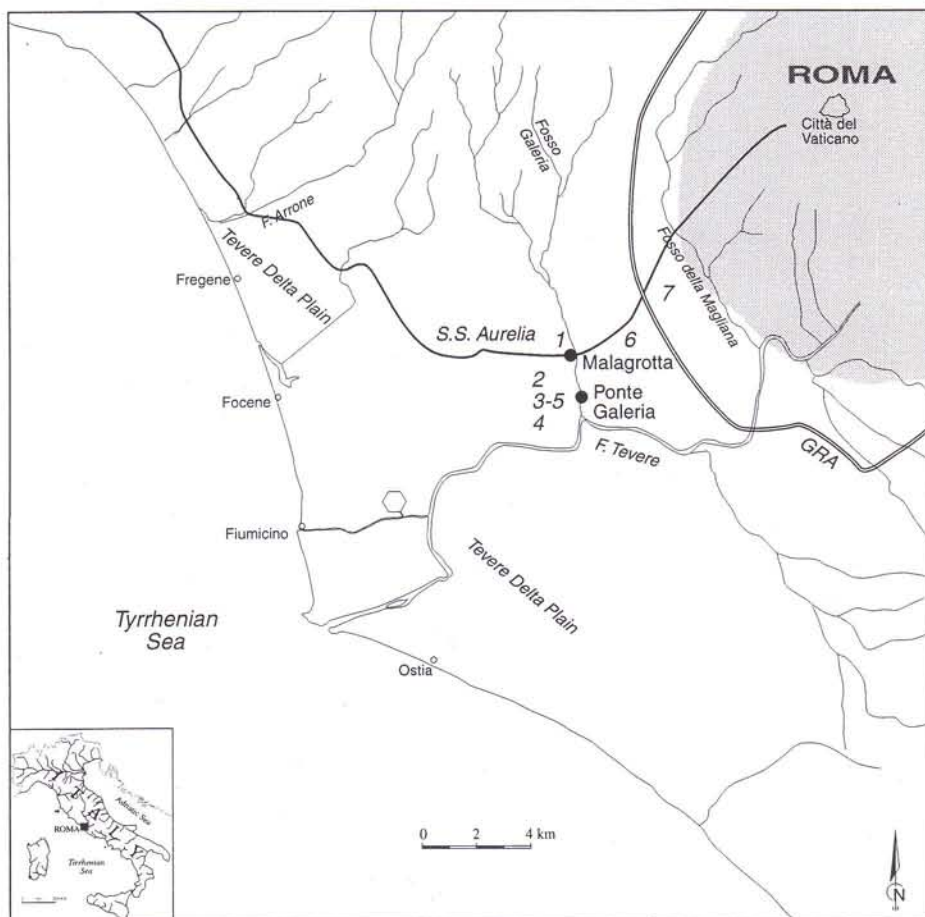


Fig. 1 - Location of the area of the Ponte Galeria quarries and deposits: 1) Cava di Breccia di Casal Selce; 2) Cava Rinaldi; 3) Cava Arnolfini; 4) Cava Alibrandi; 5) Muratella di Mezzo; 6) Fontignano; 7) Maglianella (km 11 S.S. Aurelia).

in the area considered, the clays with *Helicella* (b) testified the presence of a lagoon. The sands with frequent cross laminations (d) are linked to phases of uplift of the Apennine (Cavinato et al., 1992).

The same Authors referred also the clays with *Venerupis* to an environment of lagoon, followed by fluvio-lacustrine deposits (f-g).

Kotsakis et al. (1992) reported the results of a paleomagnetical study of the Ponte Galeria Formation. The lower clays with *Helicella* show a reversed polarity and have been related to Matuyama Magneto-

chron, while the clays with *Venerupis senescens* show a normal polarity and have been related to Brunhes. The Matuyama-Brunhes boundary occurs in the pebble gravels and sands (d), but its position is not well defined (Fig. 4).

The comparison between the paleoenvironmental and stratigraphic studies (Kotsakis et al., 1992) and the paleomagnetic data allow to better define the chronological position of the Ponte Galeria sequence. In particular, the basal conglomerates (a), the clays with *Helicella* (b) and the sands with *Arctica islandica* (c), are referable to the isotopic stage 22, the pebble gravels and sands (d) have to be related to the isotopic stage 21, while the clays with *Venerupis* (e) are referable to the isotopic stage 19. The Matuyama-Brunhes boundary, aged 0.78 MA, is related to the beginning of the isotopic stage 19 (Shackleton et al., 1990; Shackleton, 1995).

According to this chronostratigraphical framework, the mammal fauna of Ponte Galeria may have an approximate age of 0.75 MA.

#### Previous discoveries of mammal faunas.

The Ponte Galeria Fm. outcrops in a wide area and, as pointed out above, (Fig. 1) includes both fluvial delta deposits near the tyrrhenian coast and fluvio-lacustrine deposits in the inner areas of the Campagna Romana. For this reason the fossil mammal bones coming

#### Stratigraphy of the P. Galeria Formation.

Geology and stratigraphy of the Ponte Galeria Formation (Ambrosetti & Bonadonna, 1967) have been analysed in many studies (among the others Conato et al., 1980; Milli, 1992; Bellotti et al., 1993; Marra & Rosa, 1995). The well known sedimentary succession (Fig. 2) included (from the bottom to the top):

- a) fluvial conglomerates;
- b) blue-gray clays with *Helicella ericetorum*;
- c) beach conglomerates with sandy lens and levels with fragmented remains of *Arctica islandica*;
- d) pebble gravels and sands with frequent cross laminations;
- e) clays with *Venerupis senescens*;
- f) eolian salmon sands;
- g) lacustrine and marshy deposits;
- h) volcanoclastic materials.

In Cava di Breccia 1 the complete succession (approximately 40 m of thickness) is exposed (Fig. 3) and the recently discovered mammal bones come from the top of the sands (d), just underlying the clays with *Venerupis senescens* (e).

The reconstruction of the paleoenvironmental evolution of the area is due to Milli (1992) and Bellotti et al. (1993). The lower deposits of the Ponte Galeria Unit are related to the evolution from a continental environment (basal conglomerates - a) to foreshore, while,

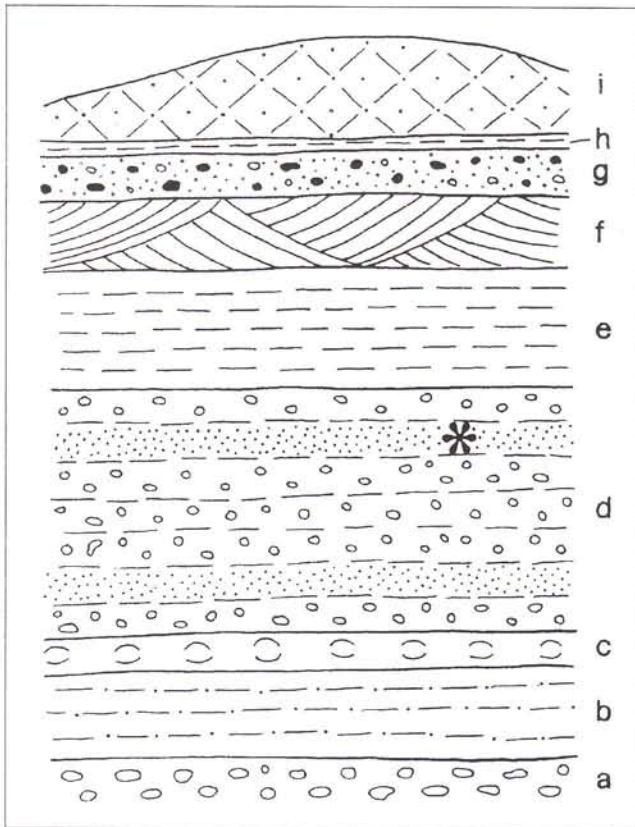


Fig. 2 - Schematic stratigraphical succession of the Ponte Galeria Formation: a) fluvial conglomerates; b) blue-gray clays with *Helicella ericetorum*; c) beach conglomerates with sandy lens and levels with fragmented remains of *Arctica islandica*; d) pebble gravels and sands with frequent cross laminations; e) clays with *Venerupis senescens*; f) eolian salmon sands; g) volcanoclastic materials; h) lacustrine and marshy deposits; i) volcanoclastic materials. \* shows the fossiliferous level (from Marra & Rosa, 1995 redrawn).

from these deposits have been discovered in different times, often not in anatomical connection.

During the last decades, from the area of Ponte Galeria several fossiliferous localities have been studied (Cava Rinaldi - Ambrosetti, 1965; Capasso Barbato & Minieri, 1987; Cava Arnolfi - Ambrosetti, 1967; Mura-tella di Mezzo - Caloi & Palombo, 1980; Cava Alibrandi - Capasso Barbato & Petronio, 1986; Cava di Breccia - Petronio, 1988).

In particular, Ambrosetti (1967), from levels underlying the volcanic deposits of the Sabatine Complex, recorded the occurrence of *Hippopotamus amphibius* (recte *Hippopotamus antiquus*, in Petronio 1986, 1995 = *H. tiberinus* in Mazza, 1991), *Megaceros* (*Megacerooides*) *verticornis dendroceros*, (recte *Megacerooides verticornis dendroceros*) *Dama* sp. (recte *Euraxis eurygonos*), *Bos primigenius* (recte *Bison* sp., in Sala 1987; in Petronio & Sardella, 1998), *Elephas* cf. *antiquus* and *Mammuthus* cf. *trogontherii*.

Caloi & Palombo (1980) from the locality Mura-tella di Mezzo, described *Elephas antiquus* and *Megaceros savini* (recte *Megaloceros savini*) remains; the occurrence



Fig. 3 - Cava di Breccia near Casal Selce (Ponte Galeria, Rome). Stratigraphical succession (approximately 40 m of thickness). The letters refer to the layers of fig. 2; x shows the position of the skull of *Bos galierianus* (Petronio & Sardella, 1998).

of *Cervus elaphus acoronatus* in correlatable deposits outcropping in the area of Rome (Vitinia lower levels - pebble gravels and sands) is described by Caloi et al., 1983 and Di Stefano & Petronio (1992).

A fragmentary skull and some limb bones of *Hippopotamus antiquus* come from lacustrine deposits outcropping in the locality Maglianella, 11 km Via Aurelia, (Caloi et al., 1980). This material is the holotype of *H. tiberinus* Mazza (1991), but Petronio (1995) considers this species as a synonymous of *H. antiquus*.

Capasso Barbato & Petronio (1986) described *Dama eurygonos* (recte *Euraxis eurygonos*) and *Equus altidens* remains coming from pebble gravels and sands in the quarry Cava Alibrandi.

Petronio (1988) studied a mandible coming from Cava di Breccia referred to *Dicerorhinus hemitoechus* (recte *Stephanorhinus hundsheimensis*, Petronio & Sardella 1997).

The fauna from 2° km of Grande Raccordo Anulare (Rome) have been described by Caloi & Palombo (1986). The bones come from sands and limes with vol-

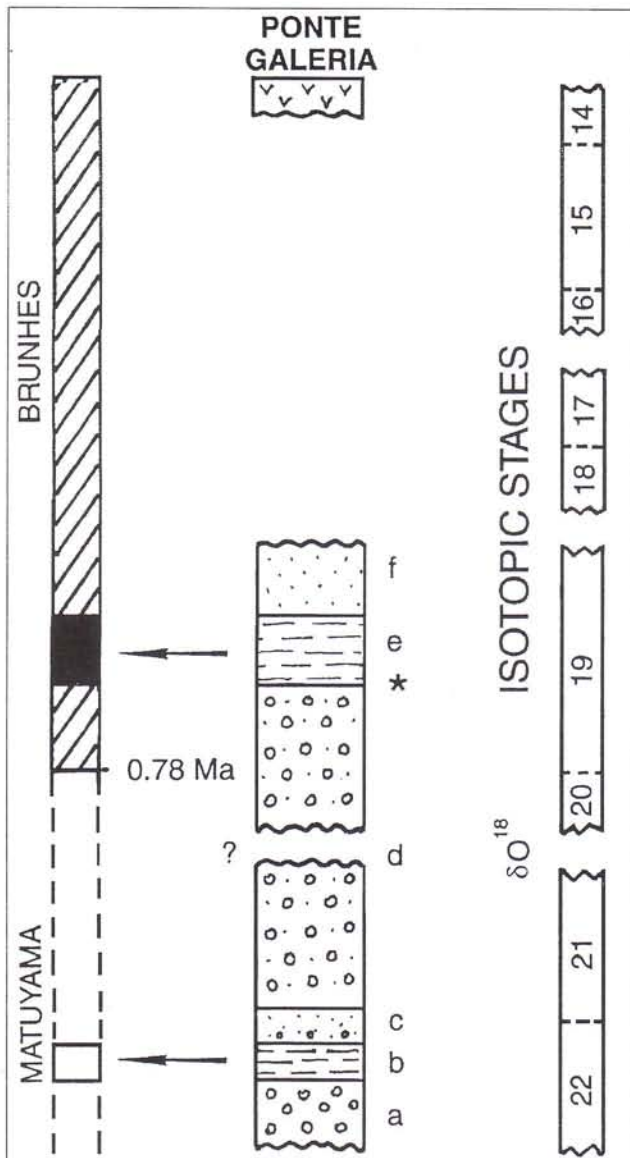


Fig. 4 - Correlations between the Ponte Galeria stratigraphical succession, the paleomagnetic and the isotopic scales of paleotemperature (from Petronio & Sardella, 1998).

canic elements, overlying an erosional surface, under the "tufi varicolori di Sacrofano". For this reason the fauna is to be considered younger than P. Galeria fauna, but older than Fontana Ranuccio F. U. The taxa recorded are: *Meles meles*, *Pachycrocuta* cfr. *perrieri* (recte *Hyaena prisca*, Sardella, 1994a), *Bos primigenius* (probably recte *Bos galerianus*) and *Cervus* (*Dama*) sp. (recte *Euraxis eurygonos*).

Finally, some micromammal remains have been recorded from the clays with *Helicella* outcropping at Fontignano (P. Galeria, Rome). The taxa represented are *Praedicrostonyx* sp. and *Prolagurus pannonicus* (Kotsakis et al., 1992).

In our opinion the revision of these faunal remains allow to point out the following list for the Ponte Galeria faunal assemblage: *Elephas antiquus*, *Mammuthus trogontherii*, *Stephanorhinus hundsheimensis*, *Equus altidens*, *Hippopotamus antiquus*, *Megaceroides verticornis dendroceros*, *Megaloceros savini*, *Euraxis eurygonos*, *Cervus elaphus acoronatus*, *Bos galerianus*, *Bison* sp.

The pebble gravels and sands d (and their interfingering deposits) of the Ponte Galeria Fm. have to be considered the stratigraphical type level of this faunal assemblage.

#### New fossil remains from the area of Ponte Galeria (P. Galeria Formation, Rome).

The fossil bones come from the sands of the P. Galeria Fm. (d) outcropping in the quarry called Cava di Breccia 1 of Casal Selce (Fig. 1, 2, 3), approximately at km 14 of the Via Aurelia, near Castel di Guido (Rome).

*Mammuthus trogontherii* is represented by fragments of tusks and one lower molar with a typical high laminar frequency and thinness of the enamel (Fig. 5c).

The presence of *Equus altidens* (Fig. 5b) is testified by an upper molar with a low protocone index, size and morphological features typical of this stenonoid equid.

A fragment of a skull and the basal part of an antler of *Euraxis eurygonos* (Fig. 5a) testifies the occurrence of this cervid (Di Stefano & Petronio, 1998). The antler shows the characteristic obtuse angle between the beam and the first tine of the evolved European *Dama*-like cervid.

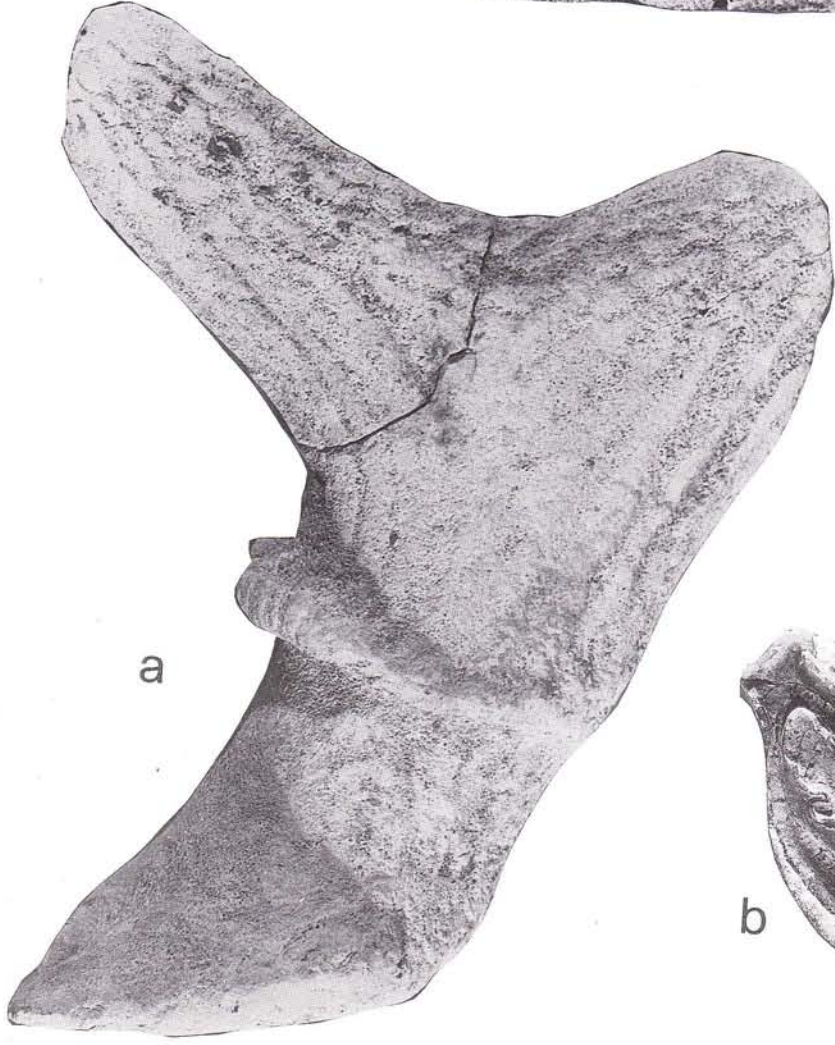
The most interesting remain is a fragmentary skull of *Bos galerianus* (Fig. 6).

This species shows primitive features like relatively narrow frontal bones, less protruding over the occipital surface; close horn cores insertion; horn cores with a subtriangular section and a strong upper-posterior keel. *Bos primigenius* seems to be more derived in having the frontal bones very posteriorly protruding, with a strong and typically convex *torus frontalis*, wide intercornual surface and horn cores with a sub circular section and no keels (Petronio & Sardella, 1998).

*Bos galerianus* shares some character, but seems to be less derived, with the Indian Pleistocene species *Bos acutifrons* (= *planifrons*) from the Early Pleistocene deposits of the Siwaliks Hills and *Bos namadicus* almost frequent in several late Middle Pleistocene and Late Pleistocene deposits (i.e. Narmada Valley and Godavari Valley, Badam, 1979; Azzaroli & Napoleone, 1982).

On the basis of these affinities, an Asian origin for *Bos galerianus* has been hypothesized, and it may be considered as the first species of its genus which was

Fig. 5 - Faunal remains from Cava di Breccia, Ponte Galeria (Roma): a, *Euraxis eurygonos*: fragmentary basal part of the antler; b, *Equus altidens*: upper molar; c, *Mammuthus trogontherii*: fragmentary molar.



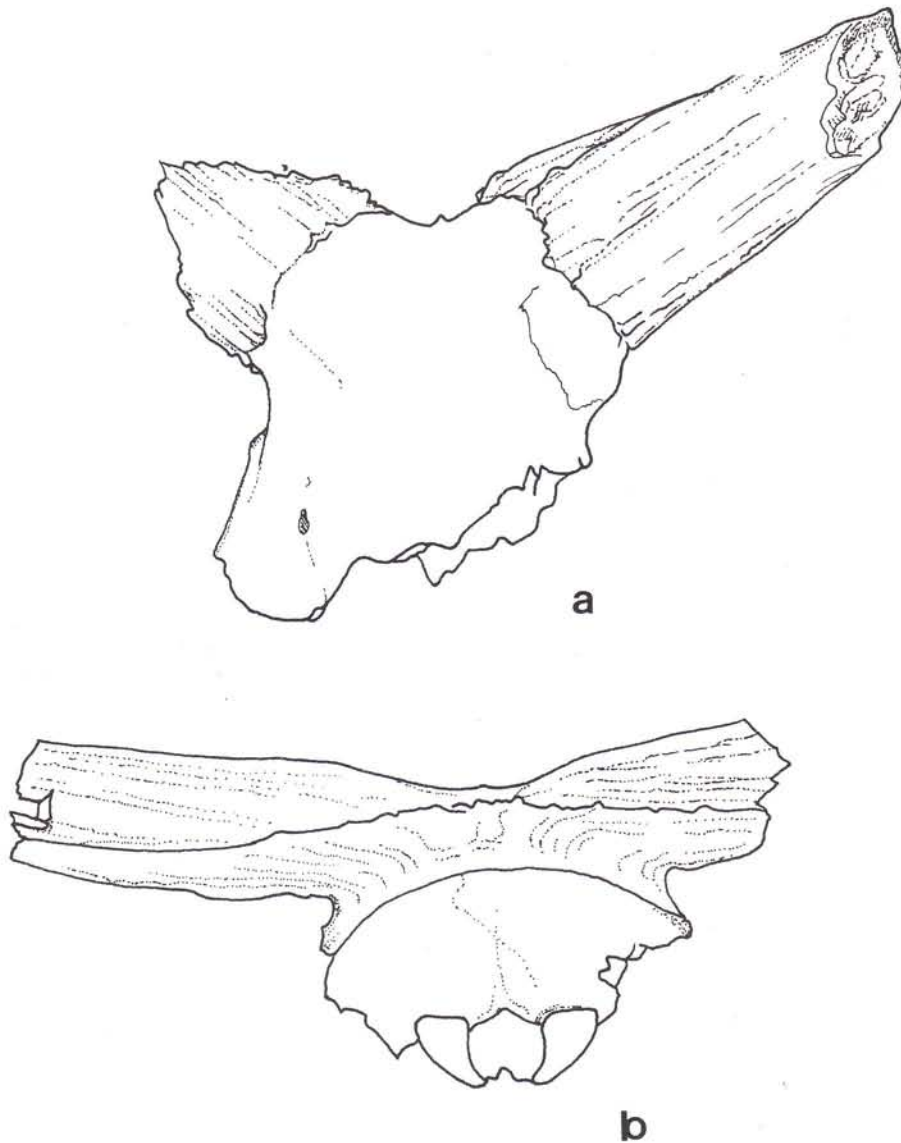


Fig. 6 - Skull of *Bos galerianus*: a, frontal view; b, occipital view ( $1/4$  natural size, from Petronio & Sardella, 1998).

widespread in Europe during the earliest Galerian Age (Petronio & Sardella, 1998).

#### Biochronology of the Galerian Mammal Age.

The Galerian Mammal Age has been divided in four Faunal Units: Colle Curti (Early Galerian), Slivia and Isernia (Middle Galerian) and Fontana Ranuccio (Late Galerian) (Gliozzi et al., 1997).

The Early Galerian assemblage is characterized by the occurrence of *Megaceroides verticornis* and by the persistence of forms with Villafranchian affinities such as the European axis *Euraxis eurygonos* (Di Stefano & Petronio, 1998), *Pachycrocuta brevirostris*, *Homotherium* ex gr. *crenatidens-latidens*, *Mammuthus* (*Archidiskodon*) *meridionalis* and a small sized etruscoid *Stephanorhinus*. The fossiliferous deposit of Colle Curti shows a normal Magnetic Polarity related to the basis of the Subchron Jaramillo (Torre et al., 1996). The Monte Peglia Faunal assemblage, including both large mammals and micromammals (van der Meulen, 1973; Piperno & Segre,

1984) is related to the Colle Curti F.U.

It appears therefore that the Early Galerian assemblage in Italy, even though it is poor in species and scarcely represented in terms of number of sites, constitutes an indicative complex of the transition between typical Late Villafranchian and typical Galerian faunas (Gliozzi et al., 1997). Among micromammals the occurrence of *Pliomys lenki* and *Microtus* (*Allophaiomys*), probably the ancestor of *Microtus* ex gr. *oeconomus*, matches well with the "modern" features of the assemblage.

The Slivia F.U. is the earliest of the units of the Middle Galerian. It is characterized by a strong faunal renewal with the first occurrence of *Cervus elaphus acoronatus*, *Sus scrofa*, *Ursus deningeri*, *Stephanorhinus hundsheimensis* and *Stephanorhinus hemitoechus* (Ambrosetti et al., 1979; Gliozzi et al., 1997). Also the first occurrence of *Bison schoetensacki* and *Elephas antiquus* is recorded, even if doubtfully, in this locality.

The oldest sites with Middle Galerian faunas belonging to the Slivia F.U. are Slivia (Bon et al., 1992) and Monte Tenda (Pasa, 1947). Due to the persistence of some Villafranchian elements, the Selva Vecchia local fauna (Bon et al., 1991) seems to be slightly more archaic than the Slivia fauna.

The following unit described by Gliozzi et al. (1997) is the Isernia F.U., with a further renewed Faunal Assemblages. As pointed out by the Authors, this Faunal Unit includes several local faunas showing both chronological and paleoecological differences. *Panthera leo fossilis* and *Megaceroides solilhacus* occur, while *Elephas antiquus*, *Stephanorhinus hundsheimensis* and *Bison schoetensacki* are common elements of the fauna. Among the equids, besides the maintenance of Villafranchian forms, the caballoid horses appear, while some large carnivores and *Euraxis eurygonos* still occur. Following Gliozzi et al. (1997), the Isernia F.U. includes the local faunas of Isernia (Sala, 1983, 1996), Cesi (Masini et al., 1991), Valdemino (Sala, 1992) several localities

FAUNAL UNITS Local Faunas TAXA	COLLE CURTI	SLIVIA	PONTE GALERIA	"ISERNIA"		FONTANA	RANUCCIO
	Colle Curti Monte Peglia	Fontignano Slivia Selva Vecchia Monte Tenda	various sites of the P. Galeria area	Valdemino Cesi	Isernia La Pineta	Notarchirico Visogliano	Cava Nera
<i>Megaceroides verticornis</i>							
<i>Megaceroides solilhacus</i>							
<i>Megaloceros savini</i>							
<i>Cervus elaphus acoronatus</i>							
<i>Cervus elaphus eostephanoceros</i>							
<i>Euraxis eurygonos</i>							
<i>Dama clactoniana</i>							
<i>Bos galerianus</i>							
<i>Bos primigenius</i>							
<i>Bison schoetensacki</i>							
<i>Elephas antiquus</i>							
<i>Mammuthus trogontherii</i>							
<i>Stephanorhinus hundsheimensis</i>							
<i>Stephanorhinus kirkbergensis</i>							
<i>Stephanorhinus hemitoechus</i>							
<i>Equus altidens</i>							
<i>Pachycrocuta brevirostris</i>							
<i>Crocuta crocuta</i>							
<i>Hyaena prisca</i>							
<i>Homotherium latidens</i>							
<i>Panthera gombaszoegensis</i>							
<i>Panthera leo fossilis</i>							
<i>Canis ex gr. arnensis-mosbachensis</i>							
<i>Ursus deningeri</i>							
<i>Ursus arctos</i>							
<i>Pliomys lenki</i>							
<i>Mimomys blanci</i>							
<i>Microtus (Allophaiomys) nutiensis</i>							
<i>Microtus (Allophaiomys) burgondiae</i>							
<i>Alloccicetus bursae</i>							
<i>Prolagurus pannonicus</i>							
<i>Microtus (Neodon) gregaloides</i>							
<i>Praedicrostonyx sp.</i>							
<i>Ochotona sp.</i>							
<i>Cricetus cricetus</i>							
<i>Arvicola cantiana</i>							
<i>Microtus (Iberomys) brecciensis</i>							

Fig. 7 - Biochronology of the Galerian Mammal Age.

in the area of Ponte Galeria (Ambrosetti, 1967; Capasso Barbato & Petronio, 1986; Petronio & Sardella 1997, 1998, inter alios). In the same paper the local faunas from Visogliano (Cattani et al., 1991) and Venosa-Notarchirico (Belli et al., 1991) are considered probably transitional with those of the late Galerian.

Finally, Fontana Ranuccio F.U. constitutes the late Galerian assemblage, characterized by the occurrence of *Cervus elaphus eostephanoceros* (Di Stefano e Petronio, 1993) and the diffusion of *Dama clactoniana*. The only villafranchian taxa still present are a derived form of *Homotherium* (Sardella, 1994b), *Equus ex gr. bressanus-suessenbornensis* and *Equus altidens*. The main localities are Fontana Ranuccio (Segre, 1984) and Cava Nera Molinaro (Blanc et al., 1956; Di Stefano & Petronio, 1993).

#### Discussion.

The local fauna of Ponte Galeria is characterized by the first occurrence of *Megaloceros savini* and *Bos galerianus*.

*Mammuthus trogontherii* and *Elephas antiquus* (an archaic form) appear maybe in the Slivia F.U., and exist with more derived forms for all the Middle Pleistocene. The other taxa are less significant from a biochronological point of view and generically characterize the Galerian Mammal Age. The typical Ponte Galeria Faunal Assemblage, as previously pointed out, should be referred to the stage 21 of the paleotemperature.

The rodents *Praedicrostonyx sp.* and *Prolagurus pannonicus*, from the clays with *Venerupis*, instead, are related with the isotopic stage 22 (Kotsakis et al., 1992).

From these data some considerations can be pointed out:

1) the Colle Curti and Slivia mammal faunas are surely older than Ponte Galeria local fauna for the persistence of several Villafranchian taxa;

2) the mammal fauna of Isernia, in our opinion, is strongly conditioned by palaeoenvironmental factors and by the human influence. The occurrence at Isernia La Pineta of the rodent *Arvicola cantiana*, which was widespread in Western Europe from 0.6 MA (Koe-

nigswald & Kolfschoeten, 1996), doesn't match with the biochronology of the fauna and with the absolute dating (0.736 MA Coltorti et al., 1982). A new radiometric dating will be useful to clear the age of the Isernia La Pineta local fauna. On the other hand, this fauna shows affinities with the mammal fauna from Venosa-Notarchirico, recently dated 0.6 MA (Cassoli et al., in press), with the occurrence of *Arvicola cantiana* and, among macromammals, of more advanced megacerine *Megaceroides solilhacus*, the abundance of *Bison schoetensacki* and the presence of moderately derived *Elephas antiquus*. It seems reasonable to hypothesise a younger age for the Isernia La Pineta Faunal Assemblage.

Also the local faunas as Valdemino (testifying "warm" climatic conditions) and Visogliano ("cold" climatic conditions) are at this moment referred to the same Faunal Unit, but the studies of these faunas are still in progress. The occurrence of *Cervus elaphus eostephanoceros* from Venosa Notarchirico (Cassoli et al., in press) have to be considered with caution. This red deer subspecies characterizes the Fontana Ranuccio F.U. (Di Stefano & Petronio, 1993).

3) the age of the Faunal Assemblage of Ponte Galeria is between 0.8 and 0.75 MA, approximately in correspondence with the Brunhes-Matuyama paleomagnetic reversal event. The first occurrence of *Bos galerianus* and *Megaloceros savini* testifies a faunal renewal in comparison with the Faunal Assemblage of Slivia. *Megaloceros savini* from Ponte Galeria is more primitive than *Megaceroides solilhacus* which characterizes Isernia La Pineta and Venosa-Notarchirico faunas.

The Ponte Galeria local fauna has to be considered as a distinct Faunal Unit, younger than Slivia F.U. and older than Isernia La Pineta (Fig. 7).

4) The Fontana Ranuccio F.U., with the almost complete disappearing of the taxa of Villafranchian tradition has to be considered as the latest of the Galerian

Faunal Units. It is characterized also by the first occurrence of *Bos primigenius* (S. Cosimato Fm. in the Campagna Romana).

### Conclusion.

The analysis of the mammal fauna from Ponte Galeria suggests us to define a distinct unit (Ponte Galeria F.U.) and makes a critical revision of the biochronology of the middle Galerian local faunas really needed.

As underlined in Gliozzi et al. (1997) in Isernia F.U. local faunas different in composition and in age were included. These are referable to a wide time span and to different palaeoenvironmental conditions.

From a biochronological point of view, the Ponte Galeria F.U. has to be considered as intermediate between Slivia F.U. and the other local faunas previously included in the Isernia F.U. According to the absolute datation for Isernia La Pineta (Coltorti et al., 1982) this fauna would be almost coeval with that from Ponte Galeria. As pointed out above, the differences in the macromammal faunal composition suggest for Isernia La Pineta a younger age. Such a biochronological collocation was also proposed in Koenigswald & Kolfschoeten (1996) to explain the occurrence of *Arvicola cantiana* which widespread in Europe after approximately 0.6 MA.

Further studies will better define the biochronology of the other middle Galerian local faunas as Valdemino, Cesi, Visogliano and Venosa-Notarchirico.

### Acknowledgements.

We wish to thank Dr. S. Milli for the useful suggestions about the stratigraphy of the Ponte Galeria area, Dr. T. Kolfschoeten and Dr. Giuseppe Di Stefano for the stimulating discussions, Prof. M. Gaetani, Prof. A. Nadachowski and two anonymous referees for the critical reading of the manuscript. Work supported by 40% MURST grants.

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