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# The early Middle Pleistocene large mammal faunas of Italy: An overview

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## Abstract

During the last decade new finds have increased our knowledge of the Middle Pleistocene mammal faunas of the Italian peninsula. We provide an updated framework, mainly based on the large mammals, highlighting some peculiarities of the Italian faunas. The early Middle Pleistocene faunas had been placed in a detailed scheme. These faunas are partially referred to the middle and late Galerian, and the validity of the different faunal units (FUs) is discussed. The main open questions arising from the recent discoveries are briefly pointed out.

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## 1. Introduction

The early Middle Pleistocene faunas (middle and late Galerian sensu [Glozzi et al., 1997](#)) are very well documented in Italy ([Fig. 1](#)). In the North, the main vertebrate faunas referable to the Galerian come from karst filling deposits outcropping in the northeastern sector (“Prealpi Venete” and “Carso Triestino”). A catalogue of the mammal faunas of this area has been realised by [Bon et al. \(1991\)](#). The attribution to a given Galerian FU is often impossible due to the generic identification of some taxa and a lack of stratigraphic control. In the northwestern area the only well-documented locality is in Liguria, at Valdemino ([Nocchi and Sala, 1997](#)). In Central Italy, the Campagna Romana area can be considered of particular interest for the study of the Italian faunas. Moreover, the name Galerian comes from the Ponte Galeria area (Rome) ([Ambrosetti et al., 1972](#)), where a very thick stratigraphic succession, including fossiliferous marine and fluvio-lacustrine deposits (notably the Tiber River delta deposits), crop

out (cf. [Milli, 1997](#); [Petronio and Sardella, 1999](#); [Milli et al., 2004](#)). In Central and Southern Italy, early Middle Pleistocene faunas have been discovered in the fluvio-lacustrine deposits which partially filled the Apennine intramountain basin, such as at Cesi ([Ficcarelli et al., 1997](#)), Isernia ([Coltorti et al., 2000](#)), Venosa-Notarchirico ([Cassoli et al., 1999](#)), and the recently discovered Pagliare di Sassa ([Palombo et al., 2001](#)) and Mercure River basin ([Cavinato et al., 2001](#)). The only Galerian fauna from the Adriatic coast is that with *Allocricetus bursae* yielded in a karst filling at Tre Fossi, near Apricena, in the Gargano peninsula (Foggia) ([De Giuli et al., 1986](#); [Fanfani, 1999](#)). The aim of this paper is to highlight the main open questions on the Italian Galerian faunas, as a first step to defining a new biochronological scheme for Italian local mammal assemblages (LFAs).

## 2. The middle Galerian LFAs

The beginning of the Galerian Mammal Age has been proposed by [Glozzi et al. \(1997\)](#) as marked by the appearance of “*Praemegaceros*” *verticornis*, first recorded in Italy in the Colle Curti LFA (Colle Curti FU, Jaramillo Subchron, [Coltorti et al., 1998](#)). In this LFA several Villafranchian taxa, such as *Axis eurygonos* (= *Pseudodama*, see [Di Stefano and Petronio, 2003](#) for discussion), *Lycan*

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Fig. 1. Map of Italy with the position of the localities cited in the text: 1, Colle Curti; 2, Slivia; 3, Visogliano; 4, Valdemino; 5, Cesi; 6, Ponte Galeria; 7, Pagliare di Sassa; 8, Isernia La Pineta; 9, Tre Fossi; 10, Venosa-Notarchirico; 11, Mercure River basin; 12, Bristie; 13, Fontana Ranuccio.

*lycaonoides* (Martínez-Navarro and Rook, 2003), *Pachycrocuta brevirostris*, *Homotherium latidens*, *Mammuthus meridionalis*, a small rhino (*Stephanorhinus* sp.), *Pliomys lenki* and *Microtus (Allophaiomys)* sp. also occurred. Accordingly, in the Colle Curti LFA the faunal renewal characterized the beginning of the Middle Pleistocene was not yet evident (Palombo, 2004). The faunal complex referred to as the Slivia FU is characterized by the first occurrence of *Ursus deningeri*, *Crocota crocuta*, *Sus scrofa*, *Cervus elaphus acoronatus*, *Bison schoetensacki*, *Stephanorhinus hemitoechus* and *Elephas antiquus*, whereas the appearance of *M. trogontherii* has to be proven (Palombo and Ferretti, 2004). Some localities in northeastern Italy have also been referred to early Middle Pleistocene of Galerian, nonetheless their biochronological position has to be clarified. Lugli and Sala (2000) revised the fauna from

Bristie 1° locality, previously considered early middle Galerian and referred it to the late Galerian-early post Galerian.

The Ponte Galeria LFA, found in the PG2 sequence (Milli, 1997) and ascribed by Petronio and Sardella (1999) to a distinct FU, is characterized by the first appearance in Italy of *Megaloceros savini* and *Hemibos galerianus* (Martínez-Navarro and Palombo, 2004); *M. trogontherii*, *E. antiquus*, *Equus altidens* and *S. hundsheimensis* are also present together with the long-persistent taxon *A. eurygonos*. Among the rodents *Praedicrostonyx* sp. and *Prolagurus pannonicus* have been recorded from *Helicella* clays at Fontignano, cropping out at the base of the PG2 sequence (Kotsakis et al., 1992). These authors claimed that this deposit might correspond to quite cold phases (OIS 22), while in a recent work this level is referred to OIS 19

(Marra et al., 1999). On the other hand, the Slivia LFA has been tentatively referred to a cold stage at the Early to Middle Pleistocene transition, and was considered older than the Ponte Galeria FU by Petronio and Sardella (1999) on the basis of the *Mimomys savini* occurrence and the survival of some Villafranchian carnivores, such as *P. brevirostris* and *Panthera gombaszoegensis* not yet recorded in the Ponte Galeria FU. However, taking into account the doubtful identification of the main herbivores of the Slivia local fauna, as well as the scanty knowledge of carnivores and micromammals belonging to the following Ponte Galeria FU (Petronio and Sardella, 1999), the possibility that Slivia and Ponte Galeria assemblages belong to the same FU cannot be ruled out (Palombo et al., 2003; Palombo, 2004).

Some mammal remains come from sandy alluvial deposits outcropping at Pagliare di Sassa (L'Aquila, Central Italy) (Palombo et al., 2001). The fossil-bearing sequence takes the shape of an alluvial fan deposit composed of grey basal clays partially pedogenised at the top, where they were cut into by a channel. The latter is filled with a sequence of sandy lenses with fine gravel intercalations that at times fit into each other and pass laterally to form regular plane-parallel beds. Paleomagnetic surveys have consistently registered normal magnetic polarity in the basal clays (Speranza, unpublished data). Most of the fossil remains (Elephantinae, *S. hundsheimensis*, *Hippopotamus* ex gr. *H. antiquus*, *M. savini*, “*P.*” *verticornis*,? *Dama clactoniana*, Hyaenidae, *Oryctologus* sp. and arvicolids) were discovered in a horizon located at the clay/sand transition. The elephant is documented by only very fragmentary remains probably belonging to a single, large individual. None of the remains are diagnostic from a taxonomical point of view. Only the tusk fragments offer some clue due to the absence of helicoidally arranged striae, which are instead typical of the *Mammuthus* lineage. The pattern of the Schreger lines cannot be detected with any certainty because of the diagenetic process. Nevertheless, the observable outer angles fall in the variability range of *E. antiquus*. A small number of bones, belonging to “*P.*” *verticornis* and elephant, were recovered from the lenses and beds marking the transition to the upper parts of the alluvial fan deposits. As to the possible age of the Pagliare di Sassa fauna, we can note that the co-occurrence of *M. savini* and “*P.*” *verticornis* in Italy has only been reported in the Ponte Galeria LFA (Ponte Galeria FU, sensu Petronio and Sardella 1999) at ca. 750 ka BP (Milli 1997), whereas *D. clactoniana*, is certainly present in the more recent Isernia FU (c. 600 ka BP, Coltorti et al., 2000), even if its occurrence is also reported in LFAs referred to the Slivia FU (Gliozzi et al., 1997). Accordingly, an early middle Galerian age can be hypothesized, even if more data need to exclude a younger age (Isernia FU), taking into account the coexistence of “*P.*” *verticornis* and *M. savini* in some central Europe sites, such as Suessenborn and Voigtsted (Kahlke, 1969).

“*Praemegaceros*” ex gr. “*P.*” *verticornis* occurs together with *Dama* cf. *D. clactoniana* and *Bison* sp. also in deposits

belonging to fluvio-lacustrine sediments outcropping in the southern area of the Mercure River basin at Fornaci-Fondo Pagano, where *E. antiquus*, *S. hundsheimensis* and *Hippopotamus antiquus* were retrieved from co-relatable deposits at Calorie (Cavinato et al., 2001). The stratigraphical data are such that we cannot ascribe this LFAs either to the Slivia/Ponte Galeria or Isernia FUs.

The fossil remains from the Colfiorito basin Cesi LFA was considered younger than that from the nearby locality of Colle Curti (Ficcarelli et al., 1997) and very similar to that of the Isernia LFA. Indeed, the faunal list includes Elephantinae, *S. hundsheimensis*, a caballine equid, *Hippopotamus* sp., “*P.*” *solihacus*, *C. elaphus*, *D. clactoniana*, *B. schoetensacki*, and *Homotherium* sp.

Stratigraphic and palaeomagnetic data suggest for the fauna an approximate age of 700 ka (Ficcarelli et al., 1997), thus not so dissimilar from that of the Ponte Galeria LFA (Milli et al., 2004). The faunal assemblage does not include peculiar elements, with several long persistent taxa, but the attribution to the Isernia FU can be considered as more suitable for the presence of “*P.*” *solihacus*.

The Isernia FU is richer and more diversified than the Slivia/Ponte Galeria FU. The most representative local fauna of the Isernia FU is “Isernia la Pineta”, where *P. leo fossilis*, *D. clactoniana* and “*P.*” *solihacus* occur, while *E. antiquus*, *B. schoetensacki* and *S. hundsheimensis* are dominant elements. The lack of *E. ferus* already reported from other coeval localities can be related to palaeoenvironmental factors, as pointed out by Petronio and Sardella (1999). Updated analyses suggest an age of about 0.6 Ma (Coltorti et al., 2000) as confirmed by the presence of *Arvicola cantianus*, which was widespread in Western Europe from 0.6 Ma (Koenigswald and Kolfschoten, 1996). The LFAs of Valdemino (Nocchi and Sala, 1997) and Notarchirico (Cassoli et al., 1999) probably belong to the Isernia FU.

The fauna recorded in the lower deposit of Valdemino (Borgio Verrezzi, Savona, Northern Italy) can be referred to “warmer” climatic conditions: according to the faunal list in Nocchi and Sala (1997) *P. pardus*, *Stephanorhinus* cf. *S. kirchbergensis* and *Bos primigenius* were first recorded together with the last evidence of *Homotherium* sp. The rich micromammal assemblage (*Oryctolagus burgi*, *Microtus* (*Iberomys*) *brecciensis* (dominant), *Apodemus* sp., *A. bursae*, *Clethrionomys* sp., *P. episcopalis*, *Microtus* (*Terricola*) sp. and a small mole) confirms a middle Galerian age.

The LFA from Venosa Notarchirico was recently revised by Cassoli et al. (1999) for the large mammals, and by Sala (1999) for the micromammals. The fossil remains come from the upper levels A and Alfa. Together with some turtles and birds the following mammals have been identified: *Lepus* cf. *L. europaeus*, Elephantidae, *E. antiquus*, *S. scrofa*, Cervidae indet., *D. clactoniana*, ?*Axis* sp., *C. elaphus*, “*Praemegaceros*” sp., Bovidae indet., *B. primigenius*, *Bison* sp. Cassoli et al. (1999) underlined the possible occurrence of *Axis* and *C. elaphus eastephanoceros* among the cervids, and the contemporary presence of *Bos* and *Bison* (Fig. 2).

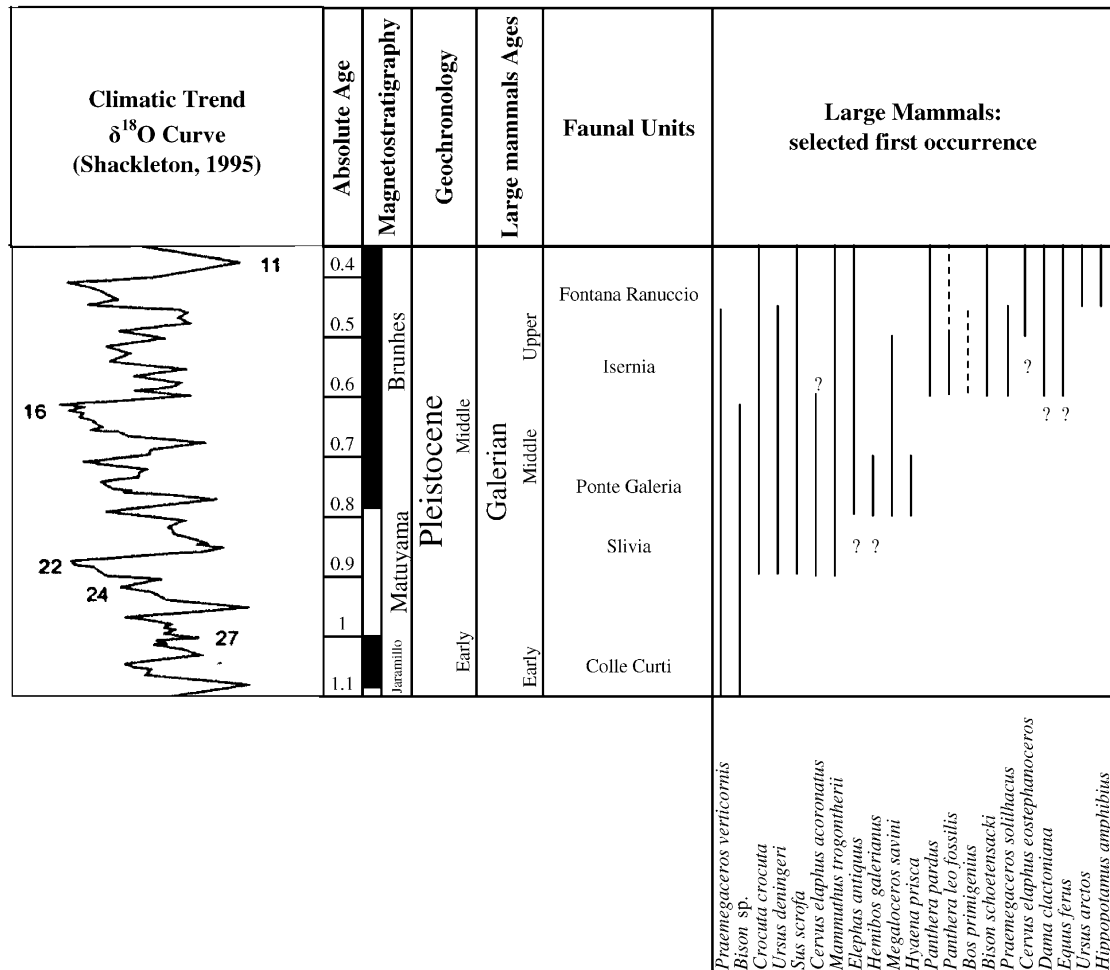


Fig. 2. Biochronology of selected Galerian large mammals of the Italian Peninsula. Climatic trend  $\delta^{18}\text{O}$  curve see Shackleton, 1995.

*B. schoetensacki* is recorded in level D, underlying levels A and Alfa. Despite the quite “modern” taxonomical composition, and the possible occurrence of *C. elaphus eostephanoceros* (see below), the Notarchirico LFA can be ascribed to the Isernia FU, taking into account the age of about 600 ka estimated by Lefèvre and Raynal (1999) and Lefèvre and Vernet (1999).

### 3. The late Galerian LFAs

The late Galerian includes only the Fontana Ranuccio FU including Fontana Ranuccio and Visogliano LAFs as the main representative sites. The composition of the Fontana Ranuccio FU is characterized by the first appearance of *U. arctos*, *H. amphibius* (Biddittu et al., 1979) and *C. elaphus eostephanoceros* (Di Stefano and Petronio, 1993), while *E. altidens* still occurred.

The Visogliano fauna has already been considered transitional to the Fontana Ranuccio one because of the supposed first occurrence of *B. prisca* (Gliozzi et al., 1997). Recently, the bovid remains have been identified as *Bison* cf. *B. schoetensacki*. The faunal list includes: *Macaca* sp., *Martes* cf. *M. martes*, *Meles* cf. *M. meles*, *Vulpes*

*vulpes*, *Canis* cf. *C. mosbachensis*, *C. crocata*, *U. deningeri*, *Felis sylvestris*, *E. ferus*, *S. hundsheimensis*, Megacerini indet., *Capreolus capreolus*, *D. clactoniana*, *C. elaphus*, Bovinae indet., *Bison* cf. *B. schoetensacki*, *Ovis ammon antiqua*. Nevertheless, the general index of anteroconid evolution measured on *Microtus* ex gr. *M. arvalis* (Abbazzi et al., 2000), as well as palaeoclimatic considerations and the aspect of evolutionary trend of the tooth enamel of *A. cantianus*, suggests a correlation with OIS 13-12 or 11-10. This is corroborated by the combined ESR/U-Th age estimates by Falguères (2003) that “suggest that the lower levels were deposited during the OIS 11-10 and assign a minimum age of more than 350 ka to the human remains”.

### 4. Remarks

The end of the Early Pleistocene (early Galerian), and the early Middle Pleistocene (middle Galerian) are characterized by major community reorganizations, occurring in successive phases during paleoenvironmental changes coinciding with the onset of 100 ka climate cyclicality. Dispersal phases, mainly related to the progressive diffusion in Italy of taxa from eastern and central



Europe, led to faunal renewal. New appearances generally outnumbered extinctions, and the progressive increase in herbivore taxa increased standing richness, in contrast to a decrease in carnivore diversity (Palombo, 2004).

Moreover, the discovery of new faunas, the increase in the knowledge of faunal renewal phases, and the transitional character of some local assemblages (LFA), suggested to introduce some new faunal units and/or to propose new mammal ages. The more detailed the framework is, the more difficult it is to define the faunal complexes that can be considered biochrons, being uniform in composition and structure. The analysis of the early Middle Pleistocene Italian faunas enables us to evidence that the Faunal Units must be considered only as a very flexible working tool since they are mainly of local significance. For instance, in the Italian case, the first occurrences of the taxa are quite scattered and allow the definition of a detailed biochronological framework. On the other hand, the presence of several long-persistent taxa tends to make the biochronological record uniform. The Italian faunas show peculiar features in comparison with coeval European ones, several bioevents, scattered in time, can be detected.

Among the cervids, the presence of three megacerine deers, “*Praemegaceros*” *verticornis*, *M. savini* and “*P.*” *solilhacus* can be noticed in the middle Galerian faunas. The occurrence of the last taxon has never been recorded in Italy in deposits older than the Isernia FU, even if it is testified in Europe since the end of the Early Pleistocene (Soleilhac—Bonifay and Bonifay, 1981). Such a distribution of the Italian megacerine suggests patterns of wide-spreading and ecological competition that are still to be clarified.

Moreover, the persistence of *Axis* and the occurrence of *D. clactoniana* earlier in Italy than in the rest of Europe add complexity to the biochronological framework of cervids. Similar peculiarities can be noticed also among bovids, with the occurrence of *H. galerianus*. The variation in the composition of the LFAs is also complicated by geographical factors. Such a pattern is not surprising and can be explained by the geographical position of the Italian peninsula, its latitudinal extension and its complex physiography, notably the occurrence of physical natural barriers such as the Alps and Apennines and the consequent fragmentation of the territory favoured the first occurrence of bio-events, scattered in time, the survival of long-persistent taxa in refugium areas, and, finally, the phenomena of endemism and local origin of new taxa. Accordingly, the geographical features of the Italian peninsula played an important role in defining the geographical and biochronological distribution of the mammals. Consequently, during the Plio-Pleistocene sharp and important faunal changes are rarely recognisable in the Italian faunas, and the transition between successive faunal assemblages often involves a restricted number of species or subspecies (Palombo et al., 2003).

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