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Large carnivore and other mammal fossils from the Early Pleistocene alluvial plain of the Tiberino Basin (Pantalla, Central Italy). Preliminary reports

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KEY WORDS - *Mammalia, Carnivora, Taphonomy, Paleosols, Crevasse-splay deposits, Early Pleistocene, Late Villafranchian, Tiberino Basin.*

ABSTRACT - *The extensional Plio-Quaternary Tiberino Basin extends from San Sepolcro to Terni (Central Italy) forming an upside-down "Y" shape. The study area is located along the southwestern branch of this "Y" near the village of Pantalla (between Marsciano and Todi). The Tiberino Basin filling is made up of continental deposits, of which the oldest outcropping sediments are deep meromictic lacustrine deposits. An angular unconformity divides these Pliocene lake sediments from horizontal Early Pleistocene alluvial sediments (S. Maria di Ciciliano Formation).*

Sandy lithosomes belonging to this Formation are interpreted as high-sinuosity channel fillings while paleosols and pond, wetland and crevasse-splay deposits are identified respectively by silty clays with pedogenetic characteristics, laminated silty clays, lignites, and sandy bodies.

*In the stratigraphic succession studied near Pantalla (SMCF) paleosols, crevasse-splay and channel deposits outcrop. Fossil remains have been found within two strata. One, consisting of silty sands and interpreted as crevasse-splay deposits, yields abundant mammalian remains. The mammal assemblage includes a small-medium sized deer (*Pseudodama* cf. *P. nestii*), a bovine (*Leptobos* sp.), a suid (*Sus* cf. *S. strozzi*), a dog (*Canis* cf. *C. etruscus*) and two cats (*Lynx* cf. *L. issiodorensis* and *Panthera* cf. *P. gombaszoegensis*). Cranial skulls, including those of lynx, panthers and dogs, are abundant in the assemblage.*

*The other fossil-bearing stratum is a paleosol. The macromammal fauna within this bed are restricted to herbivora, including the bony remains of a horse (*Equus* sp.), a small-medium sized deer (*Pseudodama* cf. *P. nestii*) and a bovine (*Leptobos* sp.), as well as rare *Pseudodama* cf. *P. nestii* teeth. The mandible of a micromammal (*Apodemus* cf. *A. dominans*) was also located in this stratum.*

Different physical and biological processes have produced these two mammal assemblages and this fauna places it among the richest known Pleistocene faunas of the Tiberino Basin. The assemblage from the Pantalla site may at present be attributed to the Late Villafranchian.

RIASSUNTO - [Grandi carnivori ed altri mammiferi fossili dei depositi di piana alluvionale del Pleistocene Inferiore del Bacino Tiberino (Pantalla, Italia centrale). Dati preliminari] - *Il Bacino Tiberino è un bacino distensivo plio-quaternario che si estende da Sansepolcro a Terni (Italia centrale) a forma di "Y" rovesciata. L'area studiata è situata nel ramo sud-occidentale del Bacino, nei pressi del paese di Pantalla (tra Todi e Marsciano). Il Bacino è colmato da depositi continentali, e i sedimenti più antichi affioranti appartengono ad un deposito di lago profondo meromittico. Lungo le coste strette e ripide di questo lago sono stati rinvenuti depositi di piana alluvionale, palude e delta. Una discordanza angolare divide i sedimenti lacustri del Pliocene (Formazione di Fosso Bianco) dai depositi orizzontali alluvionali del Pleistocene Inferiore (Formazione di S. Maria di Ciciliano).*

Nella FSMC litosomi sabbiosi (spessi 7 m, larghi 700 m e lunghi 2000 m) sono intercalati ad argille silteose e subordinatamente a ligniti e sottili strati di sabbie. I litosomi sabbiosi sono caratterizzati da una geometria planare-concava, sono a base erosiva, gradati, e attraversati da stratificazioni incrociate e superfici di accrezione e come tali interpretati come riempimenti di canali ad alta sinuosità. Argille silteose, ligniti e sabbie rappresentano subambienti deposizionali di piana alluvionale. Paleosuoli, stagni, depositi di palude e depositi di rotta fluviale sono rispettivamente individuati da argille sabbiose con caratteristiche pedogenetiche, argille silteose laminate, lignite e corpi sabbiosi spessi più di 1 m.

Nella successione stratigrafica di Pantalla (FSMC) affiorano paleosuoli, depositi di rotta fluviale e di canale; numerosi resti di mammiferi fossili sono stati rinvenuti in due strati della successione.

*Lo strato più in basso nella successione, costituito da sabbie silteose interpretate come depositi di rotta fluviale, ha restituito dei resti ossei concentrati in un'area molto ristretta (circa 2 m²). I resti comprendono un cervo di taglia medio-piccola (*Pseudodama* cf. *P. nestii*), un bovide (*Leptobos* sp.), un suide (*Sus* cf. *S. strozzi*), un canide (*Canis* cf. *C. etruscus*) e due felidi (*Lynx* cf. *L. issiodorensis* e *Panthera* cf. *P. gombaszoegensis*). I crani e in particolare quelli dei carnivori, sono gli elementi più abbondanti e vanno a incrementare in modo significativo la documentazione riguardante le faune fossili villafranchiane del Bacino Tiberino.*

*I fossili dello strato superiore provengono da un paleosuolo ricco di resti vegetali (radici e charcoal), gasteropodi terrestri e ossa e denti di mammiferi terrestri. I resti di macromammiferi recuperati in questo strato appartengono solo ad erbivori: un cavallo (*Equus* sp.), un cervo di taglia medio-piccola (*Pseudodama* cf. *P. nestii*), un bovide (*Leptobos* sp.). Dal paleosuolo proviene anche una mandibola di micromammifero riferibile ad *Apodemus* cf. *A. dominans*. Resti post-craniali e denti sono distribuiti casualmente nel paleosuolo e le ossa sono isolate e spezzate, e solo in due casi sono stati recuperati elementi articolati; sono abbondanti le "schegge" ossee non identificabili.*

Anche se i resti dei mammiferi hanno avuto due storie tafonomiche differenti, possono comunque essere considerati come un'unica associazione. Le indagini sulle figure tafonomiche e sul contesto sedimentario degli elementi scheletrici possono incrementare le conoscenze sugli antichi ambienti deposizionali del Bacino Tiberino.

La successione di Pantalla è stata anche oggetto di un campionamento per effettuare un'indagine palinologica.

I resti recuperati a Pantalla rappresentano una delle più ricche faune villafranchiane conosciute nel Bacino Tiberino; l'associazione può essere attualmente attribuita al Villafranchiano Superiore (Pleistocene Inferiore).

I dati sedimentologici e paleontologici raccolti a Pantalla (FSMC) contribuiscono ad incrementare le nostre limitate conoscenze del Pleistocene Inferiore del Bacino Tiberino.

INTRODUCTION

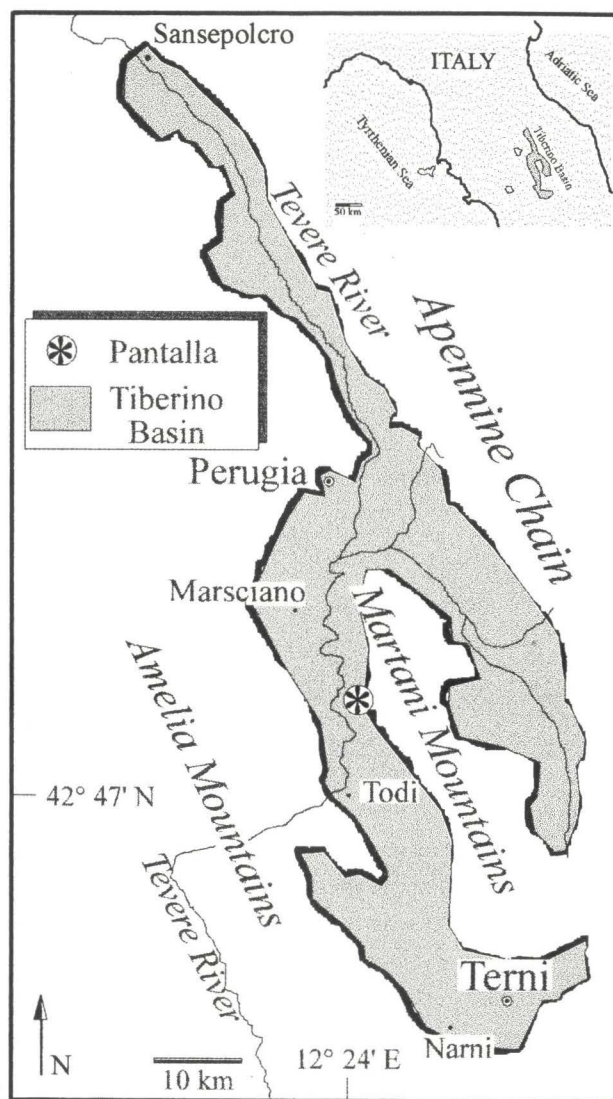
The extensional Plio-Quaternary Tiberino Basin extends from Sansepolcro to Terni (Central Italy) forming an upside-down "Y" shape. The sedimentary Tiberino Basin is 120 km long and 10 km wide; near Perugia the Basin divides in two branches, a southeastern and a southwestern branch, where the village of Pantalla is situated and where the study area was set up (Text-fig. 1).

In the Early Pleistocene, the southwestern part of the Tiberino Basin was crossed by a fluvial system, which flowed southwards and linked with the sea in the west Narni area. The fluvial system was characterized by a main meandering river and a broad flood plain. Towards the south the flood plain was marshy while towards the north in the Pantalla area it was better drained. The S. Maria di Ciciliano Formation (Basilici, 1992; Ambrosetti *et al.*, 1995) is the depositional record of this fluvial environment.

The fluvial sediments of the S. Maria di Ciciliano Formation (SMCF) consist of sandy lithosomes, which are on average 7 m thick, up to 700 m wide and 2000 m long. They are interlayered with silty clays and subordinately with lignites and thin sandy strata. The sandy lithosomes are characterized by a planar-concave shape, erosive bases, gradation, trough cross-stratifications and accretion surfaces, and, as such, are interpreted as high-sinuosity channel fillings. Silty clays, lignites and sand represent various subenvironmental deposits of the flood plain. Paleosols and pond, wetland and crevasse-splay deposits are identified respectively by silty clays with pedogenetic characteristics, laminated silty clays, lignites, and sandy bodies up to 1 m thick.

The "Parco Tecnologico Agroalimentare" excavation site is situated near the village of Pantalla (Todi-Umbria), about 6 Km to the north of Todi, on the left bank of the river Tiber. Here the early pleistocenian SMCF deposits outcrop.

The outcropping sedimentary succession near Pantalla is about 15 m thick. In the lower part of the succession a channel sandy body more than 6 m thick outcrops, while in the upper part (a)



Text-fig. 1 - The Tiberino Basin and area surrounding Pantalla.

sandy deposits not more than 1 m thick, with climbing cross-laminations, considered to be deposits of the crevasse or levee fluvial, (b) drained paleosols, (c) laminated silty clays, deposited in small lakes, alternately occur.

In the spring of 1994 Basilici and Gentili, (by courtesy of 10-year-old Giacomo Galli!) during geological and sedimentological research in these

deposits near Pantalla, brought to light some fragments of mammalian fossils from two strata of the (a) and (b) lithofacies (see above). The outcrop was reported to the Archaeological Superintendency of Umbria in mid 1994. The danger that this outcrop might have been destroyed by consolidation works by the local Comunità Montana Monti del Trasimeno of Perugia prompted us to effect an urgent recovery of other fossil remains.

Analysis of these remains revealed the richness of the outcrop in terms of represented taxa, paleobiological information and the characteristics of the represented lithotypes. At the end of 1995 a previous paleontological field expedition, which lasted one month, allowed us to recover other fossils. During this field trip, the hypothesis formulated on the potential of this paleontological site was widely confirmed.

The abundance of various mammal skulls will permit us to carry out taxonomic and phylogenetic studies of the mammal record of the Tiberino Basin. It will enable us to explain which taphonomic processes determined the high carnivore/herbivore ratio.

MAMMAL ASSEMBLAGE

SYSTEMATICS

Here a preliminary faunal list of the fossil mammal remains is reported because: (i) most of the specimens are still in the matrix and the field

casts are still to be recovered; (ii) the bones from the paleosol are rather fragmentary and not easy to analyse.

The following taxa have been identified: *Canis* cf. *C. etruscus*, *Lynx* cf. *L. issiodorensis*, *Panthera* cf. *P. gombaszoegensis*, *Sus* cf. *S. strozzi*, *Pseudodama* cf. *P. nestii*, *Leptobos* sp., *Equus* sp. and *Apodemus* cf. *A. dominans* among the micro-mammals. Fossil remains have been found in different strata within the Pantalla succession.

The research in progress will allow us to explain and certainly to extend the above rich faunal assemblage.

Carnivora

Canidae

Canis cf. *C. etruscus* Major

In the assemblage there are two well preserved dog skulls. One skull is complete, while the second does not have the right-hand side of the cranium and the anterior part of the palate. After the preliminary analysis, on the basis of size and morphology (cf. Torre, 1967) the skulls are referred to *Canis* cf. *C. etruscus*. These are the most representative remains of the *Canis* genus recovered in the Late Villafranchian layers of the Tiberino Basin. In fact only a few post-villafranchian fragmentary skeletal elements from Città di Castello (Bartolini, 1975) and from Monte Peglia (Piperno *et al.*, 1985) are known.



Text-fig. 2 - *Lynx* cf. *L. issiodorensis* Croizet & Jobert, right mandibular ramus from the Pantalla crevasse-splay deposits. Scale bar = 1 cm.



Text-fig. 3 - *Panthera* cf. *P. gombaszoegensis* (Kretzoi), left-hand mandibular ramus in the Pantalla crevasse-splay deposits. Scale bar=10 cm.

Felidae

Lynx cf. *L. issiodorensis* Croizet & Jobert

Cats are well represented in the Pantalla site. A well preserved skull and a right-hand side mandibular ramus (Text-fig. 2), broken in the central part of the horizontal ramus, are referred to *Lynx* cf. *L. issiodorensis*. This is the first appearance of the *Lynx* in the Tiberino Basin.

Panthera cf. *P. gombaszoegensis* (Kretzoi) (=*P. toscana*)

The *Panthera* genus is represented by a left mandibular ramus (Text-fig. 3) and two well preserved skulls with complete dental formula. The fossil remains, because of their size and morphology (data according to Ficcarelli & Torre, 1968), are referred to *Panthera* cf. *P. gombaszoegensis*. The remains of this cat are rather scarce in the Tiberino Basin deposits. Up till now the only remains recovered have been: a) a mandible and some fragmentary postcranial bones recovered at Villa Spinola (Tuccimei, 1896) near Perugia, b) two fragments of carpals from the lignite of

Pietrafitta (Gentili *et al.*, 1996) and c) a left calcaneum recovered at Ellera of Corciano (Ambrosetti *et al.*, 1995).

Arctiodactyla

Suidae

Sus cf. *S. strozzii* Azzaroli, 1953

A well preserved left mandibular ramus with complete dental formula is, up to now, the only fossil remain referred to a suid. The morphology of the teeth and of the mandible are comparable with *Sus strozzii*. The fossil remains referred to *Sus* recovered in the Tiberino Basin are rather scant and fragmentary (Tuccimei, 1896; Ambrosetti *et al.*, 1995). Therefore this is the most significant fossil remain so far recovered in this basin.

Cervidae

Pseudodama cf. *P. nestii* (Azzaroli, 1947)

This small medium-sized deer is the most representative taxon in the assemblage. The most interesting specimen, a skull with antlers (Text-fig.

4), allows us to refer its general morphology to *Pseudodama* cf. *P. nestii* (see Azzaroli, 1992). Most of the fossil remains include cranial remains (a palate with teeth, a fragment of the left mandibular ramus with P/2, P/3 and P/4, a right one with complete toothrow, a fragment of the left ramus and some isolated and fragmentary teeth) associated with some postcranial elements (a right lower limb, fragmentary remains of carpal and tarsal bones, some phalanges and a fragment of tibia).

Bovidae
Leptobos sp.

A complete bovine skull (Text-fig. 4) was recovered and will be the object of systematic observation and studies. At present it is attributed to *Leptobos* sp. Several complete skulls of this genus, referred to as *Leptobos* cf. *L. vallisarni* (Masini, 1989), were also recovered in the Early Pleistocene lignites of Pietrafitta (Gentili, 1991). However, while the Pietrafitta skulls underwent *fragile* deformations during the compacting of the sediments, the Pantalla skull is not deformed.

Perissodactyla
Equidae
Equus sp.

Some articular fragments of metapodial and one phalanx are referred to *Equus* sp.

Rodentia
Muridae
Apodemus cf. *A. dominans* Kretzoi, 1959

The remains of only one right mandibular ramus with incisive and first and second cheek teeth in alveolus have been recovered. The dental morphology and the size of the cheek teeth (M/1: length=1.83 mm, width=0.83 mm; M/2: length=1.25 mm, width=0.85 mm), allow us to refer it to *Apodemus* cf. *A. dominans* (see Pasquier, 1974).

The abundant fossil remains of dogs and cats recorded in the fossil assemblage of Pantalla have further enriched the carnivore fossil record of the Tiberino Basin, and increased our limited knowledge of the taxonomic and palaeoecological cha-



Text-fig. 4 - Skull with antlers of *Pseudodama* cf. *P. nestii* (Azzaroli) and skull of *Leptobos* sp. during excavation in the Pantalla crevasse-splay deposits.

racteristics of the Tiberino Basin carnivores. Turner (1995) has emphasised how evolutive events affecting the larger carnivore guild are a characteristic element of the villafranchian faunistic event.

TAPHONOMIC OBSERVATIONS

Mammal remains occur in different strata in the Pantalla succession.

Silty sands stratum - Stratigraphically lower, this is made up of silty sands which are considered to be crevasse-splay deposits. It is located in the middle part of the succession. This stratum yields abundant herbivorous and carnivorous mammal bones concentrated within a very narrow area (about 2 m²). Carnivore skulls are the most abundant in this bone assemblage, where herbivore and carnivore mandibles, herbivore skulls and rare postcranial bones are also present (Text-fig. 5). The prevalent presence of Voorhies Groups II & III (Voorhies, 1969) suggest a fluvially winnowed assemblage (Behrensmeyer, 1975).

Silty clay stratum - The upper fossil-bearing stratum, located about 2 m above the previous one, is about 20/25 cm thick and is a drained paleosol with a rich assemblage of vegetable remains (root etching, charcoal), terrestrial gastropods (Elicoidi) and mammal bones. The bony remains from the paleosol are postcranial skeletons of herbivorous mammals and teeth of small rodents (Text-fig. 5). The bones, distributed more-

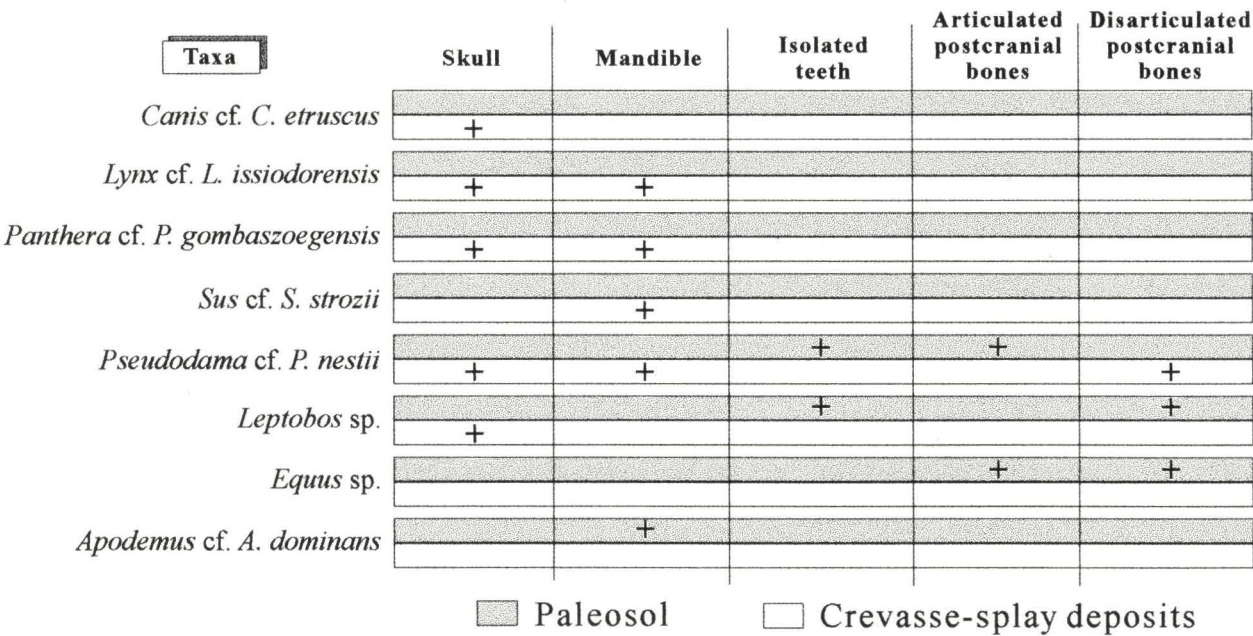
or-less at random throughout the paleosol, are isolated long bones broken at the half shaft or near their articular ends, and fragmental teeth and mandibles; unidentified bony slivers are abundant. Only in two cases we found *Pseudodama* and *Equus* articulated postcranial remains. The surface of the bones (Text-fig. 6) shows evidence of soil corrosion (cf. Andrews, 1989, 1990). The "mosaic" pattern of bone surface cracking (Behrensmeyer, 1978) is frequent in bones of the Pantalla assemblage (Text-fig. 6).

These taphonomic features and the absence of fluvially sorted traces or evidence, suggest a pedogenetic origin of the fossil accumulation, according to Bown & Kraus (1981).

CONCLUSIONS

The mammal remains in two strata influenced by different physical and biological processes can be considered a single assemblage referable at present to the Late Villafranchian association, pending a more detailed biochronological collocation.

Early Pleistocene fossil vertebrata remains are common in Umbrian sedimentary successions. In particular, several of these deposits are spread over the southwestern branch of the Tiberino Basin. In these deposits mammal remains retrieved are scant and fragmentary (Sardella et al., 1995) and micro-mammal remains are practically unknown. These poor mammal assemblages on the basis of the biochronological scheme based on large mammals



Text-fig. 5 - Distribution of the mammal remains in the two Pantalla fossil-bearing strata.



Text-fig. 6 - Soil corrosion and "mosaic" cracking pattern on the metapodial of *Equus* sp. from the Pantalla paleosol. Scale bar=1cm.

(Azzaroli, 1977, 1983; Masini *et al.*, 1994) modified by Gliozzi *et al.* (1995), have been referred to the Tasso Faunal Unit (Ambrosetti *et al.*, 1995; Sardella *et al.*, 1995) and mostly occur in sandy lithosomes of the SMCF (Santa Maria di Ciciliano Formation) interpreted as fluvial channel deposits (Ambrosetti *et al.*, 1995).

The rich Pantalla local fauna occurring in the same sedimentary deposits (SMCF) could provide:

(i) data which could help to clarify the systematic and biochronologic mammal records in the Tiberino Basin and particularly in its southwestern branch;

(ii) taphonomic and ecological information regarding the depositional paleoenvironments of the skeletal remains. The recognition of fossil-bearing paleosols has important implications for biostratigraphy and community paleoecology (Bown & Kraus, 1981).

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