



# Evidence of late Gelasian dispersal of African fauna at Coste San Giacomo (Anagni Basin, central Italy): Early Pleistocene environments and the background of early human occupation in Europe



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## ABSTRACT

Since the late 70s, the Early Pleistocene (Gelasian) site of Coste San Giacomo (Anagni Basin, central Italy) has been known amongst palaeontologists for its diverse vertebrate fauna. During the last 5 years, new excavations and the drilling of a 46-m-deep core have provided novel pieces of information. Palaeomagnetic data, pollen and small vertebrates analyses are presented here for the first time and combined with the updated list of the large vertebrates and ostracod analysis in a multidisciplinary perspective. Large and small mammals, pollen and ostracod analyses have allowed an integrated palaeoenvironmental reconstruction of the sedimentary sequence, depicting the evolution of the alluvial plain in the surrounding landscape. Moreover, magnetostratigraphy, pollen and small mammal biochronological data have confirmed the position of the Coste San Giacomo Faunal Unit, focusing the possible age of the mammal assemblage around 2.1 Ma, in a reversed phase before the base of the Olduvai chron. In particular, the occurrence of the large vole *Mimomys pliocaenicus* has important biochronological significance. The Coste San Giacomo site offers a unique opportunity to investigate the faunal and environmental changes that occurred in Mediterranean Europe during the Early Pleistocene, coinciding with major climatic changes at a global scale. The occurrence of taxa such as *Hippopotamus* sp. in the assemblage provides evidence of early dispersal events of African taxa prior to the early *Homo* diffusion into Europe.

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## 1. Introduction

The Anagni Basin (central Italy) is a Plio-Pleistocene intermontane basin in the Italian peninsula, which developed largely between the Late Pliocene and the early part of the Middle Pleistocene (Carrara et al., 1995; Galadini and Messina, 2004). The sequence includes lacustrine-alluvial sediments covered by travertine (Segre and Ascenzi, 1984) and by Middle Pleistocene pyroclastics, dated at the site of Fontana Ranuccio to between 0.528 Ma and 0.366 Ma (K–Ar dating; Biddittu et al., 1979) and attributed to the Alban Hills magmatic district (~0.7–0.02 Ma; Peccerillo, 2005). In the Anagni Basin, the Coste San Giacomo (CSG) (Fig. 1) and Fontana Ranuccio

sites have yielded important large mammal assemblages from the earliest and the middle Pleistocene respectively (Segre Naldini et al., 2009; Bellucci et al., 2012 and references therein).

Given the position of the Italian peninsula at the crossroads of Africa and Eurasia and the occurrence of African taxa such as *Hippopotamus* sp. in the assemblage, the CSG site provides information regarding early dispersal events of African fauna. It is a matter of debate as to whether the presence of African species is linked to hominin dispersal or whether there was an African faunal background preceding that dispersal (O'Regan et al., 2011 and references therein). In this context, the Italian earliest Pleistocene (Gelasian) site of CSG assumes exceptional significance due to its faunal diversity and chronological position prior to the early *Homo* dispersal in Europe.

In this work, we present a comprehensive study of the CSG site by integrating different proxies such as palaeomagnetism, pollen,

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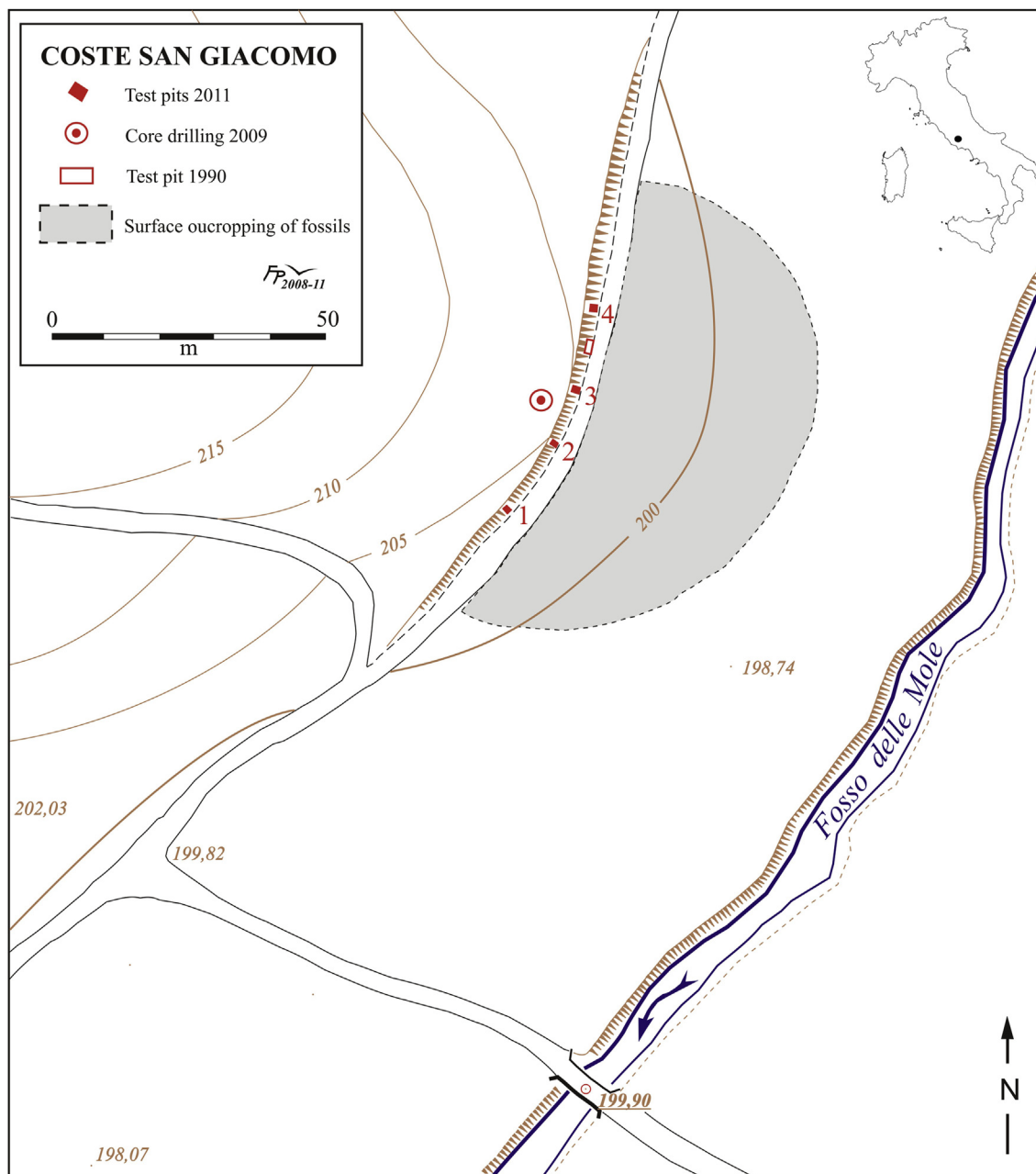


Fig. 1. Topographic map of CSG site.

and ostracod analyses. Moreover, the co-occurrence of diverse small and large vertebrate assemblages allows a comparison between the respective established biochronological scales.

## 2. Materials and methods

In 2009, a joint IsIPU (Italian Institute of Human Palaeontology) and Sapienza – University of Rome team conducted by F. Parenti and R. Sardella began re-prospecting and re-excavating the CSG site. This process has led to new palaeontological and magnetostratigraphical data being recovered. The first fossil remains from CSG were reported in 1978. After their discovery and following several field seasons in the ensuing years, an exploratory trench was dug in August 1990 (Bellucci et al., 2012). For a better understanding of the stratigraphy and to establish the lateral extension of

the fossiliferous beds, four test pits were dug in the same position as the previous trench. In addition, a 46m-deep core was drilled in 2009, a few meters from the 1990 exploratory trench (Bellucci et al., 2012). The fossiliferous horizon was detected in the core at about 5 m below the ground surface. The whole area has been surveyed in detail with a transit and alidade at 1:1000 scale (in 2008, 2009 and 2011). As a datum reference, the elevation point at 199.9 m a.s.l. from the 1:10000 regional map (sheet 389020) on the top of the bridge on Fosso delle Mole has been chosen (Fig. 1). Planimetric and altimetric tolerances are  $\pm 20$  cm and  $\pm 5$  cm, respectively.

The four test pits, numbered S1–4 from S to N (Fig. 1) have a minimum surface area of 1 m<sup>2</sup> and a maximum depth of 1.5 m from the road level. For small vertebrate analyses, at least four sediment samples of 15 kg each were collected from each pit; preliminary dry-sieving with 1 mm mesh confirmed the occurrence of a rich

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