



## Short communication

# Chronological context of the first hominin occurrence in southern Europe: the *Allophaiomys ruffoi* (Arvicolinae, Rodentia, Mammalia) from Pirro 13 (Pirro Nord, Apulia, southwestern Italy)



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## ABSTRACT

In this paper the arvicoline from the Pirro 13 fissure are described (Pirro Nord, Apulia, southwestern Italy). Due to their wide geographical distributions and rapid evolutionary rates, arvicolines are especially useful for biochronological purposes. The Pirro 13 fissure has yielded one arvicoline species: *Allophaiomys ruffoi*. The presence of this vole species, along with a comparison of our data with those of other Early Pleistocene sites such as Sierra de Atapuerca and Orce, allows us to determine the age of Pirro 13, which is shown to range from 1.3 to 1.6 Ma, making Pirro 13 the most ancient locality with human evidence currently known in Western Europe.

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## 1. Introduction

Rodents are one of the most stratigraphically significant groups of mammals in the European Pleistocene, because they have diversified more than other taxa over this relatively short geological time span. Arvicolines (voles) are particularly useful for biochronological correlation, because of the abundance of their remains and their rapid evolutionary rates. In addition, some voles have undertaken rapid, long-range migrations and may have had extensive geographical distributions, allowing to develop interregional correlations (Minwer-Barakat et al., 2011). For these reasons, arvicolines have been used to establish a biostratigraphic subdivisions of the Quaternary (Chaline, 1972; van der Meulen, 1973; Agustí, 1986; Fejfar and Heinrich, 1990; Fejfar et al., 1998; Sala and Masini, 2007; Cuenca-Bescós et al., 2010, among many others).

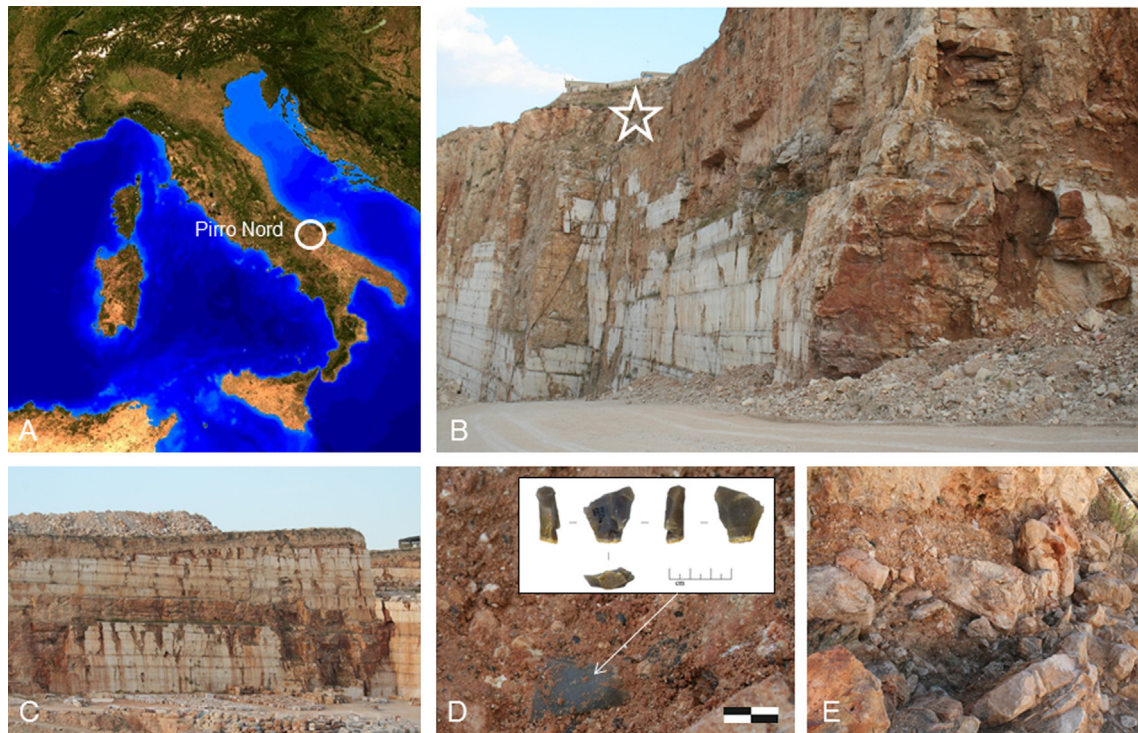
Pirro Nord is a fossiliferous site located near Apricena (Foggia, Apulia, southern Italy; 41°48'07"N, 15°23'05"E), on the northwest side of the Gargano promontory (Fig. 1). Paleontological studies have been conducted there since the 1970s (Freudenthal, 1971), and systematic field investigation have been carried out there by several research teams (De Giuli et al., 1987; Abbazzi et al., 1996). The different fossil remains recovered from various fissures, such as

Pirro 10 and Pirro 13, have provided a great deal of data and resulted in a large number of publications (synthesis by Pavia et al., 2012). Thus far, the vertebrate assemblage from Pirro Nord collected in the course of these paleontological campaigns comprises 20 species of amphibians and reptiles (Delfino and Bailon, 2000), 47 species of birds (Bedetti, 2003), and over 40 mammal species (Abbazzi et al., 1996; Gliozzi et al., 1997; Rook et al., 2004; Rook and Sardella, 2005, 2013; Petrucci et al., 2013; Salari et al., 2013). As for their chronology, the Pirro Nord fissures have been dated by the presence of the extinct vole *Allophaiomys ruffoi* (De Giuli et al., 1987; Masini and Santini, 1991; Marcolini et al., 2013), known from various Italian Early Pleistocene sites (Pietrafitta, Cava Sud, and other fissure fillings in northeastern Italy; Maul et al., 1998) all correlated with the late Villafranchian/early Biharian biochronological unit, and in the "*Mimomys savini*–*Mimomys pusillus* zone", with an age i.e. between 1.3 and 1.7 Ma (Gliozzi et al., 1997; Maul et al., 1998). The biochronological attribution of Pirro Nord has been further corroborated by paleomagnetic studies, which have shown that the fossiliferous sediments exhibit a reversed magnetization, referring them to the Matuyama post-Olduvai Chron, at a date not much younger than 1.7 Ma (Napoleone et al., 2003; Pavia et al., 2012).

Against this background, in this paper we present for the first time the chronological data obtained for the *Allophaiomys* species from Pirro 13 (Fig. 1), the only fissure where human presence has been documented, on the basis of the finding of lithic tools

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**Fig. 1.** A: Location of Pirro Nord in the Italian Peninsula. B: Pirro Nord quarry; the star indicates the locality Pirro 13; C: Panoramic view of the quarries; D: triangular debordant flake found in the P13 fissure; E: Closer views of the karst deposit in which the lithic artifacts have been found in association with the small mammal remains.

throughout the quarry (Arzarello et al., 2007, 2009, 2012; Arzarello and Peretto, 2010). The Pirro 13 deposit constitutes the filling of a karst structure that has developed in the roof of a Mesozoic limestone. The sediments are composed of red sand–clays with frequent limestone pebbles, scattered skeletal remains and sandy lenses of calcarenite (Arzarello et al., 2007, 2009; Arzarello and Peretto, 2010; Pavia et al., 2012) (Fig. 1).

Finally, a particularly interesting point is the correlation of Pirro 13 with the sites of Sierra de Atapuerca and Orce, which present complete stratigraphic sequences from the Early Pleistocene and carry the earliest documented records of fossil *Homo* in Western Europe (Carbonell et al., 2008; Toro-Moyano et al., 2013).

## 2. Material and methods

During the excavation campaigns of the Pirro 13 site that took place from 2010 to 2013, sediments were screen-washed and picked in order to obtain the small-vertebrate fossil remains. The specimens described were sorted and classified in the Sezione di Scienze Preistoriche e Antropologiche, Dipartimento di Studi Umanistici, Università degli Studi di Ferrara (Ferrara, Italy). The Pirro 13 assemblage includes a total of 114 small mammal identified remains (including insectivores, bats and rodents), 53 of which are arvicoline teeth corresponding to a minimum number of 26 individuals and representing only one taxon: *A. ruffoi* (Fig. 2). The nomenclature used in the description of the arvicoline teeth (only first lower molars are considered) is that of van der Meulen (1973) and Martin (1987). Length (L), width (W) and parameters a, b and c (Appendix A1) are those proposed by van der Meulen (1973). Indices A/L, B/W and C/W have been calculated and compared with those of other population of *A. ruffoi* (Masini and Santini, 1991), of archaic form *Allophaiomys pliocaenicus* (van der Meulen, 1973; Markova and Kozharinov, 1998; Garcia-Alix et al., 2009), of

*Allophaiomys chalinei* (Cuenca-Bescós et al., 1995; Garcia-Alix et al., 2009; Minwer-Barakat et al., 2011; López-García et al., 2012) and of evolved species *Allophaiomys lavocati* which appears in Early Pleistocene Western European sites with evidence of human presence (Laplana and Cuenca-Bescós, 2000; Minwer-Barakat et al., 2011; López-García et al., 2012).

## 3. Results and discussion

### 3.1. *A. ruffoi*: systematics and remarks

The oldest known *Allophaiomys* species recorded in Europe is *Allophaiomys deucalion* from the Early Pleistocene of different sites, such as Kamyk in Poland, Villány 5 in Hungary or Tizdar in Russia with an age i.e. between 2.0 and 1.9 Ma. It displays *Mimomys*-type or negative enamel thickness and a lack of roots, representing the most primitive species of the *Allophaiomys* lineage (van der Meulen, 1974; Garapich and Nadachowski, 1996; Tesakov, 1998; Maul and Markova, 2007). *A. deucalion* is the ancestor of *A. pliocaenicus*, the oldest *Allophaiomys* species recorded in the Italian Peninsula, coming from Monte la Mesa (ca 1.7 Ma) (Sala and Masini, 2007). As initially pointed out by Pasa (1947) and subsequently corroborated by other authors (Masini and Santini, 1991; Agustí, 1998, among others), *A. pliocaenicus* seems to be the ancestor of *A. ruffoi*. *A. ruffoi* has been documented in several Early Pleistocene Italian sites, such as Pietrafitta, Cava Sud and other fissure fillings in northeastern Italy (Maul et al., 1998) dated to 1.7–1.3 Ma, inside the *M. savini*–*M. pusillus* zone (Sala and Masini, 2007) and between the Spanish *A. pliocaenicus* and *A. lavocati* biozones (Cuenca-Bescós et al., 2010). *A. ruffoi* has also been found in southern Spain in the Venta Micena site (Agustí, 1998), with an age of 1.6–1.4 Ma according to Agustí et al. (2011). The evolutionary trend for enamel thickness in *Allophaiomys* lineage goes towards the *Microtus*-type, proceeding

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