

NEW DATA ON THE MIDDLE PLEISTOCENE SMALL MAMMAL FAUNA FROM THE *HOMO* BEARING SITE OF FONTANA RANUCCIO (ANAGNI BASIN, CENTRAL ITALY).

Fabio Bona¹, Flavia Strani^{2,3}

¹ Museo Civico dei Fossili di Besano, Besano, Varese, Italia.

² Dipartimento di Scienze della Terra, Sapienza Università di Roma, Roma, Italia.

³ Istituto Italiano di Paleontologia Umana, Roma, Italia.

Corresponding author: Fabio Bona <fabgeo@libero.it>

ABSTRACT: The scanty small mammals material of the Middle Pleistocene Fontana Ranuccio site is characterized by the presence of six species belonging to three order: Eulipotyphla, Lagomorpha, and Rodentia. The small mammal fossils evidence from Fontana Ranuccio, instead the scarce number of specimens, indicates that the site is characterized by a warm and wooded environment with subordinate grassland.

Keywords: Systematics, chronological remarks, environmental.

1. INTRODUCTION

The aim of this Short Note is to describe for the first time the remains of small mammals, albeit limited to a few often poorly preserved fragments, from the Middle Pleistocene *Homo* bearing site of Fontana Ranuccio (Anagni, Central Italy).

The Fontana Ranuccio site is located in the Anagni basin about 90 km southeast of Rome (Fig. 1). The locality was discovered in 1976 during quarry activities for the extraction of “pozzolana” (volcanic ash). Since then, several excavation campaigns have been carried out by the Italian Institute of Human Paleontology which have allowed to unearth a large number of archaeological tools (>100), faunal remains (>25,000) and four human teeth (Segre & Ascenzi, 1984; Ascenzi et al., 1993; Segre Naldini et al., 2009; Rubini et al., 2014; Grimaldi et al., 2020).

The fossiliferous layer is located within a succession of pyroclastic deposits which has been dated around 0.4 Ma (Pereira et al., 2018), right after the MIS 12-11 passage which marks the end of the Early-Middle Pleistocene Transition with the definitive consolidation of the glacial cycles’ periodicity change from 41 kyr to 100 kyr (the so-called “Mid-Brunhes Event”; Head & Gibbard, 2015). After this event an increase in the amplitude of both glacial and interglacial periods is observed with the MIS 11 representing one of the longest and warmest interglacial recorded after the Early-Middle Pleistocene Transition (Weirauch et al., 2008).

The Fontana Ranuccio rich vertebrate collection is stored at the Italian Institute of Human Palaeontology (IsIPU) depository (Anagni, Frosinone). Among the large mammals, 1360 specimens have been attributed to 15 taxa: *Palaeoloxodon antiquus*, *Stephanorhinus* sp., *Equus* cf. *E. mosbachensis*,

Hippopotamus amphibius, *Dama clactoniana*, *Cervus elaphus eostephanoceros*, *Praemegaceros* sp., *Bos primigenius*, *Sus scrofa ferus*, *Ursus deningeri*, *Ursus* sp., *Panthera* sp., *Crocota crocuta*, *Canis mosbachensis*, *Macaca sylvanus* and *Homo* sp. (Segre & Ascenzi, 1984; Ascenzi et al., 1993; Rubini et al., 2014; Conti et al., 2021). Artiodactyla is the best-represented order (68% of faunal remains) of which 69% belong to cervids and 25% to bovids (Strani et al., 2018).

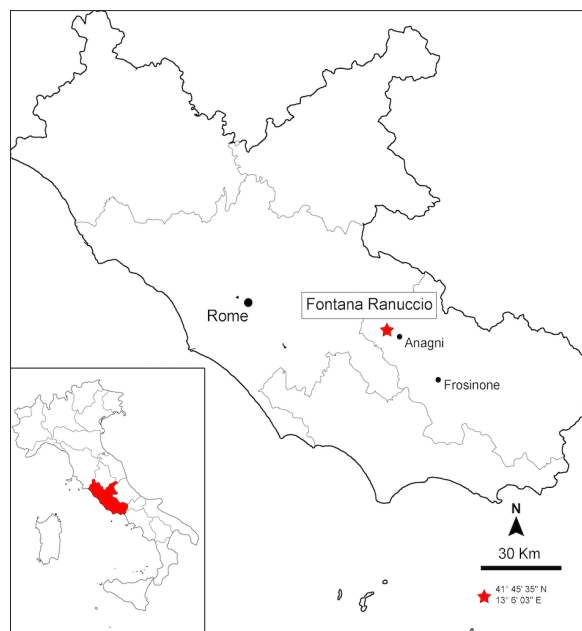


Fig. 1 - Geographical position of Fontana Ranuccio (modified from Strani et al., 2018).

2. MATERIALS AND METHODS

The studied material was collected during past field excavations starting from 1976 to today (Tab.1).

The measurements of long bones and skulls presented in this paper were taken according to von den Driesch (1976). The measurements of the Lower first molar of *Microtus (Terricola)* sp. were taken, using a digital micrometer Parker Hannifin-decadal, according to Sala et al. (1994).

The length of the tooth row were taken on the buccal side from the first root of the p4 to the last of the m3.

The fossils were compared, where necessary, with the comparison collection of one of the authors (FB).

3. SYSTEMATIC

The scanty small mammals material of the Middle Pleistocene Fontana Ranuccio site is characterized by the presence of six species belonging to three orders: Eulipotyphla, Lagomorpha and Rodentia. The rodents are represented by seven specimens, only four of those are determined at least to the generic level. The Eulipotyphla are represented by two remains attributed one to a talpid and the second to a hedgehog. Three specimens are referred to a leporid.

Order Rodentia Bowdich, 1821
Family Cricetidae Fischer, 1817
Genus *Microtus* Schrank, 1798
Microtus (Terricola) sp.

Material: 1 Left hemi-mandible with m1 and m2 (FR SD-171) (Fig. 1,2).

Measure: Tab. 2.

The m1 of FR SD-171 shows a posterior loop, T1, T2 and T3 alternate, T4 and T5 are extremely confluent, forming a "pitymoid" rhombus useful to attribute the specimen to subgenus *Terricola*, and T6 and T7 are confluent with AC3. BSA3 and LSA4 are aligned similar in shape to the extant M. (T.) gr. *multiplex-subterraneus*. BRA4 and LRA5 are well developed. The tooth axis is rectilinear with a slight concavity to the buccal side. The tooth enamel shows a positive thickness (*Microtus*-type) differentiation. The lingual triangles are larger than the buccal ones. The cement is present in the re-entrant angles.

The current taxonomic situation of the vole of the subgenus *Terricola* of the so-called "savi" group of Central-South Italy, in accordance with genetic data, sees the attestation of different species of the classic Italian endemic Savi's pine vole (*Microtus (T.) savii*) as described by Toschi (1965). Specifically, the species *Microtus (T.) brachycercus* is the most typical of Southern Italy. *Microtus (T.) brachycercus* was primarily defined at the genetic level and secondarily for some morphological characteristics defined as a member of the "Mediterranean" group; in fact, it is probably related, for the morphometric analysis of m1, to species like *Microtus (T.) duodecimcostatus* and *Microtus (T.) lusitanicus* of the

	L	B (Wt)	A	A2	L5	L4	W	b	c	d	e	AL	A2A	de	eW
FR SD-17	2.761	1.013	1.404	0.857	1.714	1.405	0.879	0.043	0.224	0.238	0.695	50.851	61.04	34.245	79.067

Tab. 2 - Measures of First lower molar of FR SD-171 (measures in mm).

Catalog number	Taxon	Skeletal element	Siding	Description	Comments
FR SD-170	Rodentia	Femur	dx	2/3 proximal	Shape and dimensions compatible with a small rodent
FR 1982-43	Rodentia	2 incisor teeth		2 fragments	Rodents probably Cricetidae or Muridae
FR SD-177	Unidentified	7 fragments			
FR SD-177/1	Cf. <i>Glis</i>	Femur	sx	Uncomplete diaphysis	Morphology and dimensions compatible with <i>Glis</i>
FR SD-171	<i>Microtus (T.)</i> sp.	Hemimandible	sx	M1 and M2	
FR 86-1	<i>Talpa</i> sp.	Humerus	sx	Uncomplete diaphysis	Dimensionally it falls within the upper dimensional range limit of <i>T. europaea</i> and within the dimension range of <i>T. romana</i>
FR SD-172	<i>Eliomys</i> sp.	Hemimandible	sx	Uncomplete hemimandible with well preserved alveoli	
FR SD-174	Rodentia	Lower incisor			Dimension and section shape allow to exclude Sciurids and Glirids
FR SD-173	<i>Lepus</i> sp.	Upper Pm or M	sx		The shape and size allow to attribute the remains to a lagomorph of slightly larger dimensions to the rabbit
FR SD-163	<i>Lepus</i> sp.	Humerus	sx	Distal fragment with epiphysis fused	
Inv. 56572	<i>Lepus</i> sp.	Tibia	dx	1/4 distal fragment	
FR 89-25	Unidentified	Femur	sx	Trochlea fragment	Small dimension. Too small fragment to give an accurate identification
FR 78-3	<i>Erinaceus</i> sp.	Scapola	sx	Proximal fragment	Very large dimension
FR 85-14	Cf. <i>Vulpes</i>	Proximal phalanx		Distal half	

Tab. 1 - Commented list of the collected small mammals.

Iberian peninsula (Contoli et al., 2008).

According to data on extant Savi's pine vole group, which underline the great level of variation in the Italian peninsula, is not possible with only one specimen to attribute FR SD-171 to a specific level.

Family Gliridae Muirhead in Brewster, 1819
Genus *Eliomys* Wagner, 1840
Eliomys sp.

Material: 1 second left hemi-mandible (FR SD-172) without teeth.

Measure: Length of the tooth row p4-m3: 6 mm.

According to the shape of the radical surface (Niethammer & Krapp, 1978), reflecting the presence of the roots of the fourth premolar and of the three molars, and to the dimensions (Fig. 2, 3) FR SD-172 is attributed to *Eliomys* sp.

The complete radical surface of FR SD-172 measured 6 mm, it is smaller than genus *Sciurus*, that usually reached 9-11 mm (Toschi, 1965) and larger for the genus *Dryomys*, that usually reached 3-4 mm (Toschi, 1965).

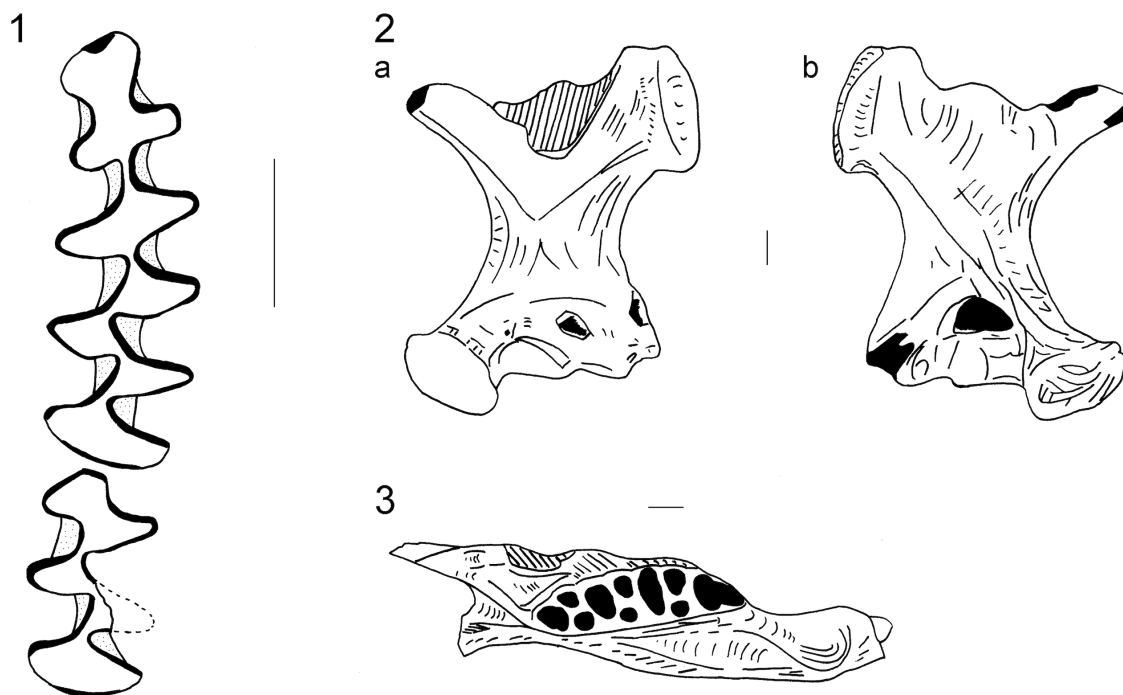


Fig. 2 - Fontana Ranuccio small mammals. 1: FR SD-171 - *Microtus (Terricola)* sp., left M/1-2 (hemi-mandible); 2: FR 86-1 - *Talpa* sp., left humerus (a: dorsal, b: ventral); 3: FR SD-172 - *Elyomys* sp., left hemi-mandible. Scale bars = 1mm.

Genus *Glis* Brisson, 1762
cf. *Glis* sp.

Material: 1 left incomplete femur (FR SD-177/1).

The direct comparison of FR SD-177/1 with specimens of the comparative collection allows to tentatively attribute the fossil to cf. *Glis* sp.

Order Lagomorpha Brandt, 1855
Family Leporidae Fischer de Waldheim, 1817
Genus *Lepus* Linnaeus, 1758
Lepus sp.

Material: 1 upper left fourth premolar or first/second molar (FR SD-173); 1 distal fragment of left humerus (FR SD-163); 1 right distal fragment of tibia (Inv. 56572).

Measure: FR SD-173, Bd (breadth of distal end): 11.8 mm; Inv. 56572, Bd (breadth of distal end): 14.1 mm.

FR SD-173 is characterized by a not deep coronoid fossa and a wide supratrochlear hole and by a deep trochlea and small humeral capital (Fig. 3A). Inv. 56572, although a small fragment, presents a sub-rectangular distal articular surface and a well-developed *malleolus lateralis* (Fig. 3B).

The three lagomorph specimens, according to the dimensions (larger than the genus *Oryctolagus* where, for example, specimens from Sicily humerus Bd does not reach 10 mm and tibia Bd does not reach 12 mm, Fig. 3A-B) are attributed to *Lepus* sp. (Ascenzi et al., 1993).

Order Eulipotyphla Waddell et al., 1999
Family Talpidae Fischer de Waldheim, 1817

Genus *Talpa* Linnaeus, 1758
Talpa sp.

Material: 1 incomplete left humerus (FR 86-1).

Measure: FR 86-1, SD (smallest breadth of diaphysis): 4.4 mm.

The morphology permit, without doubts, to attribute FR 86-1 to *Talpa* sp. (Fig. 2A-B); the large dimensions (Fig. 4B) and the poorly preservation of the humerus does not permit to a clear attribution to one of the two large species of the genus *Talpa* nowadays present in the area of Fontana Ranuccio: *Talpa europaea* and *Talpa romana*.

Family Erinaceidae Fischer de Waldheim, 1817
Genus *Erinaceus* Linnaeus, 1758
Erinaceus sp.

Material: 1 proximal fragment left scapula (FR 78-3).

Measure: FR 78-3, GLP (greatest length of the processus articularis): 10.7 mm.

The fragment FR 78-3 has been determined on a comparative base to *Erinaceus europaeus* (Fig. 4A).

4. CHRONOLOGICAL CONSIDERATIONS

The association of the large mammals and the geochemical dates testified an age for Fontana Ranuccio site of about 400.000 (Middle Galerian) (Pereira et al., 2018). The presence in the scanty small mammal fauna of an evolved form of *Microtus* vole indicates that the deposit's age is near to the early Toringian (Sala & Masini, 2007) confirming the



Fig. 3 - Fontana Ranuccio Lagomorphs. A, left humerus, A1: *Oryctolagus cuniculus*, modern; A2: FR SD-163; A3: *Lepus europaeus*, modern. B, right tibia, B1: *Oryctolagus cuniculus*, modern; B2: Inv. 56572; B3: *Lepus europaeus*, modern. Scale bars = 1mm.

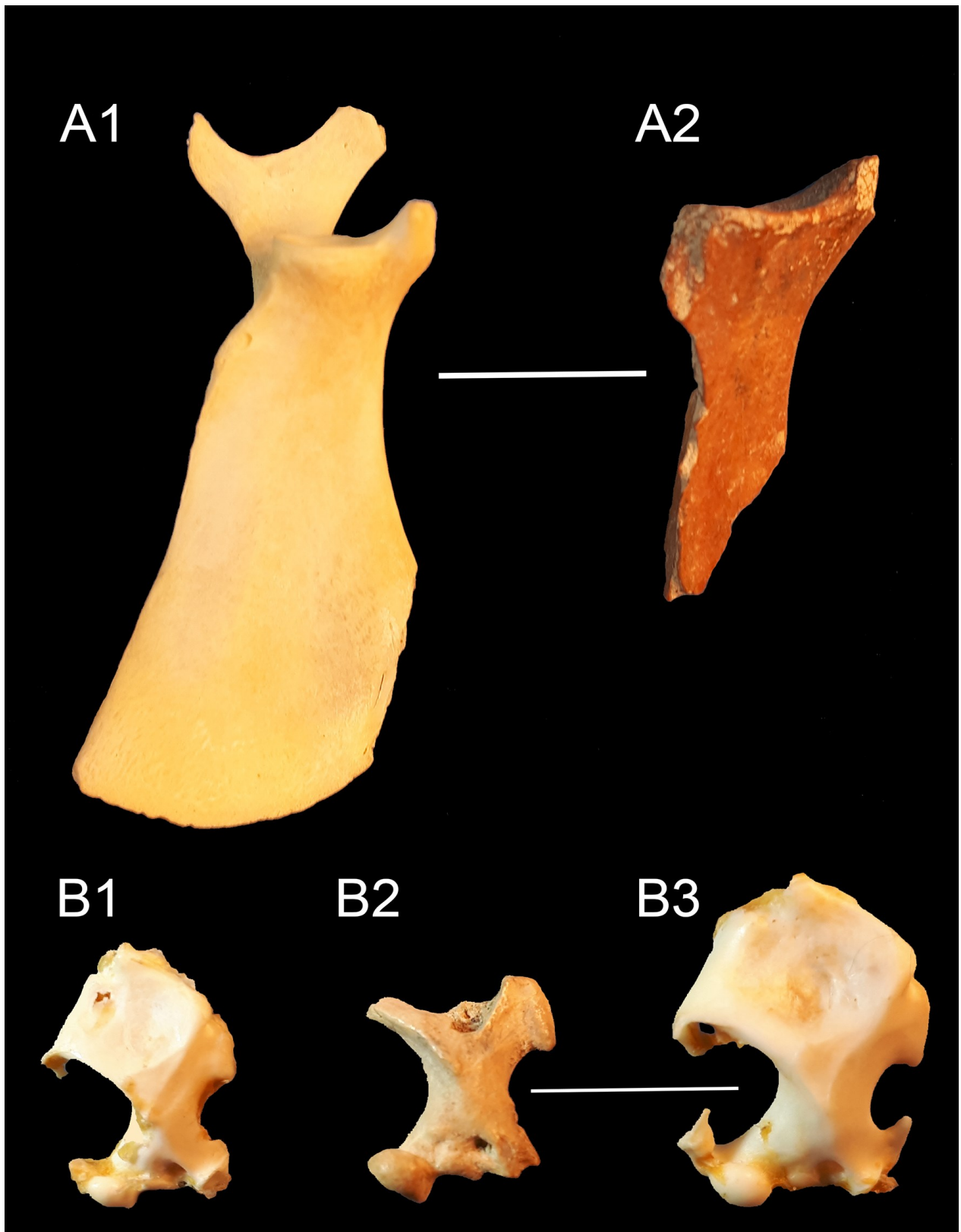


Fig. 4 - Fontana Ranuccio small mammals. A left scapula, A1: *Erinaceus europaeus*, modern; A2: FR 78-3, *Erinaceus* sp., left scapula fragment. B left humerus, B1: *Talpa caeca*, modern; B2: Fr SD-1; B3: *Talpa europaea*, modern. Scale bars =1mm.

data for the large mammal fauna (Sala & Masini, 2007).

5. PALEOECOLOGICAL INFERENCES

The small mammal fossils from Fontana Ranuccio, despite the scarce number of specimens (two glirids, a pine vole, a hare, a large mole and a large hedgehog), allow to make some considerations on paleoenvironmental conditions of the area during the deposition of fossil beds. The presence of glirids, arvicolids of the subgenus *Terricola* and large talpids allows to interpreted as the site was characterized by the presence of warm and wooded environment with subordinate grassland and well-developed soils; the presence of beavers (Ascenzi et al. 1993) allow to think about the presence of water stream. This is in accordance with what has been reported by palaeoecological and paleoenvironmental reconstruction based on herbivorous ungulates dietary adaptations, where most cervids (the best represented mammal group) display dental wear patterns compatible with a diet based on the consumption of soft plant resources (e.g., leaves and twigs) which are most common in wooded areas and closed canopies (Strani et al., 2018). The abundance of wooded areas is also supported by results obtained by the stable isotopic analysis on *E. cf. E. mosbachensis* dental material, which suggests that this equid while feeding mostly on abrasive plants occupied less open habitats (e.g. at the edge between grasslands and woodlands) (Strani et al., 2019).

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