

## **Voles from the Early Pleistocene of Pietrafitta (central Italy, Perugia)**

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Accepted for publication: 15 May, 1995

GENTILI S., ABBAZZI L., MASINI F., AMBROSETTI P., ARGENTI P., TORRE D. 1996. Voles from the Early Pleistocene of Pietrafitta (central Italy, Perugia). *Acta zool. cracov.*, **39**(1): 185-199.

**Abstract:** The lignite deposits of Pietrafitta (Perugia, Central Italy) contain an association of large mammals attributable to the Farneta Faunal Unit, Early Pleistocene (late Villafranchian). Remains of Arvicolidae and Insectivora were recovered during the excavation of skeletons of large mammals (e. g., *Mammuthus meridionalis vestinus*). The presence of traces of digestion indicate that predation contributed significantly to the accumulation of the remains. The arvicolid assemblage comprises the following taxa: *Mimomys pusillus*, *Microtus (Allophaiomys) chalinei* and *Microtus (Allophaiomys) cf. ruffoi*. The morphology of *M. pusillus*, which is the most abundant form, is comparable to that found in early Biharian sites of eastern Europe (e. g., Chlum 6, Holštejn, Včelare). Large-sized teeth of a single individual of *Microtus* demonstrate the presence of *M. (A.) chalinei*. The Pietrafitta specimen represents the first find of this form outside the Iberian peninsula. *M. (A.) cf. ruffoi*, the second species in terms of abundance, shows an evolutionary level comparable to that of *M. (A.) cf. ruffoi* of Cava Pirro (southern Italy). In general, the association indicates an early Biharian mammal age. The predominance of Arvicolidae among the small mammals indicates the presence of open areas with a tendency towards a cold climate in the local environment. This hypothesis is strengthened by the presence of the giant deer *Megaceroides obscurus* within the association of large mammals.

**Key words:** *Arvicolidae*, systematics, factor analysis, Early Pleistocene, Pietrafitta, Italy.

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### **I. INTRODUCTION**

The lignites of Pietrafitta, used as fuel in the Thermoelectric Station of ENEL (the Italian National Electricity Company), have been known in the literature since the second half of the 19th century (AMBROSETTI et al. 1992a), and were used for domestic purposes even before that. Since the first excavations started with the advent of excavations for industrial purposes before the First

World War, numerous, mostly mammal fossils that have enriched many European museums and private collections have been retrieved. In the 1960s, thanks to the interest of some miners at Pietrafitta, especially Mr. Luigi BOLDRINI, the systematic collection and conservation of fossils from the mine began. Since the 1980s, these remains have been stored in a special building in the premises of the Enel mine, under the supervision of Enel and the Archaeological Superintendence of Umbria. From 1986, researchers from the Department of Earth Sciences of the University of Perugia have joined the workers of the mine. This collaboration has resulted in an increase in the number of fossils retrieved thanks to the expert and continuous follow-up of the lignite excavations (GENTILI 1992).

The lignites of Pietrafitta are part of the lacustrine succession of the Tavernelle basin (Fig. 1) which surrounds the high valley of the Nestore river. The deposition of the lignites took place during the Early Pleistocene, probably as a result of tectonic movements that caused the elevation of the delta of the Paleo-Nestore and the consequent formation of several small basins characterised by stagnant fresh water facies (AMBROSETTI et al. 1989; Fig. 2 a-c).

The lignite lithosomes are made up predominantly of herbaceous species amongst which specimens of Cyperaceae and Graminaceae have been recognized (AMBROSETTI et al. 1992b). The plant remains were deposited *in situ* and fine strata of organic clays containing intraformational clasts and molluscs locally interrupt the succession. The depositional picture suggests that the lignite was deposited in a swampy area at the border of a lacustrine basin with fine clastic sedimentation, characterised by abundant organic production (marshland) (AMBROSETTI et al. 1992b).

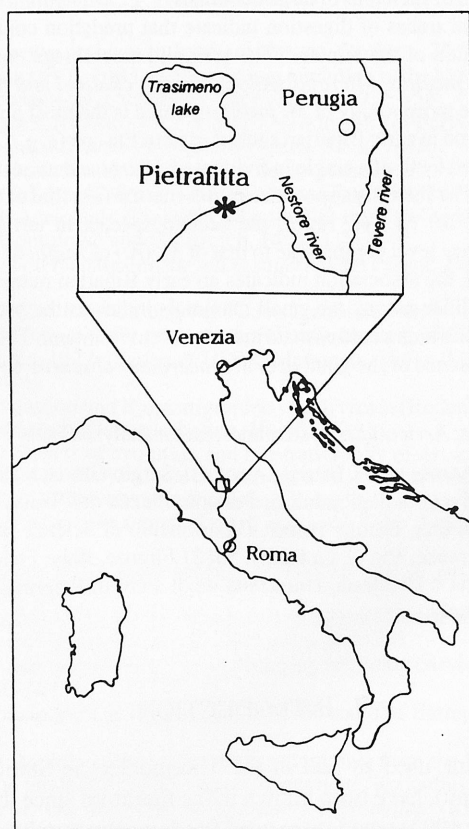


Fig. 1. Map showing location of Pietrafitta.

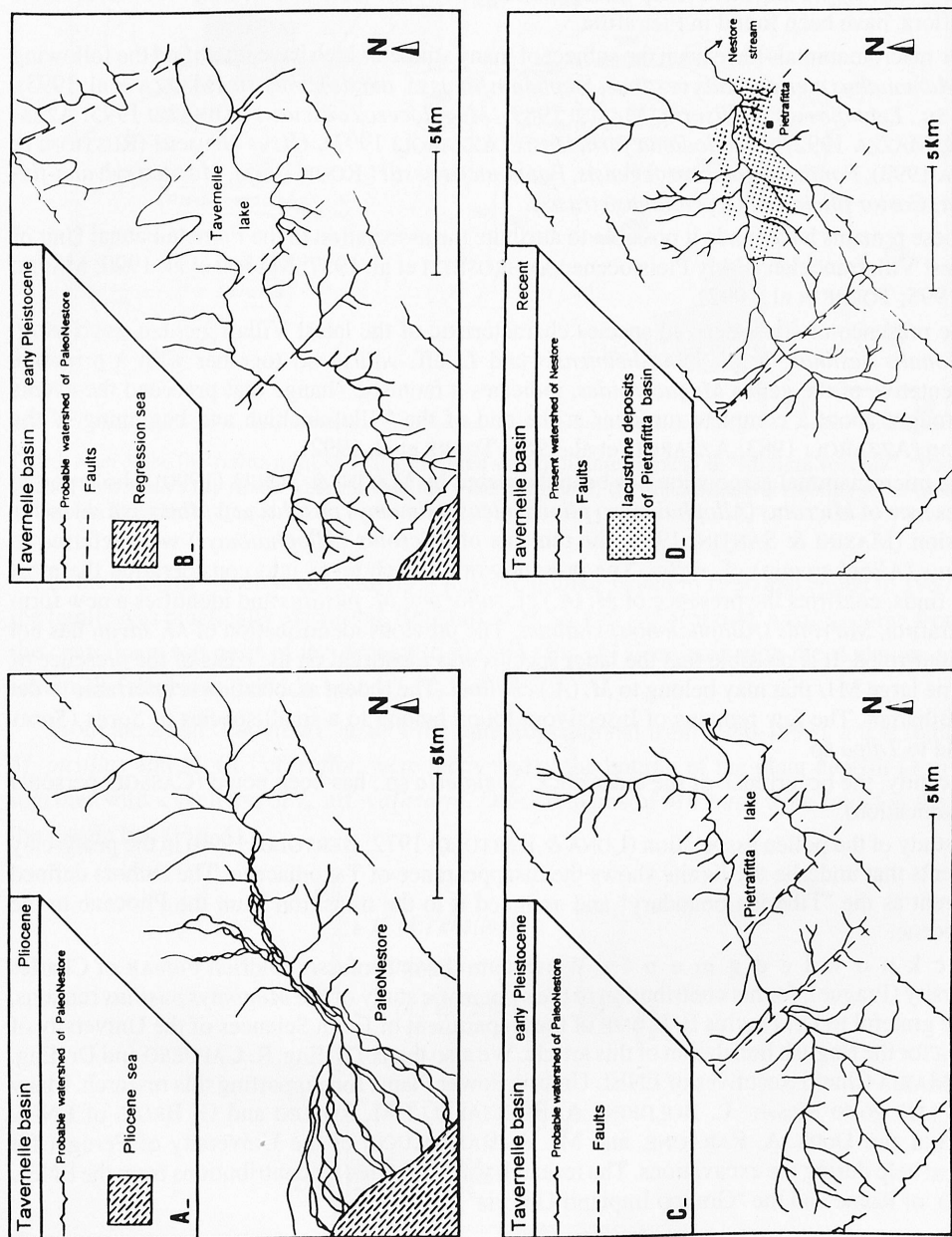


Fig. 2. Paleogeographic evolution of the Tavernelle basin. For details see text.

Towards the end of the Pleistocene, successive tectonic activities caused an uplift of the area, with consequent capture of the waters and drying up of the basins, which became subject to an erosive cycle (Fig. 2d).

Many remains of large and small mammals, together with other vertebrates, invertebrates and macroflora, have been found in Pietrafitta.

The macromammals have been the subject of many studies which have identified the following taxa: *Mammuthus meridionalis vestinus*, *Stephanorhinus* cf. *hundsheimensis* (MAZZA et al. 1993), *Equus* sp., *Leptobos* aff. *vallisarni* (MASINI 1989), *Megaloceros obscurus* (ABBAZZI 1995; AZZAROLI & MAZZA 1992), *Pseudodama farnetensis* (AZZAROLI 1992), *Ursus etruscus* (RUSTIONI & MAZZA 1993), *Panthera gombaszoegensis*, *Pannonictis nestii* (ROOK 1995), *Macaca sylvana-florentina*, *Castor plicidens*, *Oryctolagus etruscus*.

These remains have made it possible to attribute the association to the Farneta Faunal Unit of the latest Villafranchian (Early Pleistocene; AMBROSETTI et al. 1987; MASINI et al. 1990; MASINI et al. 1995; TORRE et al. 1992).

The presence of some derived species characteristic of the latest Villafranchian, such as *M. meridionalis vestinus*, *S.* cf. *hundsheimensis* and *L.* aff. *vallisarni*, together with a primitive representative of the genus *Megaceroides*, indicates a faunistic change that preceded the events that brought about a complete turnover at the end of the Villafranchian and beginning of the Galerian (AZZAROLI 1983; AZZAROLI et al. 1988; TORRE et al. 1992).

The micromammal association has been discussed by MASINI & TORRE (1990) who reported the presence of *Microtus (Allophaiomys) pliocaenicus*, *Mimomys pusillus* and *Mimomys savini*. In a revision (MASINI & SANTINI 1991) the remains of *Microtus (Allophaiomys)* were referred to *Microtus (Allophaiomys)* cf. *ruffoi*. The present work, which takes into consideration the most recent finds, confirms the presence of *M. (A.)* cf. *ruffoi* and *M. pusillus* and identifies a new form to Pietrafitta, *Microtus (Allophaiomys) chalinei*. The previous identification of *M. savini* has not been confirmed. It is possible that the latter species was identified on the basis of the presence of the same large M1/ that may belong to *M. (A.) chalinei*. The rodent association is referable to the early Biharian. The few remains of Insectivora found belong to a small species of *Sorex (Sorex* sp.) and to *Talpa* sp.

Recently, the occurrence of the eider duck, *Somateria* sp., has been noted (CASSOLI personal communication).

A study of the pollen association (LONA & BERTOLDI 1972; BERTOLDI 1990) in the peaty-clay sediments that underlie the lignite shows the disappearance of Taxodiaceae. The authors defined this event as the "Tiberian boundary" and assigned it to the transition from the Pliocene to the Pleistocene.

**A c k n o w l e d g m e n t s.** We wish to thank Professor Oldřich FEJFAR of Charles University (Prague), for his contribution to the systematic study of the *Mimomys pusillus* remains. We are grateful to Dr. Flavius E. IKOME of the Department of Earth Sciences of the University of Perugia for the English translation of this article. We also thank Dr. Eng. R. CAPURSO and Dr. Eng. V. DE MARIA Chief Executives of ENEL Umbria Power Plants for supporting this research. Many thanks also go to Messrs: L. BOLDRINI, A. BOCCIARELLI, M. ROTONI and G. BRUNI of ENEL Pietrafitta and Dott. A. FARAONE, and Mr. A. BARTOLUCCI of the University of Perugia for practical help during the excavations. The research was supported by contributions from the ENEL (D.C.O. of Rome and the "Gruppo Impianti Umbria").

## II. THE RODENT FINDS

The arvicolids were obtained from three sites of the mine at different times; the "Miniera Vecchia", "Poderetto" and "Poderone" (Fig. 3). They were generally found associated with larger mammals and only rarely isolated in the lignite.



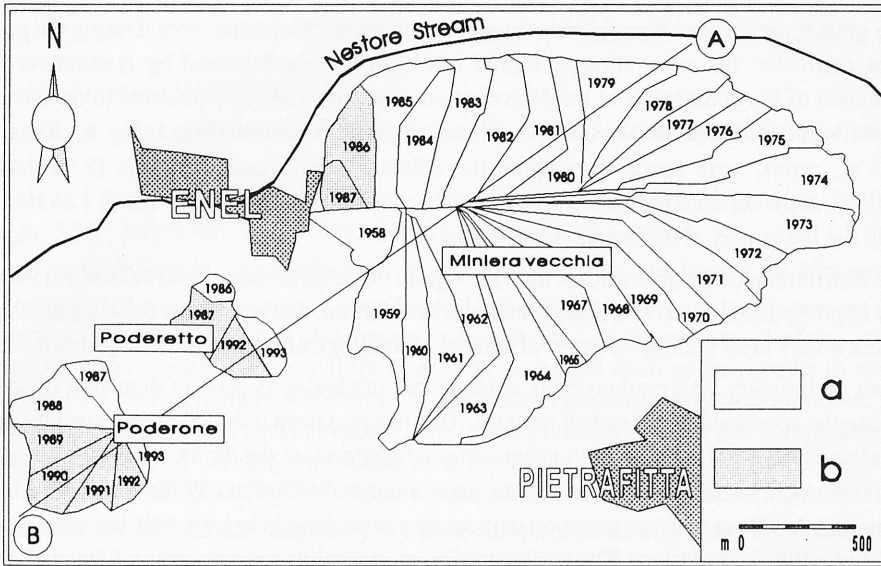


Fig. 3. Map of the Pietrafitta mine showing the three sites of lignite extraction: "Miniera vecchia", "Poderetto" and "Poderone". (a) Areas where arvicolidi were not found; (b) areas where arvicolidi were found. The line (A-B), refers to Fig. 4.

In the Miniera Vecchia, the search for micromammals began in 1986 and ended in 1987 when the lignite was practically exhausted. Remains of *M. (A.) cf. ruffoi* and *M. pusillus* come from both the central and top parts of the deposit (6 m thick; Fig. 4) associated with the skeletons of large mammals (elephants, cervids, bovids).

From the small "Poderetto" area of the mine (operational from 1986-1993), a few remains of *M. pusillus* and *M. (A.) cf. ruffoi*, were recovered at the bottom of the plant deposit (4 m thick) together with a skeleton of *L. aff. vallisarni*. Other remains of *Microtus* were found at the top of the lignite bed (Fig. 4).

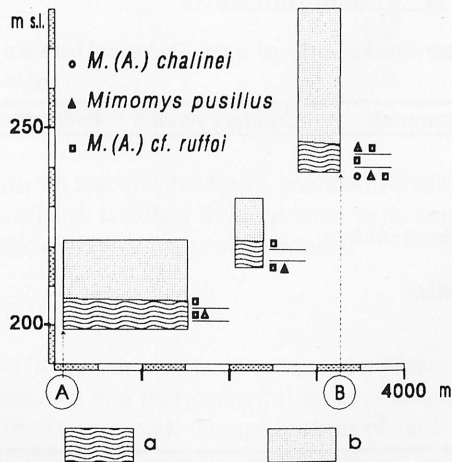


Fig. 4. Distribution of the lignite deposits along the line A-B shown in Fig. 3. (a) Lignite bed; (b) overlying soils constituted mainly of lacustrine clays. The distribution of the arvicolidi inside the three lignite sites which are subdivided into three parts, low, middle and high, is shown on the sides of each profile.

The greater part of the arvicolid remains was found in the "Poderone" area. During the past few years in particular, the excavation of lignite has been closely followed by researchers of the Departement of Earth Sciences of the University of Perugia, making it possible to recover many more fossils and thus enhance the quality and variety of the collection (Fig. 5; Fig. 6). Remains of *M. (A.) cf. ruffoi*, were found throughout the extent of the organic deposits (8 m thick), in association, at the top and bottom, with *M. pusillus*; the single specimen of *M. (A.) chalinei* was found in the lower part of the lignite deposit (Fig. 4).

The distribution of the arvicolids within the lignite of the three areas tends to confirm what was already hypothesized based on the large mammal association, that is, that the three lignite deposits document a very brief geological interval and are chronologically close or perhaps even coeval.

From preliminary observations, it is evident that predation as seen in digestion traces contributed to the accumulation of rodent remains. This has also been indirectly confirmed by the fact that skeletons have not been found in their original anatomical positions. Moreover, as already evident from taphonomic observations on the macromammals (GENTILI 1992), the skeletons of the micromammals did not undergo transport or processes of prolonged aggregation, but were probably rapidly buried in the sediment. The concentration of arvicolids remains around the skeletons of large mammals could be the result of the careful handling which a significant quantity of lignite underwent or of the intervention of biostratinomic factors which have yet to be identified.

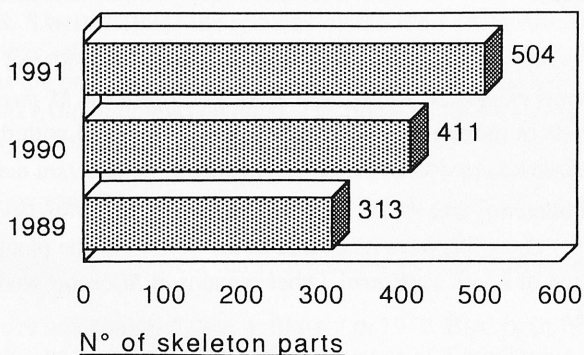


Fig. 5. The number of vertebrate remains retrieved at the "Poderone" between 1989 and 1991.

Micromammals	Miniera vecchia	Poderetto	Poderone
<i>M. (Allophaiomys) cf. ruffoi</i>	+	+	+
<i>M. (Allophaiomys) chalinei</i>			+
<i>Mimomys pusillus</i>	+	+	+
<i>Sorex</i> sp.			+
<i>Talpa</i> sp.			+

Fig. 6. Micromammals retrieved from the "Miniera vecchia", "Poderetto" and "Poderone". The greater diversity of species found in the "Poderone" is probably attributable to the intense and continuous scientific follow-up of the excavations during the past few years.

## III. SYSTEMATIC PALAEONTOLOGY

*Mimomys pusillus* (MÉHELY, 1914)

S y n o n y m y: *Mimomys* sp. AMBROSETTI et al., 1987; *Mimomys* cf. *pusillus* MASINI & TORRE, 1990

M a t e r i a l: 10 M1\right; 13 M1\left; 8 M2\right; 9 M2\left; 3 M3\right; 3 M3\left; 5 M/1 right; 5 M/1 left; 5 M/2 right; 5 M/2 left; 6 M/3 right; 2 M/3 left.

These molars belong to a small *Mimomys* with hypsodont crowns and lacking the *Mimomys*-islet.

In the M/1, the triangles maintain a moderate degree of confluence, even when worn. This is very evident in the T1 and T2. The *Mimomys*-ridge, limited to the upper part of the crown, is observed only in remains with very little wear. The very high *linea sinuosa* tends to reach the occlusal surface even in remains without roots. The enamel presents the typical *Mimomys* type of differentiation; the cement is never abundant. The length of the M/1 (Table I) is comparable to that of other populations of *M. pusillus* found at some Biharian localities of Eastern Europe, in particular the one from Holštejn (FEJFAR, personal communication; FEJFAR & HORAČEK 1983).

In the M/2, T1 and T2 converge fully in all the samples. In the M3/, BRA2 e LRA2 are very deep and tend to join together even with little wear (Plate I, Figs. 6-8). BRA3 and LRA3 are barely visible. This morphology is typical of *Mimomys* with more closed triangles such as *Mimomys blanci* and *M. pusillus*.

Table I

Maximum length (in mm) of M/1 in *M. pusillus*. The numbers in parentheses correspond to those reported in the legend to Plate I

Taxa	Total Length
<i>Mimomys pusillus</i>	2.50
(1) "	2.89
(4) "	2.68
"	2.61
"	2.79
"	2.65
"	2.61
(9) "	2.68
(13) "	2.76
"	2.90
(3) "	2.87
average	2.72

*M. pusillus* shows significant resemblance to *M. blanci* of Monte Peglia (VAN DER MEULEN 1973) to which it is closely related. It differs from the latter in its larger size, a higher frequency of the *Mimomys*-ridge and the slightly less abundant cement.

*Microtus (Allophaiomys)* (KORMOS, 1932)

The remains of *Microtus (Allophaiomys)* were compared to those obtained from other Italian localities using the measurements and morphological indexes proposed by VAN DER MEULEN (1973) (Fig. 7). The comparisons were made through analysis of variance and factor analysis with Varimax rotation computed from the descriptive variables (except variable d) and morphological indexes. In the factor analysis, the first three factors were found to be significant (eigenvalue 1), and these together explained 89% of the total variance. The results of the analyses are shown in Table II and in the graphs in Fig. 8. The first factor, which explains 34.87% of the total variance,

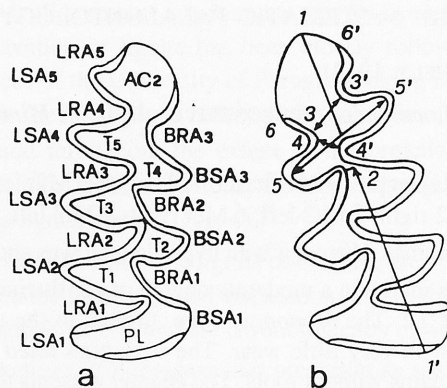


Fig. 7. a – Terminology of the lower M1 of *Microtus (Allophaiomys)*, after VAN DER MEULEN 1973 (modified). AC2= anterior cap; PL= posterior lobe; T= triangle; LSA= lingual salient angle; BSA= buccal salient angle; LRA= lingual re-entrant angle; BRA= buccal re-entrant angle. b- Sketch of the measurements of the lower M1 of *Microtus (Allophaiomys)*, after VAN DER MEULEN 1973, (modified). 1-1' = L (total length); 1-2 = a (length of the ACC); 3-3' = b (pinching of the occlusal surface between the AC2 and the pitomyoid rhomb); 4-4' = c (pinching of the pitomyoid rhomb); 5-5' = w (width of the pitomyoid rhomb); 6-6' = d (width of the enamel free area).

is positively correlated with B and B/W and negatively correlated with A/L, and thus represents an evolutionary index of ACC and the neck pinch. Low values of this index relate to morphotypes with elongated anteroconids and narrow necks. The second factor, which accounts for 29.73% of the variance, is positively correlated with the total length of the tooth, the length of the ACC and the width of the pitomyoid rhomb and thus describes the area and the length of the occlusal surface of the ACC. Finally, the third factor, which explains 25.12% of the variance, is closely correlated with the parameters that describe the pinching of the pitomyoid rhomb, that is, C and C/W.

The results show the mean morphological distance between the populations of *M. (A.) cf. ruffoi* from Cava Pirro and *Microtus (Allophaiomys) burgondiae* and *Microtus (Allophaiomys) nutiensis*. The sample of *M. (A.) cf. ruffoi* of Pietrafitta, indicates an evolutionary degree comparable to that achieved by the populations from Cava Pirro (MASINI & SANTINI 1991). The single specimen of *M. (A.) chalinei* is significantly different, showing a lower evolutionary degree (high positive value for factor 1) and large size (high value of factor 2).

*Microtus (Allophaiomys) chalinei* ALCADÉ, AGUSTÍ & VILLALTA, 1981

**M a t e r i a l:** left mandible with M1-M2.

This specimen was found at Pietrafitta as a single fragment of a left mandible with M1 and M2 (Plate II, Fig. 4). The first lower molar is characterised by a symmetric and round AC2 with a wide mesial enamel-free area; distinct BRA3 and LRA4 separate it from the rest of the ACC. T4 and T5 are confluent (C/W=27.4), the cement is abundant, and the enamel is of the undifferentiated type, with a tendency towards the *Mimomys* type in T1 and T3. The trigonid triangles are tight, with round salient angles.

The large size (Table III) and greater enamel thickness and rounder AC2 distinguish this specimen from *M. (A.) cf. ruffoi*. The neck pinch is comparable to that in *M. (A.) cf. ruffoi*, while the low value of A/L, even though somewhat similar to that of the *M. (A.) cf. ruffoi* populations, is an indication of a feeble development of the ACC.

Multivariate analysis shows the isolated position this molar assumes with respect to the samples of *M. (A.) cf. ruffoi*, *M. (A.) burgondiae* and *M. (A.) nutiensis* of various Italian localities (Fig. 8).



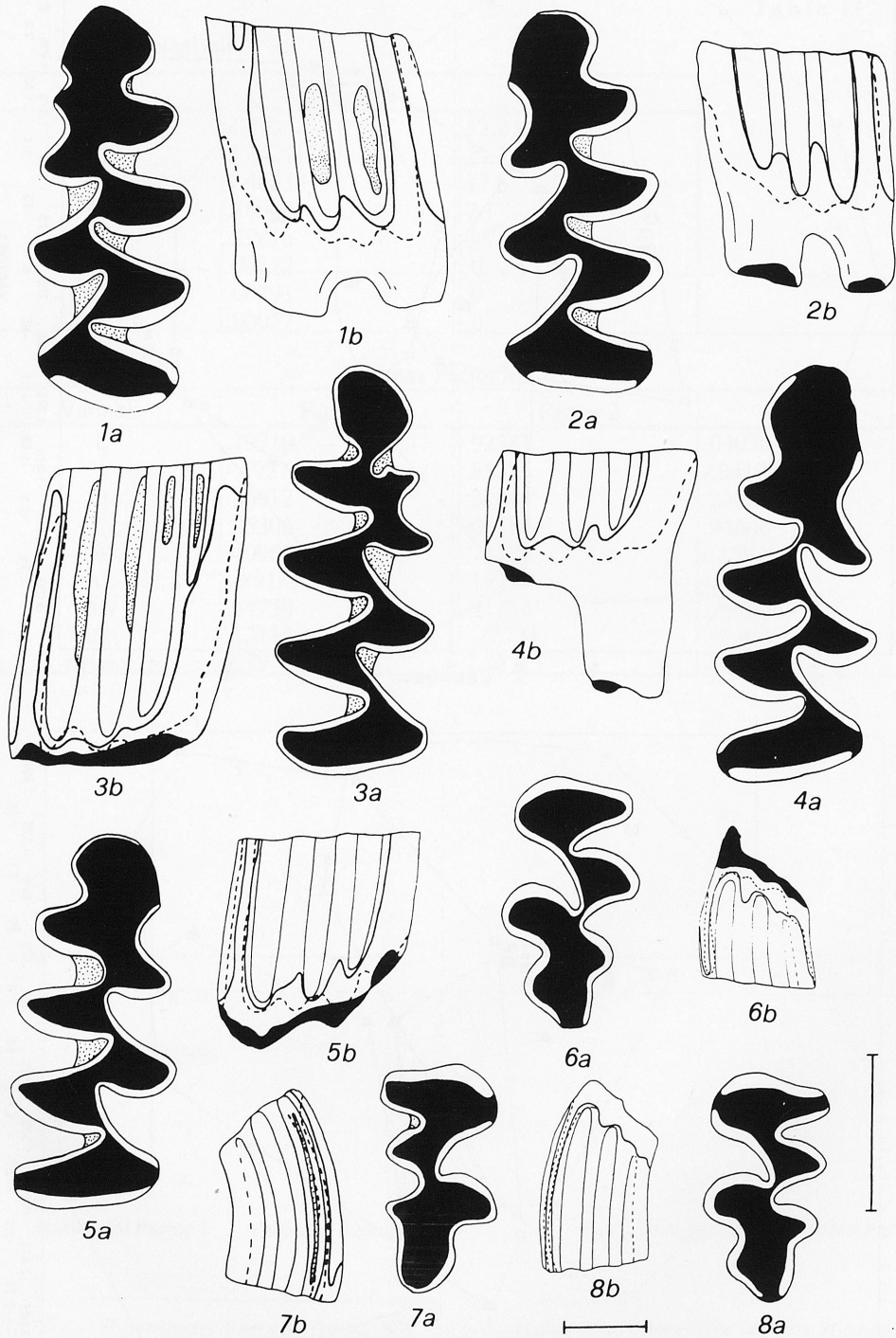


Plate I. *Mimomys pusillus*. 1 – M/1 l (1); 2 – M/2 l (4); 3 – M/1 r (13); 4 – M/1 r (3); 5 – M/1 r (9); 6 – M3/1; 7 – M3/ r; 8 – M3/ r. The numbers in parenthesis correspond to those reported on the left of Table I. a = occlusal view; b = labial view. The vertical scale (=1 mm) refers to the occlusal view, the horizontal scale (=1 mm) to the labial view.

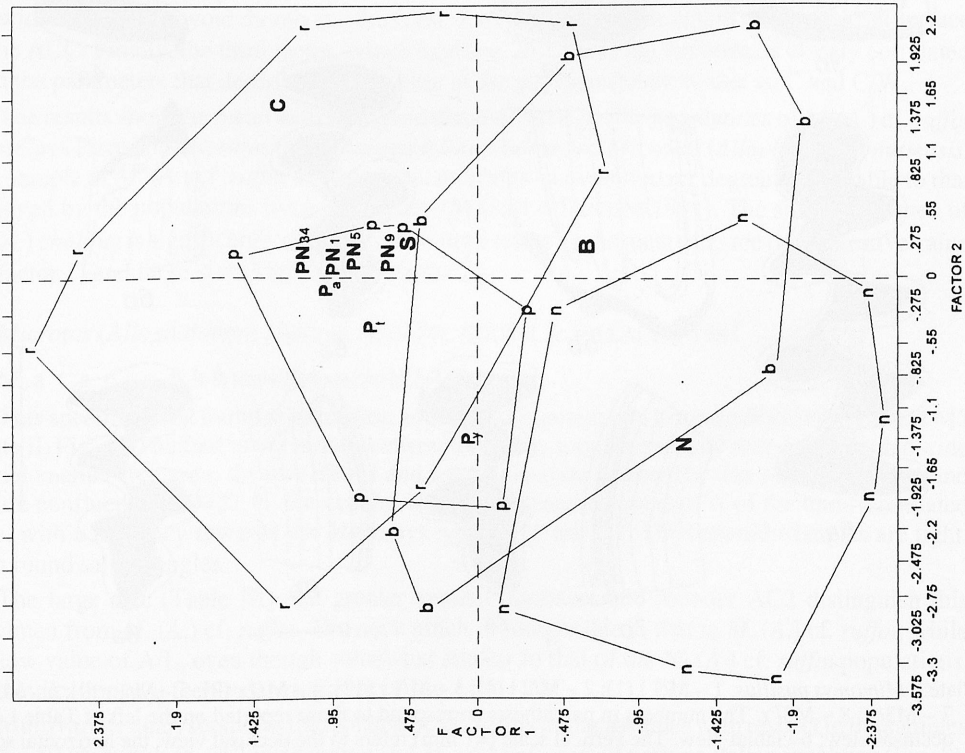
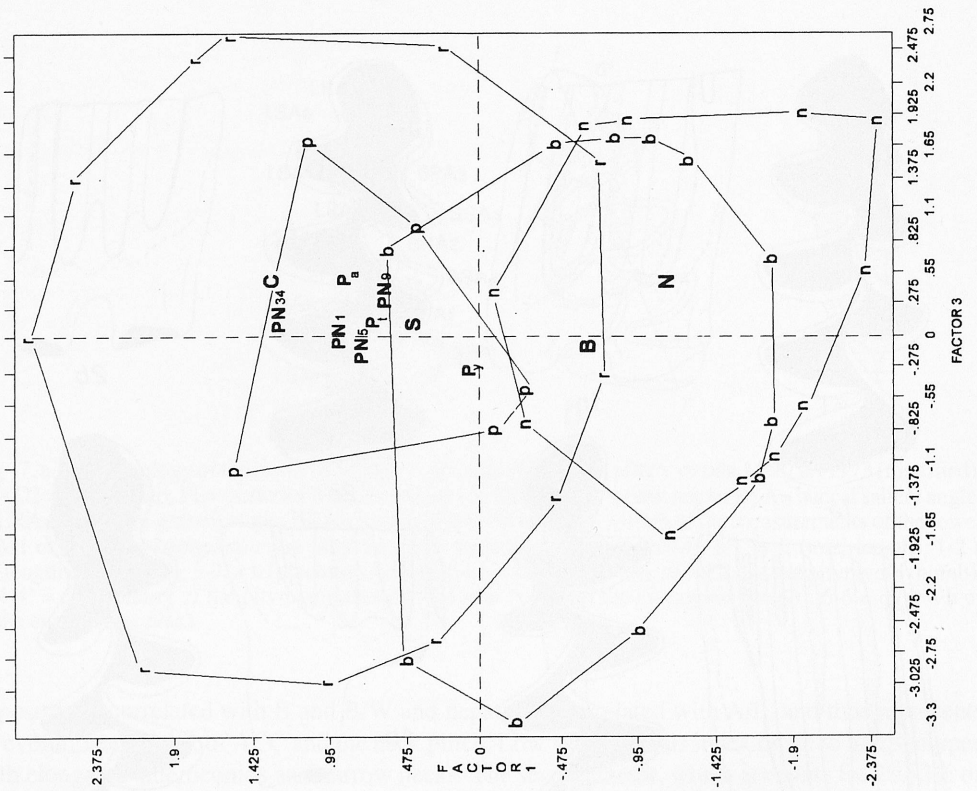


Table II

## Factor analysis

Factor	Eigenvalue	Pct of Var
1	3.37642	42.2
2	2.34211	29.3
3	1.40833	17.6
4	.56998	7.1
5	.29616	3.7
6	.00352	.0
7	.00291	.0
8	.00057	.0

Varimax Factor Matrix:			
Variable	Factor 1	Factor 2	Factor 3
L	.19710	.92381	.04030
A	-.49276	.85185	-.04106
B	.86612	.32644	.23062
C	.25306	.06186	.94646
W	.40968	.72121	-.15978
AL	-.89185	.19728	-.09194
BW	.84730	.21718	.26806
CW	.12112	-.15731	.97806
variance	2.79	2.35	2.01

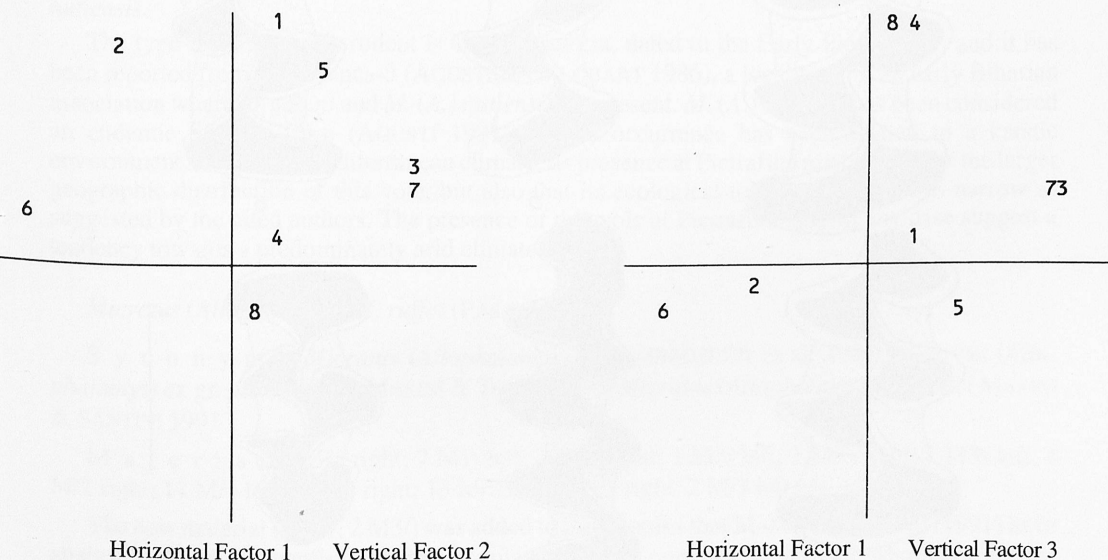


Fig. 8. Factor scores scatter diagrams. The symbols correspond to the mean values of the samples; lines indicate the area of scatter of the samples. N(-n-) – *Microtus (Allophaiomys) nutiensis*, Monte Peglia; B(-b-) – *M. (A.) burgondiae*, Monte Peglia; S(-r-) – *M. (A.) ruffoi*, Cava Sud; PN9(-r-) – *M. (A.) cf. ruffoi*, Pirro Nord; PN5(-r-) – *M. (A.) cf. ruffoi*, Pirro Nord; PN1(-r-) – *M. (A.) cf. ruffoi*, Pirro Nord; PN34(-r-) – *M. (A.) cf. ruffoi*, Pirro Nord; Pt(-p-) – *M. (A.) cf. ruffoi* (all specimens), Pietrafitta; Pa(-p-) – *M. (A.) cf. ruffoi*, (only adult, n=7) Pietrafitta; Py(-p-) – *M. (A.) cf. ruffoi*, (only young, n=3) Pietrafitta.

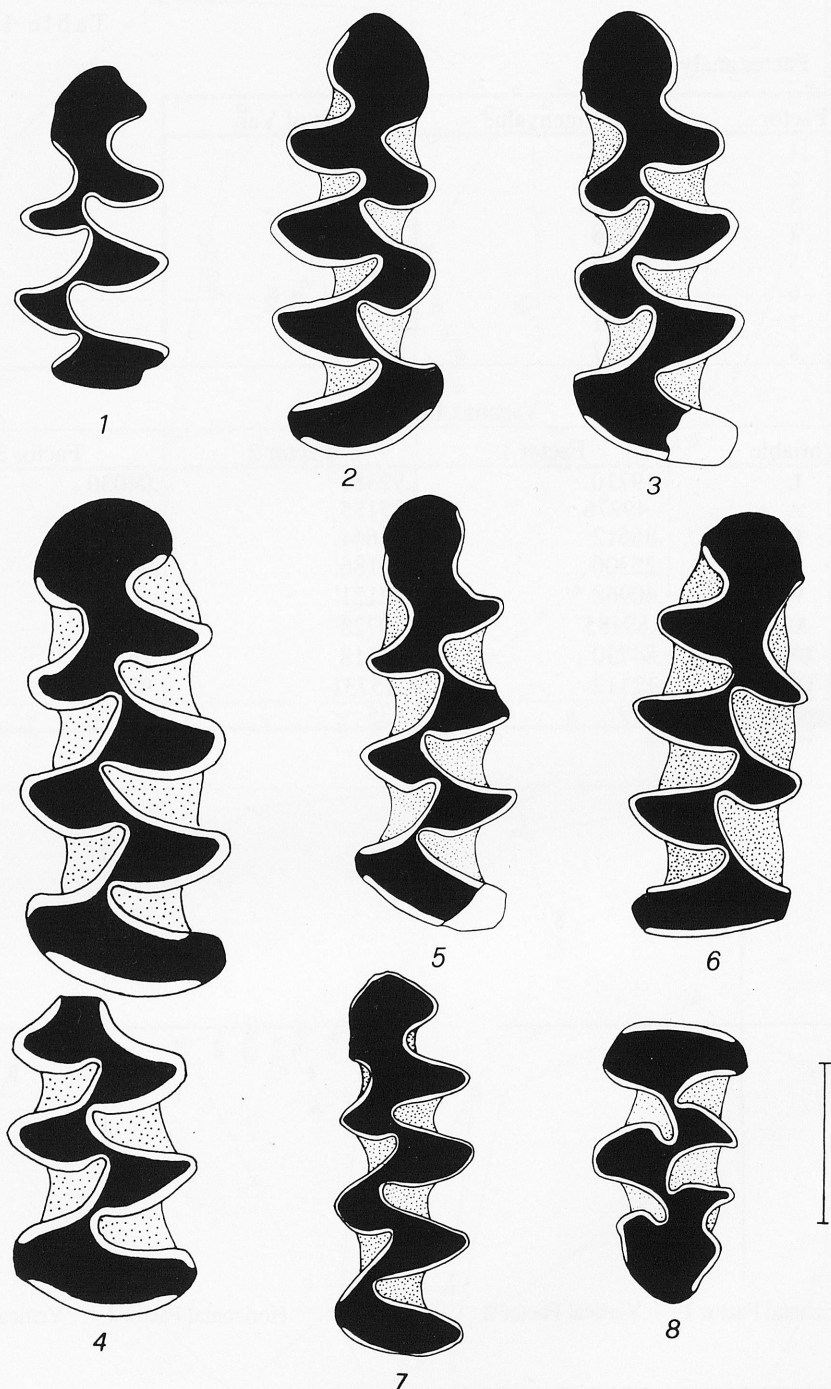


Plate II. 1 – *Microtus (Allophaiomys) cf. ruffoi*, M/1 r (2)\*; 2 – *M. (A.) cf. ruffoi*, M/1 r (5); 3 – *M. (A.) cf. ruffoi*, M/1 l (8); 4 – *Microtus (Allophaiomys) chalinei*, M/1-M/2 l (14); 5 – *M. (A.) cf. ruffoi*, M/1 l (7); 6 – *M. (A.) cf. ruffoi*, M/1 r (11); 7 – *M. (A.) cf. ruffoi*, M/1 l (10); 8 – *M. (A.) cf. ruffoi*, M3/l. The numbers in parenthesis correspond to those reported in Table III. The scale is 1 mm. \*This specimen has been drawn reversed at the base of the crown.



Table III

Measurements (in mm) and morphological indexes in *M. (A.) cf. ruffoi* from Pietrafitta. 1-13, *M. (A.) cf. ruffoi*; 14, *M. (A.) chalinei*). \* = specimens analysed by MASINI & SANTINI (1991)

	L	a	b	c	d	w	A/L	B/W	C/W
1	2.63	—	—	—	—	—	—	—	—
3*	2.62	1.14	0.24	0.19	0.50	0.85	43.51	28.24	22.35
4*	2.59	1.13	0.13	0.27	0.68	0.98	43.63	13.27	27.55
5*	2.91	1.26	0.25	0.17	0.68	0.94	43.30	26.04	17.71
6	2.77	1.41	0.30	0.21	0.00	0.76	41.16	39.47	27.63
7*	2.86	1.18	0.30	0.22	0.59	0.86	41.26	34.88	25.58
8*	2.94	1.27	0.27	0.16	0.62	0.92	43.20	29.35	17.39
9	2.70	1.25	0.20	0.14	0.51	0.90	46.30	22.22	15.56
10	2.46	1.08	0.25	0.17	0.46	0.85	43.90	29.41	20.00
11	2.86	1.21	0.29	0.21	0.68	0.96	42.31	30.21	21.88
12*	2.86	1.19	0.30	0.14	0.58	1.02	41.61	29.41	13.73
13	2.88	1.03	0.39	0.19	0.47	1.24	35.76	31.45	15.32
14	3.26	1.29	0.28	0.21	0.87	1.02	39.57	27.54	20.59

It is distinguished by its large size, short ACC, open pitomyoid rhomb and large neck. These characters confirm the primitivity of this species. The data suggest that *M. (A.) chalinei* represents a distinct phylogenetic line in the *Microtus* group, making it rather difficult to support the hypothesis of AGUSTÍ (1991) that this vole may be phylogenetically linked to the species *M. (A.) nutiensis*.

The type locality of this rodent is Cueva Victoria, dated to the Early Pleistocene, and it has been reported from Casablanca-3 (AGUSTÍ & GALOBART 1986), a locality with an early Biharian association where *M. savini* and *M. (A.) nutiensis* are present. *M. (A.) chalinei* has been considered an endemic Spanish form (AGUSTÍ 1991) and its occurrence has been related to a karstic environment and an arid Mediterranean climate. Its presence at Pietrafitta not only shows the larger geographic distribution of this vole, but also that its ecological tolerance was not as narrow as suggested by the cited authors. The presence of this vole at Pietrafitta may in any case suggest a tendency towards a predominately arid climate.

*Microtus (Allophaiomys) cf. ruffoi* (PASA, 1947)

S y n o n y m s: *Microtus (Allophaiomys)* sp. AMBROSETTI et al. 1987; *Microtus (Allophaiomys)* ex gr. *pliocenicus* MASINI & TORRE 1990; *Microtus (Allophaiomys) cf. ruffoi* MASINI & SANTINI 1991

M a t e r i a l: 9 M1\ right; 7 M1\ left; 2 M2\ right; 1 M2\ left; 1 M3\ right; 1 M3\ left; 4 M/1 right; 11 M/1 left; 8 M/2 right; 13 M/2 left; 3 M/3 right; 2 M/3 left.

The new material (4M/1, 2 M3/) was added to the samples that MASINI & SANTINI (1991) have analysed earlier, and confirm that this population is fully comparable with the populations of the karst deposits of Cava Pirro and Cava Sud. Thus, the small *Microtus* from Pietrafitta, is referred to *M. (A.) cf. ruffoi*. This form, described by MASINI & SANTINI (1991), is characterised by an ACC with an elongation comparable to that of *M. (A.) pliocenicus*, a narrower pitomyoid rhomb and a large neck.

In the factor score diagrams (Fig. 8), the centroids of the sub-samples made up of adult (n=7) and young (n=3) individuals from Pietrafitta are shown separately, while the samples from the other localities include only adult individuals. As can be seen, ontogenetic variability strongly

influences not only the dimensions but also the evolutionary level of the molars and particularly the index of elongation of the anteroconid. The molars of young individuals show an apparently more derived morphology, while the sub-sample of adults tends to group with the more primitive forms. This suggests that the remains from Pietrafitta may be somewhat older than those from sites PN1, PN5 and PN9 of Cava Pirro.

The two M/3 from Pietrafitta show dimensions similar to *M. (A.) cf. ruffoi* from Cava Pirro. A shallower LRA3, slightly larger PC1 and more developed BSA4 are characteristics that are typical of the Cava Pirro morphotypes. The more pronounced height of the crown seen in the Pietrafitta remains does not have any clear taxonomic significance and could be due to a lower degree of wear (Table IV).

Table IV

Comparison between occlusal length and height of the crown in *Microtus (Allophaiomys)* M3/ samples from Pietrafitta and a few fissures from Pirro Nord. P = Pietrafitta; PN = Pirro Nord; ML = maximum length; mL = minimum length; Mh = maximum height; mh = minimum height; a = average; N = number of specimens. All measurements in mm

Taxa	ML	a	mL	Mh	a	mh	N
P	1.87	1.89	1.92	4.06	4.21	4.37	2
PN34a	1.70	1.86	2.01	2.63	3.00	3.55	20
PN34c	1.76	1.90	2.05	2.70	3.14	3.45	11
PN2	1.62	1.83	2.10	2.49	3.15	3.80	15
PN5	1.74	1.87	1.98	2.89	3.05	3.29	7
PN9	1.70	1.86	2.01	2.92	3.39	3.97	11

#### IV. CONCLUSIONS

The Pietrafitta local fauna is characterised by the occurrence of *Megaceroides obscurus*, *Pseudodama farnetensis*, and *Stephanorhinus cf. hundsheimensis*. The dispersal of these species foreshadows the Galerian faunal turnover.

The micromammal assemblage of Pietrafitta is dominated by *Mimomys pusillus* and *Microtus (Allophaiomys) cf. ruffoi*, and characterised by the coexistence of *M. (A.) cf. ruffoi* and *M. (A.) chalinei*.

The occurrence of *M. (A.) chalinei* in Italy is now proved. It has previously been reported from late Villafranchian localities in Spain and considered an endemic Spanish species (ALCADE et al. 1981; AGUSTÍ & GALOBART 1986; AGUSTÍ 1991).

The dominance of arvicolids in the Pietrafitta rodent fauna may suggest an environment characterised locally by open areas with a probably cold climate. This hypothesis is further strengthened by the presence of the giant deer *Megaceroides obscurus*.

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