

<i>Bollettino della Società Paleontologica Italiana</i>	33 (2), 1994	ISSN 0375-7633	279-288	3 pls.	Pisa, Dicembre 1994
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The würmian fauna from Sternatia (Lecce, Apulia, Italy)

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KEY WORDS — *Fossil vertebrates, Late Pleistocene, Italy.*

ABSTRACT — *At the end of the 70's fossil vertebrates were reported from a «ventarola» (karstic fissure) of the «Pietra Leccese», near Sternatia, a small village in the outskirts of Lecce. Although the material is fragmentary and poorly preserved, several species have been recognized, Equus caballus, Equus hydruntinus, Cervus elaphus, Dama dama, Bos primigenius, Capra ibex, Canis lupus, Vulpes vulpes, Crocuta crocuta, Martes sp., Mustela nivalis, Oryctolagus cuniculus, Erinaceus europaeus, Apodemus sylvaticus, Microtus (Terricola) savii, Aves ind., Lacerta viridis, Testudo sp., Bufo viridis. Equus caballus is middle-to small-sized; it is by far the best represented among the ungulates. The fox dominates amongst carnivores. Ibex is attested only by a right first or second lower molar. The presence of the fallow deer and of the hyaena and the absence of any kind of pachyderm may possibly suggest an attribution to the second part of the Würmian Early Pleniglacial. However the possible occurrence of holdovers cannot be excluded. The complete absence of Microtus (Microtus) may even suggest an attribution to the isotopic stage 3. The fauna altogether suggests a mixed environment, with open tendentially dry spaces.*

RIASSUNTO — [La fauna würmiana di Sternatia (Lecce, Puglia, Italia)] — *Alla fine degli anni '70 furono segnalati resti fossili di vertebrati da una «ventarola» (fessura carsica) della «Pietra Leccese», in località Sternatia, piccolo centro a pochi chilometri da Lecce. Il materiale, seppure frammentario e mal conservato, ha consentito il riconoscimento di numerose specie, quali Equus caballus, Equus hydruntinus, Cervus elaphus, Dama dama, Bos primigenius, Capra ibex, Canis lupus, Vulpes vulpes, Crocuta crocuta, Martes sp., Mustela nivalis, Oryctolagus cuniculus, Erinaceus europaeus, Apodemus sylvaticus, Microtus (Terricola) savii, Aves ind., Lacerta viridis, Testudo sp., Bufo viridis. Equus caballus è rappresentato da una forma medio-piccola ed è il più abbondante fra gli ungulati, mentre fra i carnivori domina la volpe. Lo stambecco è testimoniato da un solo primo o secondo molare inferiore destro. La presenza del daino e della iena e l'assenza di qualsiasi tipo di pachiderma possono suggerire un'attribuzione alla seconda parte del primo Pleniglaciale würmiano. Tuttavia non si può escludere la presenza di forme attardate. La completa assenza di Microtus (Microtus) può anche suggerire un'attribuzione allo stadio isotopico 3. La fauna nel suo complesso suggerisce un ambiente misto, comprendente aree aperte e tendenzialmente aride.*

INTRODUCTION

The Salento Peninsula provided wealthy collections of fossil vertebrate remains of different ages. The most significant paleontological finds come from the «Pietra Leccese», a Miocene fine-grained marine limestone, exploited for construction.

The site of Sternatia is located in a «Pietra Leccese» quarry near Lecce. It consists in a classical «ventarola» infilling. The «ventarole» are prevalent-

ly vertical karstic fissures filled with reddish or brownish clayey sediments. The Sternatia material was originally collected by Mr. L. Villani in 1979. In later times other specimens were recovered by S. Petrucci and Mr. G. Bini, who passed them to Prof. C. De Giuli of the University of Florence. After Prof. De Giuli's death, the finds from Sternatia were given to Prof. E. Borzatti von Löwenstern, Director of the «Laboratorio per l'Ecologia del Quaternario» by the Institute of Anthropology of the University of Florence.

M. Rustioni, P. Mazza and S. Petrucci studied macromammals; L. Abbazzi and L. Rook micromammals; M. Delfino analyzed amphibians and reptiles.

In the course of the study, Fabio Vianello perished in a tragic airplane accident. The eventual intentional fractioning of the bones and stone implements therefore remained unstudied.

The fauna was preliminarily examined by Petrucci *et alii* (1989), who referred it to one of the cold phases of the last glaciation.

METHODS

The study of the *Sternatia* fauna first included a careful taphonomical analysis, in order to find possible evidence of transportation, exposure to weathering, scrape marks or fracturing for marrow extraction. These preliminary data would indeed warrant paleoecological inferences more reliable than any based on simple lists of species and would also permit sounder comparisons with other contemporary sites.

The total number of skeletal fragments was then established. It provides information on the relative quantities of the faunas represented in the site, and, in case the latter may result being a waste heap, it may furthermore tell us about the butchering habits and food economy of the human population who lived on the fauna. Two methods were used to evaluate the total number of skeletal fragments: one led to the assessment of what has been here called the «total number of skeletal fragments» (TNSF), the other to the «grand total number of skeletal fragments» (GTNSF). The former (TNSF) includes the count of the single teeth, even the ones mounted on jaws, as separated entities, while in the latter (GTNSF) a jaw with teeth is considered a single specimen.

In order to assess the biomasses represented in the sample, the minimum number of individuals was calculated using two different methods: the classical one, based on the simple count of the right and left pairs, called MNI (= Minimum Number of

Individuals), and Chaplin's (1971) GMT (Grand Minimum Total), which is given by total number of rights and lefts minus the number of pairs based on the estimated ages of the specimens. The two methods were used to stress the differences between the two approaches.

The micromammals represented in the *Sternatia* sample have been recognized through the examination of the dental material (in particular M1 and M3/ for the microtines). The Minimum Number of Individuals was assessed counting the highest amount of right and left M1; the Total Number of Skeletal Fragments counting all the teeth (M1, M2, M3) and considering those still mounted on maxillaries and mandibles as distinct entities; the Grand Total Number of Skeletal Fragments considering the mandibles with teeth as single specimens.

FAUNA

The vertebrate remains are very fragmentary and usually poorly preserved. No articulated elements were found.

The following species have been recognized: *Equus caballus* (Pl. 1, figs. 1-5); *Equus hydruntinus* (Pl. 1, figs. 6-8); *Cervus elaphus* (Pl. 1, figs. 9-10; Pl. 2, figs. 1-3); *Dama dama* (Pl. 2, figs. 4-5); *Bos primigenius* (Pl. 2, fig. 6); *Capra ibex* (Pl. 2, fig. 7); *Canis lupus* (Pl. 2, fig. 8); *Vulpes vulpes* (Pl. 2, fig. 9); *Crocuta crocuta* (Pl. 2, figs. 10-11); *Martes* sp.; *Mustela nivalis*; *Oryctolagus cuniculus* (Pl. 2, fig. 12); *Erinaceus europaeus*; *Apodemus sylvaticus* (Pl. 3, fig. 15); *Microtus (Terricola) savii* (Pl. 3, figs. 1-14); Aves ind.; *Lacerta viridis*, *Testudo* sp.; *Bufo viridis*.

EXPLANATION OF PLATE 1

Equus caballus L.

Fig. 1a-b - Left second upper premolar, occlusal and buccal view. About 3/4 natural size.

Fig. 2a-b - Right third upper premolar, occlusal and buccal view. About 3/4 natural size.

Fig. 3a-b - Right second lower premolar, occlusal and buccal view. About 3/4 natural size.

Fig. 4 - Fragmental left metatarsal bone, dorsal view. About 3/4 natural size. The bone bears longitudinal cracks due to weathering.

Fig. 5 - Fragmental right metatarsal bone, dorsal view. About 3/4 natural size. The bone bears longitudinal cracks due to weathering.

Equus hydruntinus Regalia

Fig. 6a-b - Left second upper premolar, occlusal and buccal view. About 3/4 natural size.

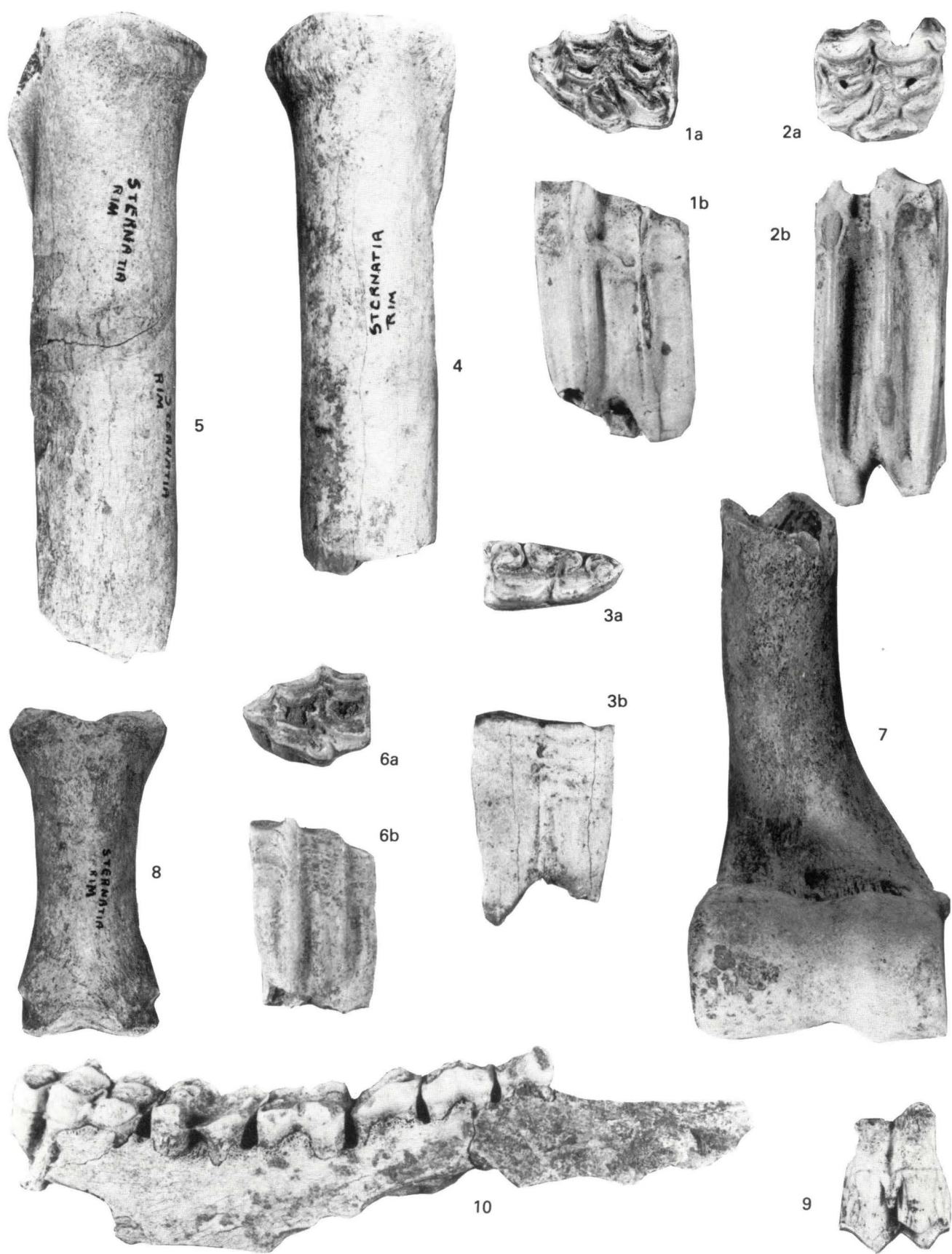
Fig. 7 - Left humerus, distal half, cranial view. About 3/4 natural size.

Fig. 8 - Left first phalanx pes, dorsal view. About 3/4 natural size.

Cervus elaphus L.

Fig. 9 - Left second upper molar, lingual view. About 3/4 natural size.

Fig. 10 - Fragmental right mandible, lateral view. About 3/4 natural size.



RESULTS

MACROMAMMALS

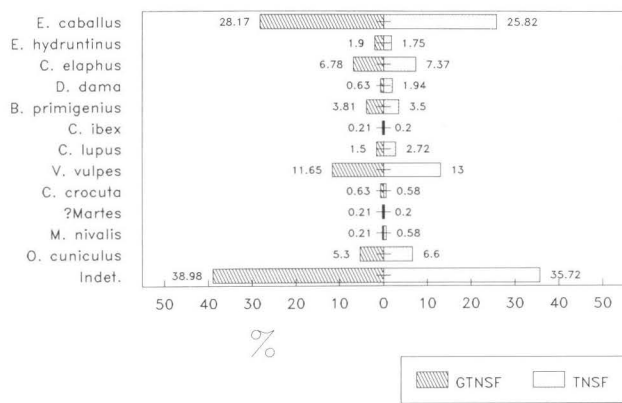
The TNSF of macromammal remains from Sternatia (inclusive of mustelids and lagomorphs) reaches a total of 472; the GTNSF 515. The total percentages of the bone fragments are shown in text-fig. 1. The MNI and GMT are shown in text-fig. 2.

The macromammals are dominated by a middle to small-sized *Equus caballus*; the fox and rabbit are relatively less abundant, while the other faunal components are slightly represented. Significant occurrences from this site are those of the steppe ass, hyaena and ibex. Noteworthy are also the absence of the wild boar and pachyderms.

Practically all the long bones of the large mammals are fractured in the middle of the diaphyses. Many show longitudinal cracks and evidence of bacterial action due to sub-aerial exposure. No scrape marks, flaked fractures or tooth marks due to carnivore or rodent activity were observed. The bones show no evidence of transportation.

One of us (S.P.) has measured the *Canis lupus* and *Vulpes vulpes* material; the measurements are reported in Table 1.

GTNSF versus TNSF



Text-fig. 1 - Grand Total Number of Skeletal Fragments versus the Total Number of Skeletal Fragments of macromammals from Sternatia.

MICROMAMMALS

Almost all the specimens are referable to *Microtus (Terricola) savii* (97.2%). The MNI reaches a total of 42; the TNSF 222; the GTNSF 171.

EXPLANATION OF PLATE 2

Cervus elaphus L.

Fig. 1 - Left astragalus, dorsal view. About 3/4 natural size.

Fig. 2 - First phalanx, medial view. About 3/4 natural size.

Fig. 3a-b - Plantar and lateral view of right metatarsal bone showing longitudinal cracks due to weathering. About 1/2 natural size.

Dama dama (L.)

Fig. 4a-b - Fragmental left upper maxillary, lateral and medial view. About 3/4 natural size.

Fig. 5a-b - Fragmental right mandible, lateral and medial view. About 3/4 natural size.

Bos primigenius Bojanus

Fig. 6a-c - Left fourth upper premolar, occlusal view; left fourth lower premolar, occlusal view; first lower molar, occlusal view. All figures about 3/4 natural size.

Capra ibex (Bayol)

Fig. 7a-b - Left first or second lower molar, buccal and lingual view. About 3/4 natural size.

Canis lupus L.

Fig. 8 - Fragmental right mandible, lateral view. About 3/4 natural size.

Vulpes vulpes (L.)

Fig. 9a-b - Fragmental left and right mandible, lateral view. About 3/4 natural size.

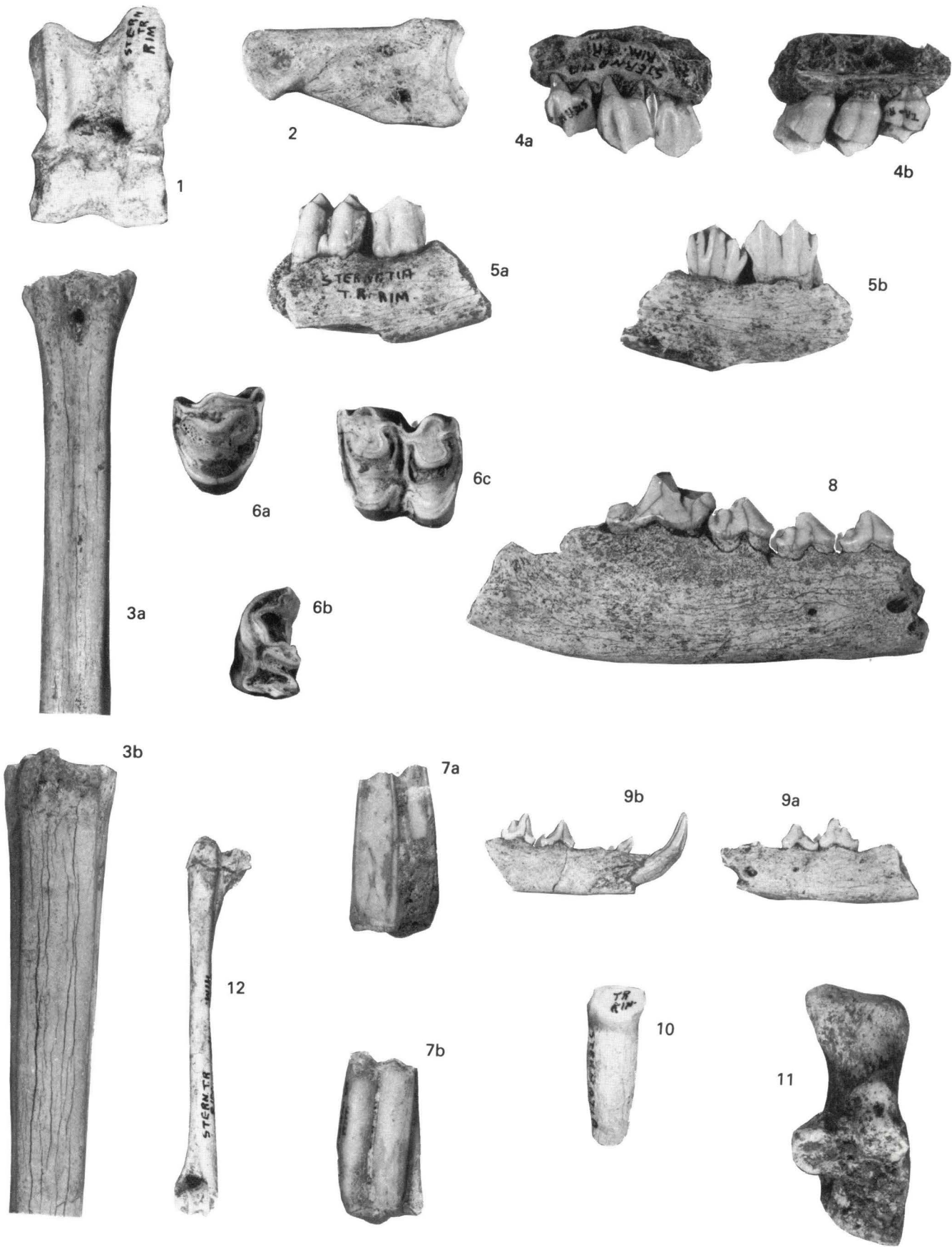
Crocuta crocuta (Erxleben)

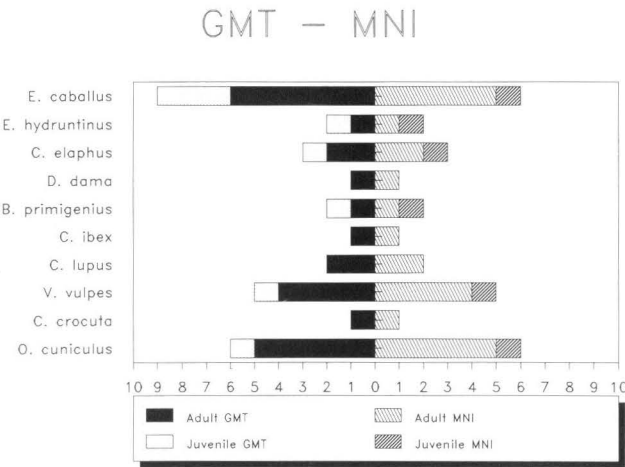
Fig. 10 - Left third lower premolar, lateral view. About 3/4 natural size.

Fig. 11 - Left calcaneum, dorsal view. About 3/4 natural size.

Oryctolagus cuniculus L.

Fig. 12 - Right humerus, cranial view. About 3/4 natural size.





Text-fig. 2 - Grand Minimum Total and Minimum Number of Individuals of macromammals from Sternatia.

A high number of *M. (T.) savii* teeth show clear evidence of digestion, sometimes so intense to expose and destroy the underlying dentine. This indicates that predation by owls was the main cause of death of the Sternatia micromammals.

The murids and insectivors are represented, respectively, by *Apodemus sylvaticus* (1.7%) and *Erinaceus europaeus* (1.1%).

Microtus (Terricola) savii (de Selys Longchamp, 1838) (Plate 3, Figs. 1-14).

The size and morphology of M/1 (2.55-3.24, mean = 2.83, n = 48; Text-fig. 3) and M3/ (1.5-1.89, mean = 1.77, n= 19) are characteristic of this species. Besides the pitymyoid rhomb, the first lower molars have confluent T6 and T7 and show several morphotypes on the basis of the pinching and the size of the anterior cap (AC2) (Text-fig. 4). The third upper molars are simple, with two lingual re-entrant angles. A M/1 (Plate 3, Fig. 10) is distinguished from the other specimens for its larger size (L= 3.41), more pinched and wider AC2. These characters can be observed in *M. (T.)* gr. *multiplex-*

<i>Canis lupus</i>	
Upper dentition	
p ⁴ Greatest breadth:	14
Length:	25
Breadth:	11
M ¹ Length:	12
Breadth:	22
M ² Length:	10
Breadth:	14
Mandible	
Total length:	110
Height between P ₂ and P ₃ :	28
Height between P ₄ and M ₁ :	34.6
Height between M ₁ and M ₂ :	32.6
Height behind M ₁ :	33
Thickness of the body between P ₂ and P ₃ :	13.4
Thickness of the body between P ₄ and M ₁ :	14.5
Thickness of the body between M ₁ and M ₂ :	13.2
Lower dentition	
Length of the premolar row, P ₂ -P ₄ :	46
M ₁ Length:	28
Breadth:	11
Axis	
Greatest length of the body:	57
IV Mt	
Greatest length:	13
Breadth in the middle of the diaphysis:	8
Breadth of the distal epiphysis:	12
<i>Vulpes vulpes</i>	
Upper dentition	
P ⁴ Greatest breadth:	6.5
Length:	15
Breadth:	5.5
M ¹ Length:	10
Breadth:	12-13
Mandible	
Height between P ₂ and P ₃ :	11-12
Lower dentition	
Length of the premolar row, P ₁ -P ₄ :	32
Length of the premolar row, P ₂ -P ₄ :	27-28
M ₁ Length:	16
Breadth:	6
Ulna	
Smallest depth of the olecranon:	14-15
Depth across the Processus anconaeus:	17-18
Breadth across the coronoid processus:	9-10

Tab. 1 - Measurements (in mm) of *Canis lupus* and *Vulpes vulpes* elements from Sternatia. Measuring points mostly according to Driesch (1976). Measurements taken by S. Petrucci.

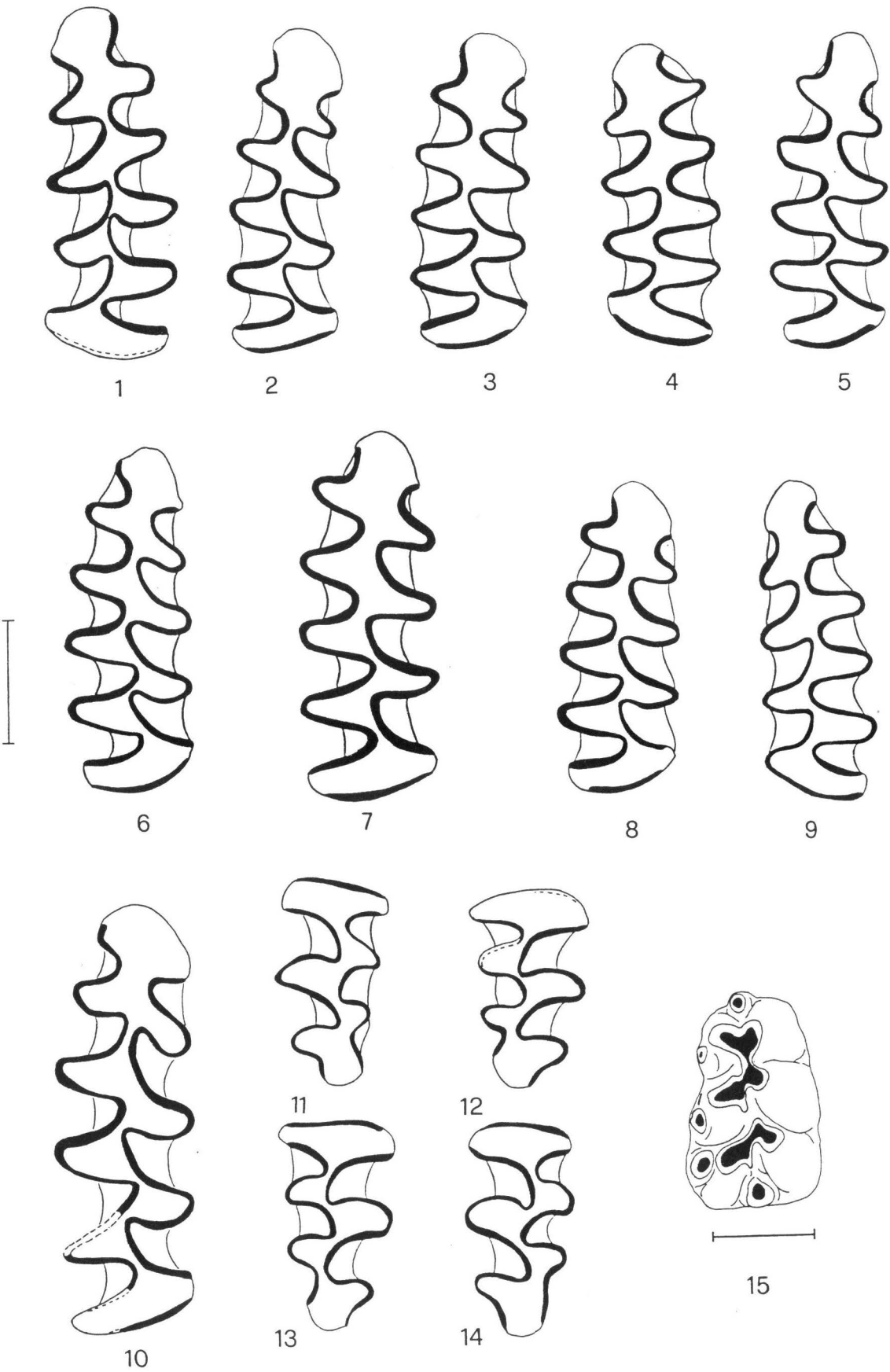
EXPLANATION OF PLATE 3

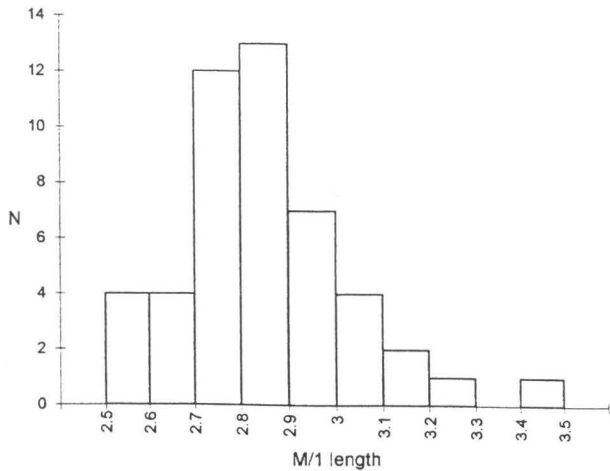
Microtus (Terricola) savii (de Selys Longchamp)

Fig. 1 - l. M/1.	Fig. 4 - l. M/1.	Fig. 7 - r. M/1.	Fig. 10 - r. M/1.	Fig. 13 - r. M3/.
Fig. 2 - r. M/1.	Fig. 5 - r. M/1.	Fig. 8 - r. M/1.	Fig. 11 - l. M3/.	Fig. 14 - l. M3/.
Fig. 3 - r. M/1.	Fig. 6 - r. M/1.	Fig. 9 - l. M/1.	Fig. 12 - r. M3/.	

Apodemus sylvaticus L.

Fig. 15 - l. M/1.
The bar is 1mm long.

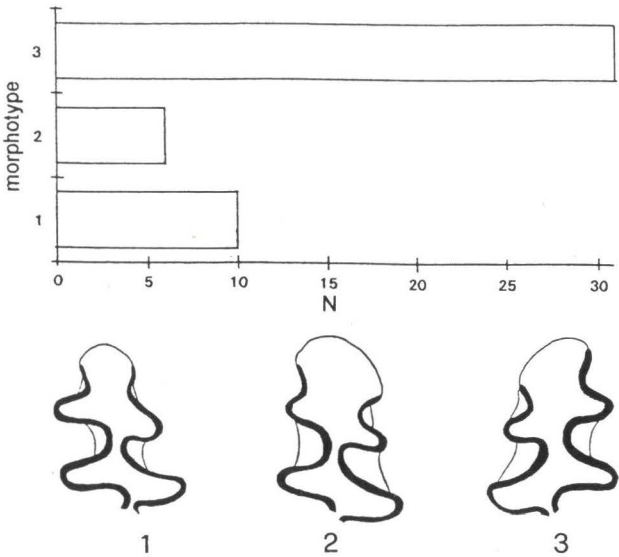




Text-fig. 3 - Length range in *Microtus (Terricola) savii*

subterraneus, but the absence of a complex M3/, with a third angle on its lingual side, suggests that these differences may reflect a strong morphometric variability within the *Sternatia* population.

Microtus (Terricola) savii is the best represented microtine present today in Italy. Distributed in fairly open environments, it has a temperate-Mediterranean climatic valence. Its abundance in the fossil assemblages thus indicates interglacial and interstadial phases. In Southern Italy the species is documented during the whole Würm glaciation (i.e. Castelvita: Cioni *et al.*, 1980; La Cala. Bartolomei *et al.*, 1976; Paglicci: Bartolomei, 1975; Bartolomei



Text-fig. 4 - Morphotypes of *Microtus (Terricola) savii*

et al., 1979; Sala, 1983). In some localities of the Salento peninsula (S. Sidero 3: De Giuli, 1983; Fondo Cattie: Corridi, 1987), probable refuge area during the last glacial (F. Masini, pers. comm.), it is the dominant species.

AMPHIBIANS AND REPTILES

Bufo viridis Laurenti, 1768 (Amphibia, Anura) and *Lacerta viridis* (Laurenti, 1768) (Reptilia, Squamata) are represented in the *Sternatia* sample. The former has been identified following Böhme (1977), Sanchiz (1977) and Holman (1989). *Lacerta viridis* has been recognized following Rocek (1980)

		<i>L. viridis</i>	<i>Lacerta</i> sp.
maxillary	r.	3	
dentary	r.	1	1
	l.	4	
pterygoid	l.		1
frontal	r.		1
postfrontal	l.		1
jugal	l.		2
parietal			1
humerus	r.		2
	l.		1
rib	r.		1
	l.		1
femur	r.		1
	l.		3
tibia	r.		1
ilium	l.		1
coxal	r.		1
vertebra			2
GTSNF		8	21
NMI		4	

		<i>B. viridis</i>	<i>Sufo</i> sp.
frontparietalia	l.	1	
humerus	l.		1
radiocubitus	l.		1
femur	r.		1
tibiofibule	r.		2
	l.		1
ilium	r.	1	
V1			1
GTNSF		2	7
NMI		1	

Tab. 2 - Number of skeletal elements of *Lacerta* spp. and *Bufo* spp. from *Sternatia*. Counts by M. Delfino.

and through direct comparisons. The skeletal elements referred to the two named species are listed in Table 2. The GTNSF and MNI are also reported. There is no reason for attributing the fragmentary remains, or those lacking diagnostic traits, which are identified only at the genus level, to other species than the ones mentioned.

B. viridis and *L. viridis* are quite well represented in the Pleistocene deposits of Italy (Kotsakis, 1977, 1980; Bottali, 1975). Both are still present today in Apulia. *B. viridis* is the most thermophile and xerophile (Lanza, 1983) of the toads of Italy. It is reported from the sea level up to 2100 m of altitude in the western Alps, and mainly distributes in sandy and dry shrubby plains. According to Lanza (1983) it tends to refrain from deciduous or mountain conifer woodlands.

L. viridis distributes typically in dense shrubs, at the margins of woods and in well exposed glades (Arnold & Burton, 1985).

By and large, the ecological requirements of the Sternatia amphibians and reptiles seem to be consistent with those of the macro- and micromammals.

INFERENCES

In the frame of the Alpine glacial episodes, the presence of the fallow deer and of the hyaena and the absence of the woodland straight tusked elephant (*Elephas antiquus*), of the Stephanorhine rhinoceroses and of the hippopotamus may possibly suggest an attribution to the second part of the Würmian Early Pleniglacial, basing on the indications of Sala *et al.* (1992). However, because of the particular geographical setting of the Salento peninsula, it cannot be excluded that some faunal components, such as the fallow deer (Masetti & Rustioni, 1988), may have survived to later times.

Nevertheless, also an attribution to the beginning of the second Pleniglacial, and thus to the isotopic stage 3, may also be possible, due to the complete absence of *Microtus* (*Microtus*).

The large mammal assemblage from Sternatia is suggestive of a relatively dry Mediterranean climate, characterized by open grasslands dominated by scrubs and with rare wood cover. This seems to be supported by the high abundance of the horse and by the occurrence of the steppe ass, ibex and rabbit and by the absence of the wild boar. This scenario is also consistent with the ecological inferences drawn on the micromammals and the amphibians and reptiles.

The slight grade of weathering shown by the macromammal remains is particularly significant, because under the dry environmental conditions suggested above bones are expected to alterate very rapidly. However, low temperatures may slow down the chemical reactions responsible for bone decomposition.

The lack of articulated skeletal elements and of any evidence of transportation and the short exposure to weathering may lead to two possible conclusions: 1) the bones came from the immediate surroundings of the «ventarola» and were accumulated and sealed by the sediments very rapidly; 2) the fact that all the macromammal long bones appear fractured in the middle of the shafts may be suggestive of an intentional fracturing for marrow extraction, in which case the site may result from the accumulation of wastes of human activity. In this second hypothesis, all the inferences would be severely affected by a very strong bias. However, this seems to contrast with the absolute absence of scrape marks.

The Sternatia micromammals are of no help from the chronological point of view. The dominance of *M. (T.) savii* suggests a temperate and tendentially arid climatic phase within the Würm glaciation which is consistent with the picture offered by the macromammals. Worth of note is the lack of the subgenus *Microtus* (*Microtus*), which is present in Southern Italy during the Würm glaciation and is particularly well represented during the most continental phases of the stadial intervals. At Paglicci, for example, the Gravettian levels dated between 24.720 ± 420 and 20.160 ± 310 BP and referred to the first part of the second Pleniglacial, are rich in remains of this microtine (Bartolomei, 1975; Bartolomei *et al.*, 1979). *M. (Microtus)* is absent today in Southern Italy from which it seems to disappear at the beginning of the Lateglacial (Bartolomei, 1982).

The absence of this microtine from Sternatia may be due to the poorness of the sample and anyhow indicates that it was poorly represented in the assemblage.

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(manuscript received July 25, 1994
accepted September 28, 1994)