

EXPLOITATION OF THE FOX IN THE EPIGRAVETTIAN LEVELS OF GROTTA ROMANELLI (APULIA, ITALY)

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Summary

The Romanelli cave is a very important Palaeolithic deposit of South Italy that yielded an Epigravettian lithic assemblage and a rich faunal complex including *Equus hydruntinus*, *Cervus elaphus*, *Bos primigenius*, various *Carnivora* and birds (including some arctic species), dated $10,640 \pm 100$ bp and 9790 ± 80 bp. In this paper we present the results of the detailed research carried out on about 5 000 fox bone remains recovered from the "Terre brune" levels of Grotta Romanelli. Morphometric analysis on over 2 300 well preserved bones assigns most of them to *Vulpes vulpes*. Only a few remains cannot be included in the variability range of the red fox and are compared with the measurements of arctic fox (*Alopex lagopus*). The analysis of the different anatomical parts and of the cut marks on the bones allows us to identify the various stages of use of the carcass: skinning, butchering (disarticulation and filleting), bone working, and also to examine the general way of exploitation of this species.

Résumé

L'exploitation du renard dans les niveaux épigravettiens de la Grotta Romanelli (Pouilles, Italie).

Parmi les sites les plus importants du Paléolithique en Italie méridionale, la Grotta Romanelli présente une stratigraphie allant du Paléolithique moyen à l'Épigravettien final. La macrofaune des niveaux épigravettiens est constituée principalement de mammifères (*Cervus elaphus*, *Equus hydruntinus*, *Bos primigenius*), de carnivores et d'oiseaux; on note parmi ces derniers la présence d'espèces arctiques.

L'analyse que nous présentons ici a été effectuée sur 5 000 restes, attribués au renard, provenant des niveaux épigravettiens. L'étude biométrique faite sur 2 300 des restes osseux présentant une meilleure conservation, nous permet de les attribuer, en grande partie, à *Vulpes vulpes*. Les données qui ne correspondent pas au domaine de variabilité du renard commun ont été comparées à celui du renard polaire (*Alopex lagopus*). L'étude des parties anatomiques et des traces de boucherie permet de reconstruire les différents stades de la chaîne opératoire de l'exploitation de la carcasse (écorchage, découpe, décarnisation) et de l'exploitation de l'os.

Zusammenfassung

Die Nutzung des Fuchses in den Schichten des Epigravettien der Grotta Romanelli (Apulien, Italien).

Die Höhle Grotta Romanelli ist eine bedeutende paläolithische Fundstelle Süditaliens. Sie lieferte u.a. auch einen Fundkomplex des Epigravettien. Die zahlreichen Überreste der Fauna beinhalten *Equus hydruntinus*, *Cervus elaphus*, *Bos primigenius*, verschiedene Carnivoren und Vögel, darunter einige arktische Arten. Mit 10640 ± 100 BP und 9790 ± 80 BP liegen zwei Datierungsansätze vor.

In diesem Beitrag stellen wir die Ergebnisse der Untersuchung von fast 5000 Knochen des Fuchses dar, die aus den "Braunerde"-Schichten der Höhle stammen. Nach der morphologisch-metrischen Untersuchung von über 2300 gut erhaltenen Knochen stammt der größte Teil von *Vulpes vulpes*. Nur wenige der erfassten Maße können nicht dem Rotfuchs zugerechnet werden. Sie werden mit solchen des Polarfuchses (*Alopex lagopus*) verglichen. Die Untersuchung von verschiedenen Skeletteilen und Schnittspuren erlaubte es, verschiedene Arbeitsschritte nachzuvollziehen: Häuten, Schlachten (Zerlegen und Entfleischen) und Weiterverarbeitung zu Artefakten.

Key Words

Italy, Upper Palaeolithic, *Vulpes vulpes*, *Alopex lagopus*, Faunal analysis, Butchering.

Mots clés

Italie, Paléolithique supérieur, *Vulpes vulpes*, *Alopex lagopus*, Analyse faunique, Boucherie.

Schlüsselworte

Italien, Jungpaläolithikum, *Vulpes vulpes*, *Alopex lagopus*, Faunenanalyse, Schlachtung.

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Grotta Romanelli, located in the southernmost extremity of Apulia, is one of the most important Italian Palaeolithic deposits. The main stratigraphic and cultural data are summarized in the article by Cassoli *et al.* (this volume). Analysis of fox remains was performed on the material from the Final Epigravettian levels of the old Blanc excavations, already partially published, and the unpublished 1954 and 1958 Cardini excavations. The material comes from single levels (A, B, upper C, lower C, D, E = I-VII) within the “Terre brune” (“Brown soil”) as well as unidentified levels within the same complex (levs. A-E). Together with Romanellian lithic industry, this stratigraphic series yielded abundant red deer, aurochs, and *hydruntinus* ass fauna, as well as a very large number of bird species. Two series of C¹⁴ datings (from 11,930 ± 520 bp to 9050 ± 100 and from 10640 ± 100 bp to 9980 ± 100 bp) locate the series between the end of the Alleröd and the entire Dryas III.

Analysis of data

With its 4990 bone remains, the fox is, after the deer, the quantitatively best represented species. Table 1 shows the stratigraphic origin and each bone of the osteological sample examined.

The levels yielding the largest number of remains are C and D (IV, V and VI), which account for more than 50% (fig. 1). Those from the other stratigraphic units are very rare and account for barely 10% of the total. There are numerous bones from the unidentified levels of the “Terre brune” complex (40%). Overall, at least 283 different individuals are represented. The MNI was computed on the basis of the mandibles and lower carnassials. In age determination a few newborn’s mandibles, which practically had erupting deciduous teeth (perhaps even end of term foetuses) were classified as belonging to very young individuals (neonatal) and those with erupted deciduous teeth as belonging to juveniles (fig. 2, 1-3). Mandibles in which several teeth were highly worn were deemed to belong to aged individuals. The other mandibles with definitive teeth were on the whole considered to belong to adult individuals, allowing no room for further differentiation inside the group (tab. 2). This led to an over-representation of the adult class, which includes animals from the ages of 6 months to several years. Considerations about seasonality can be made only on the mandibles of newborns and juveniles, which indicate the capture period as Spring-Summer. Thin section analyses of teeth are currently under way in order to define age and season of death more accurately.

Some manifest pathologies were observed in the bones of the Grotta Romanelli foxes: the most frequent in

mandibles is tooth agenesis (in 9 cases of P1, in one case of P2, in another of P3, in three cases of M3). In other specimens an anomalous arrangement of the teeth is noted: crooked premolars; the presence of two P2, one of which crooked; presence of two overlapping P4 (fig. 2, 5). Bone pathologies include cases of badly healed fractures (femur, humerus and radius), of degenerative osteophytosis of the articular extremities of radius-ulna, femur, tibia and calcaneus. A humerus diaphysis exhibits a particularly devastating degenerative periostite (fig. 2, 6-7).

Problem of the presence of the polar fox

Previous analysis done at the beginning of the century (Regalia, 1904, 1905) assigned most of the remains found in the “Terre brune” of Grotta Romanelli to the red fox (*Vulpes vulpes*). However, he underlined the presence of fairly small specimens which he tentatively attributed to the polar fox (*Alopex lagopus*). Blanc (1920, 1928) instead ascribed all the remains to *Vulpes vulpes*.

The ongoing examination of the bones has confirmed that they almost all belong to the red fox. Only some of them, due to their morphological characteristics or small size, leave room for some doubt as to their specific attribution. In Italy, with the exception of Regalia’s mention and the more recent although dubious one of Cassoli and Tagliacozzo (1994) for Riparo di Fumane (Monti Lessini, Veneto), no certain reports of the polar fox have ever been made (Capasso Barbato *et al.*, 1991), although in numerous deposits mammal and bird species with a decidedly cold-climate nature are present which normally coexist with *Alopex*, including several species of micromammal on which the polar fox usually feeds.

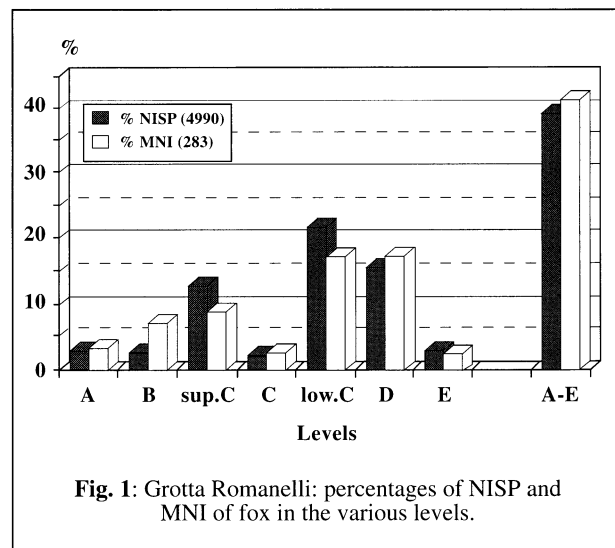


Fig. 1: Grotta Romanelli: percentages of NISP and MNI of fox in the various levels.

Table 1 : Grotta Romanelli: number of identified fox specimens (NISP) and their stratigraphic position.

Skeletal Elements	LEVELS								TOTAL	
	A I-II	B III	up. C IV	C IV-V	low. C V	D VI	E VII	A-E TB	NISP	%
Cranium	7	2	6	4	20	13	8	23	83	1.66
Maxilla	8	3	10	1	33	16	1	34	106	2.12
Upper M2					9			6	15	0.3
Upper M1			5		16	7	1	14	43	0.86
Upper P4			10	1	18	12	1	19	61	1.22
Upper teeth	1	3	27	5	33	15	5	57	146	2.93
Mandible	10	28	45	8	115	83	14	266	569	11.4
Lower M2			2		6	1		11	20	0.4
Lower M1		1	21	4	38	27	2	55	148	2.97
Lower teeth	3	4	34	7	54	35	5	83	225	4.51
Upper and Lower Premolars	6	3	17		29	13	4	96	168	3.37
Indet. Canines	3		10	1	27	19		27	87	1.74
Atlas	1	4	12	3	13	11	3	20	67	1.34
Epistropheus	1		6	2	14	10	1	19	53	1.06
Cervical -Thoracic Vertebrae	13	12	58	13	70	59	13	70	308	6.17
Lumbar-Sacral-Caudal Vertebrae	6	9	59	11	84	58	9	83	319	6.39
Sternum	1				10	4	1	2	18	0.36
Scapula	2	1	22	5	32	24	5	56	147	2.95
prox.	3	4	14	1	25	22	6	52	127	2.55
Humerus shaft/complete		1	4	1	7	7	1	11	32	0.64
dist.	7	3	20	5	38	42	7	90	212	5.25
prox.	2	4	18	1	24	26	4	58	137	2.75
Radius shaft/complete	4	1	5		7	8		13	38	0.76
dist.	3	3	12	1	6	15	2	27	69	1.38
prox.	6	4	26	4	32	25	1	81	179	3.59
Ulna shaft/complete	1	3	6	1	23	17	2	27	80	1.6
dist.				1	2	1		1	5	0.1
Carpals					1	1		1	3	0.06
Metacarpus I					1			3	4	0.08
Metacarpus II	4		13	2	14	2	4	29	68	1.36
Metacarpus III	1	3	4		9	10	1	20	48	0.96
Metacarpus IV		2	9	2	7	7	4	23	54	1.08
Metacarpus V	2		9	1	13	6	4	42	77	1.54
Pelvis	10	5	23	4	43	43	8	95	231	4.63
prox.	4	1	11	4	19	23	4	44	110	2.2
Femur shaft/complete		1	2	1	2	3		9	18	0.36
dist.	3	1	13	1	15	16	3	46	98	1.96
prox.	2	1	8	1	15	15	1	29	72	1.44
Tibia shaft/complete	2	3	5	1	8	9	2	15	45	0.9
dist.	2	2	13	1	10	12	4	65	109	2.18
prox.										
Fibula shaft/complete										
dist.			1		2		2	1	6	0.12
Calcaneus	5	2	6	1	15	13	2	34	78	1.56
Astragalus	2	1	3		6	2	1	7	22	0.44
Tarsals	1		1		1			2	5	0.1
Metatarsus II	3	1	5	2	8	5	2	17	43	0.86
Metatarsus III	1		6	1	15	7	2	18	50	1
Metatarsus IV	2	2	10	1	10	3		21	49	0.98
Metatarsus V	1	5	4	1	6	7	1	14	39	0.78
Indet. Metapodials	8	3	23	2	40	15	4	61	156	3.13
Phalanx I	1	1	13	2	36	10	2	47	112	2.24
Phalanx II	1		5	1	10	2		10	29	0.58
Phalanx III								2	2	0.04
Total NISP	143	127	636	109	1091	781	147	1956	4990	
% NISP	2.9	2.5	12.7	2.2	21.9	15.6	2.9	39.2		
Total MNI	9	20	25	7	49	49	7	117	283	
% MNI	3.2	7.1	8.9	2.5	17.3	17.3	2.5	41.3		

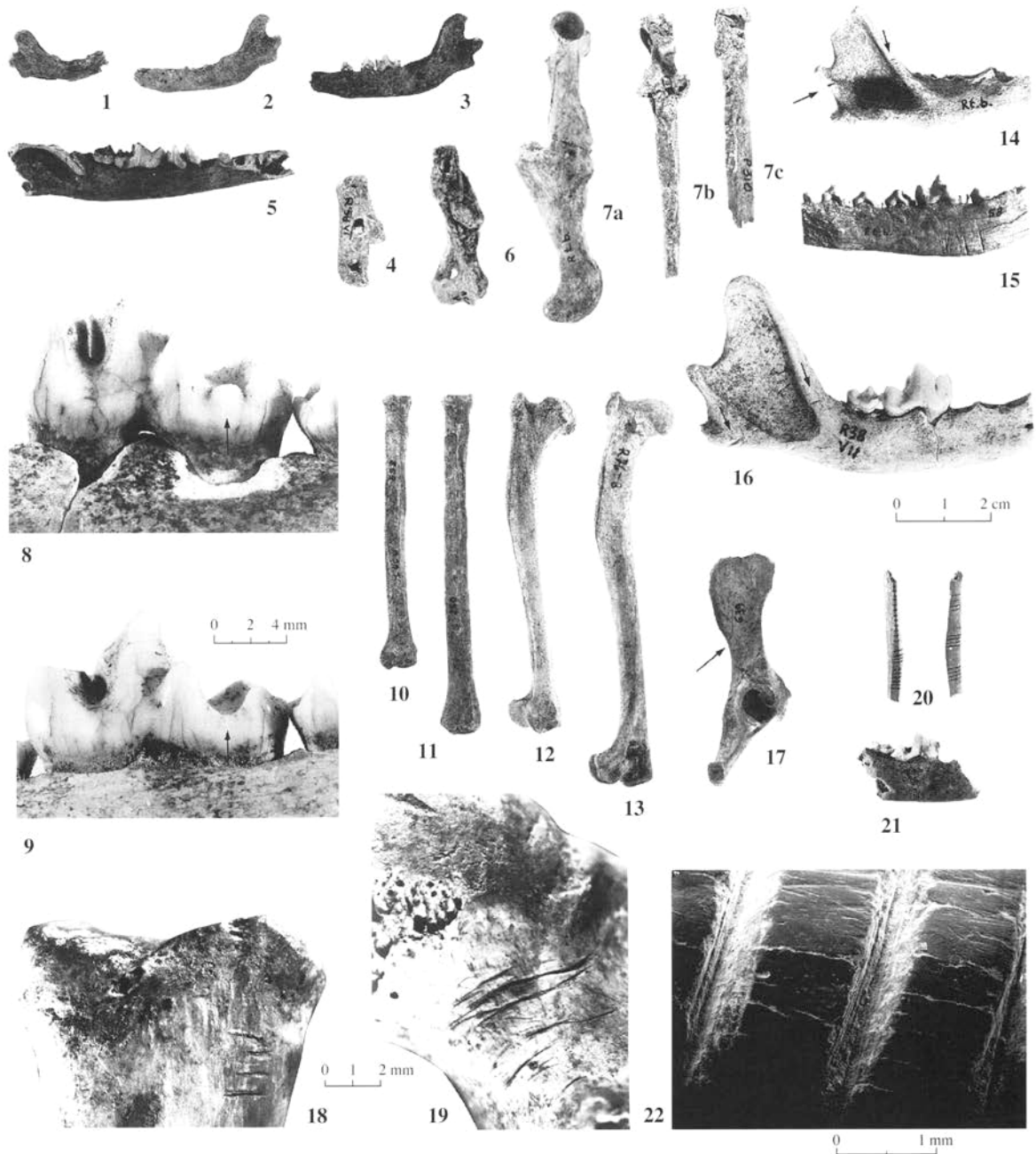


Fig. 2 : Grotta Romanelli: fox remains from the Epigravettian levels. 1-3: mandibles of newborn and juvenile individuals; 4: calcaneus with traces of punctures; 5-7: pathological bones; 8-9: details of *Vulpes* and cf. *Alopex* M1; 10-13: Radii and humeri of *Vulpes* and cf. *Alopex*; 14-19: bones with cut marks; 20-21: bones with decorative notches; 22: detail of no. 21 (SEM).

Table 2 : Grotta Romanelli: age classes and MNI of fox.

Age Classes	LEVELS								TOTAL	
	A I-II	B III	u. C IV	C IV-V	I. C V	D VI	E VII	A-E TB	MNI	%
Neonatal	2	2	1			1		8	14	5
Juvenile			1		2	1			4	1.4
Adult	6	18	22	6	45	45	6	96	244	86.2
Senile	1		1	1	2	2	1	13	21	7.4
Total MNI	9	20	25	7	49	49	7	117	283	
% MNI	3.2	7.1	8.9	2.5	17.3	17.3	2.5	41.3		

Table 3 : Measurements (in mm) of the principal skeletal elements of *Vulpes vulpes* and cf. *Alopex lagopus* from Grotta Romanelli compared with ranges of variation reported for present day foxes (from Poplin, 1976; *from Ballesio, 1979).

Skeletal part	Measurement	<i>Vulpes vulpes</i> Grotta Romanelli		<i>Vulpes vulpes</i> (Poplin, 1976)			<i>(Alopex lagopus?)</i> Grotta Romanelli		<i>Alopex lagopus</i> (Poplin, 1976)
		N.	Range	Average	St. dev.	Range	N.	Range	Range
Maxilla	L. P1-M2	4	50.6-56.4	54.77	2.42	46.5-59	1	49	39.8-50
	L. P4	116	11.7-14.7	13.24	0.64	11-16.6	2	12.5-12.6	10-13.8
	L. M1	86	8.2-10.9	9.45	0.46	8-11.6	4	8.2-9.1	6.9-9.6
Mandible	L. P1-M3	80	54.2-63.5	58.21	2.3	50-60	3	53.2-56.2	42-55.2
	L. M1	293	13-16.8	15.06	0.72	12.6-18.8	5	13.8-14.5	12-15.2
	L. M2	233	5.8-8.4	6.86	0.43	5.9-9.4	4	5.5-6	4.3-6.7
Humerus	GL	18	108.8-132.8	117.33	6.11	109-143	1	105.6	91-108
Radius	GL	14	100.7-112.7	106.88	3.78	96-134	1	88.6	87-103
Mc II	GL	52	35.9-45.6	40.69	2.34	35-49	1	34.3	31.5-38.5
Femur	GL	6	114.6-123.7	117.38	3	114-149	2	109-111.4	93-110
Tibia	GL	7	124-132.7	128.27	3.28	119-163			106-126
Mt IV	GL	15	55.8-67.3	61.36	3.63	53.5-74.5	1	51	46-56
Calcaneus	GL	53	28.1-32.9	30.17	1.26	30-34.2*	3	26.8-27.6	

The red fox and the polar fox in Eurasia overlap extensively as the red fox is scattered over a very wide area. The separation at the osteological level between the two species can be carried out only when complete skulls are available. Numerous distinctive characteristics have been pointed out by various authors (Poplin, 1976 and references therein; Ballesio, 1979) on single anatomical elements, particularly the teeth P⁴ and M¹, M₁ and M₂ (presence of accessory cusps, different ratios between talonid and trigonid, presence of crests, etc.) and on the mandible (position of mental foramen). However, there is not always agreement on the actual diagnostic validity of these characteristics. Furthermore, our analysis shows that some of the morphological characteristics, assumed to be typical of the polar fox, are associated with large-sized specimens and vice versa.

In addition to the material from the reference collection of the Istituto Italiano di Paleontologia Umana of

Rome, extensive use was made of the values reported in Poplin's (1976) paper in order to obtain a more complete idea of the range of variability of the modern European foxes (tab. 3). The size of the upper and lower jaws of the red fox of Grotta Romanelli lies within the mean values found in the present forms. However, on the strength of a few morphological and/or size characteristics a few specimens stand apart and could belong to the polar fox.

The smallest maxillary bone (specimen n° 17) has a length of the P¹-M² series (49 mm) comparable to that of a large polar fox (39.8-50.0). Some M¹ lie within the range of variability of the polar fox, in particular sp. n° 1527 has the following size: 8.2 x 9.4. The mandibles n° 71, 72 and 1707 have some dimensions comparable with those of the polar fox. Specimen n° 71 has only M₂ with small dimensions (5.5 x 5.0 mm), while the other values are typical of the red fox; specimen n° 72 (fig. 2, 9) has an alveolar

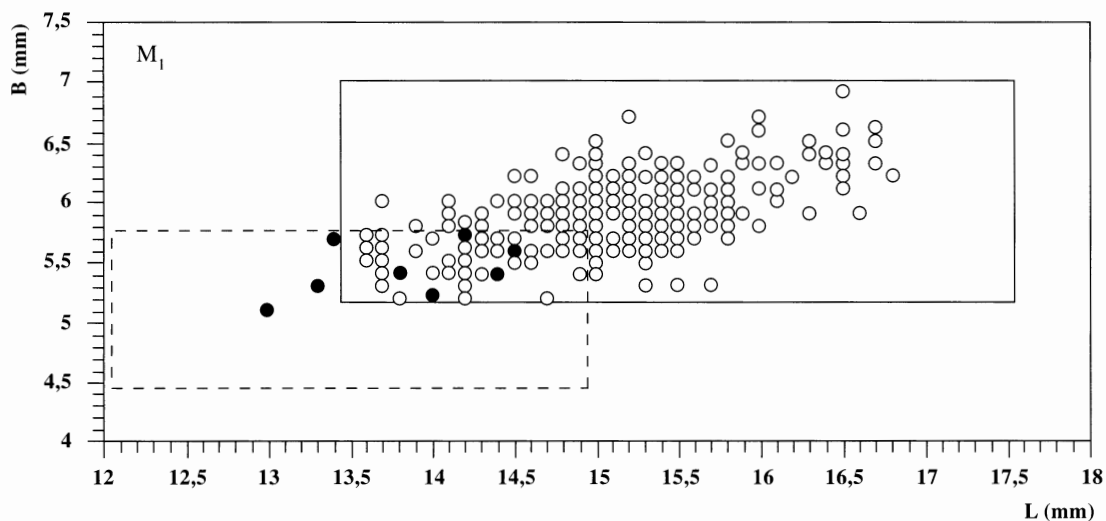


Fig. 3 : Diagram of M_1 length (L) and breadth (B) of fox from Grotta Romanelli compared with the dispersion area of the present-day red fox (continuous line) and of the polar fox (dashed line). The area is calculated on two standard deviations. Filled circle indicates the value of the probable polar fox.

length M_3-P_1 of 53.2 mm, a height of the corpus at the root of M_1 (11.2 mm) and the dimensions of M_1 (13.8 x 5.4 mm, it should be pointed out the absence of entoconid), of M_2 (6.0 x 4.7 mm) comparable with those of a medium-sized polar fox; mandible n° 1707 has an alveolar length M_3-P_1 similar to that of ex. 72 (53.2 mm), while M_1 has dimensions similar to those of the red fox (14.2 x 5.7 mm).

Figure 3 shows the length and breadth values of the M_1 of Grotta Romanelli compared with the dispersion areas, calculated on the basis of the double standard deviation from the means, of modern *Vulpes vulpes* and *Alopex lagopus*. The diagram confirms that the values of the Grotta Romanelli fox almost all lie within the field of dispersion of the red fox. The elements described above referable to the polar fox are located in the area where the two species overlap. The smaller elements (sp. n° 104, 1868 and 1857) lie within the area of the polar fox but their morphological characters are hard to identify owing to their extreme dental wear.

The specimens of *Vulpes vulpes* are separated from those whose small dimensions indicate that they might belong to the polar fox on the basis of the dimensions reported by Poplin for the limb bones of the modern species of *Vulpes* and *Alopex* (tab. 3). The possible *Alopex* include: a humerus (n° 307; fig. 2, 12); a radius (n° 858; fig. 2, 10; fig. 4); a second metacarpus (n° 495); two femurs (n° 415 and 789), a fourth metatarsus (n° 611) and three calcanei (n° 959, 1184, fig. 5; and n° 972).

In conclusion, the presence of the polar fox in the Epi-gravettian levels of Grotta Romanelli is not certain. In fact, the finds of dubious attribution are rare and their dimensions, although smaller, do not differ appreciably from those of the red fox. The only exceptions are the radius n° 858, whose length is comparable to that of a small polar fox, and the mandible n° 72.

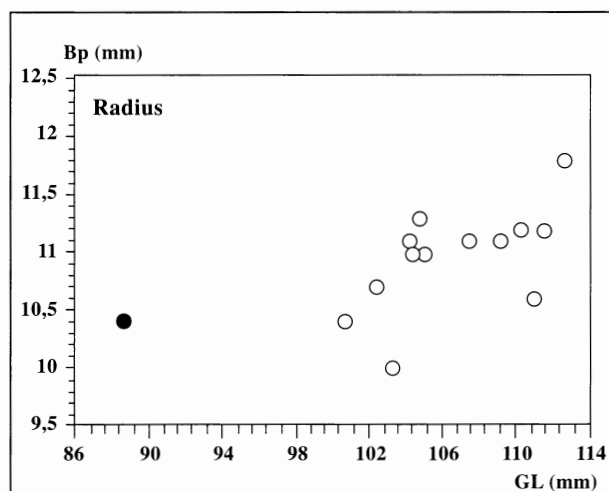
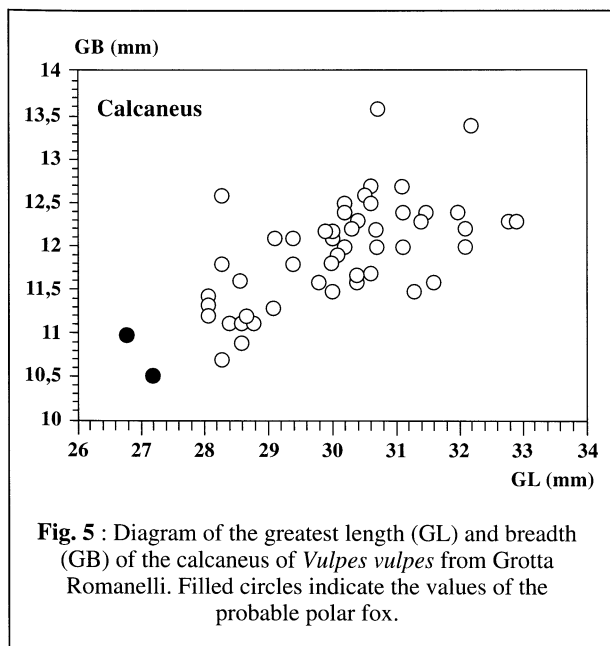


Fig. 4 : Diagram of the greatest length (GL) and breadth (Bp) of the proximal end of the radius of *Vulpes vulpes* from Grotta Romanelli. Filled circle indicates the value of the probable polar fox.

Butchering and exploitation

In the sample analysed, all the bones (except the rotula and the penial bone) are present and this provides evidence that the whole animal was brought into the cave. The rib fragments have not been counted because of problems of identification. Slight percentage oscillations occur in individual bones from one level to the other. However, these oscillations appear to be random and are probably somehow related to differences in the areas investigated during the different excavations. Overall, however, a few characteristics have been observed in the composition of the osteological sample:

- the mandibles and several teeth (in particular lower M1) are over-represented when compared with the long bones;
- the forelimb is better represented than the hindlimb (humerus + radius = NISP 615; femur + tibia = NISP 452);
- considerable differences are found between the proximal parts and the distal parts of individual bones;
- quantitative differences are found among the various long bones, which range from 212 distal humeri to 109 distal tibiae;
- the vertebrae are under-represented, as is shown also by the first two cervicals;
- all the bones of the extremities are under-represented and also display several numeric anomalies:

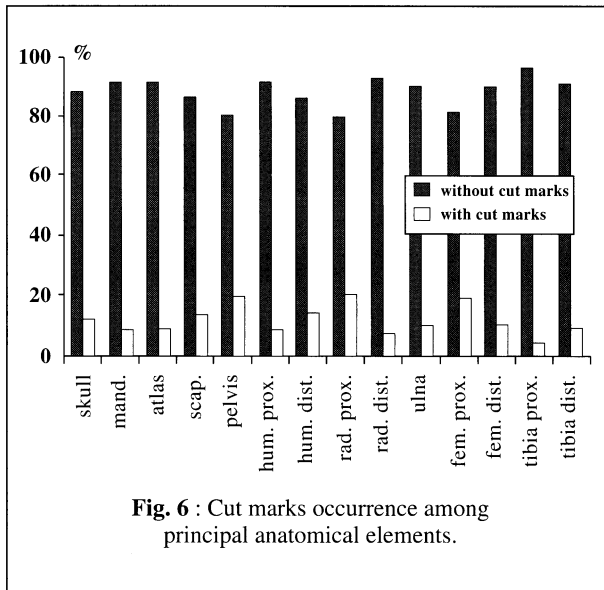


- almost complete absence of carpal bones and first metacarpal
- differences between calcaneus (78) and astragalus (22) and among phalanges I (112), II (29) and III (2).

Some of these characteristics, in particular the large number of mandibles and the differences between the proximal and distal parts of the long bones can certainly be ascribed to the differences in bone preservation. Others, such as the absence or relatively low number of small bones are perhaps due to a non optimal recovery method. The absence of phalanges is possibly due to the skinning method used in which they were preserved inside the hide itself. However, the different ratio between forelimb and hindlimb, that between individual long bones, between calcaneus and astragalus and the relatively small number of the first two cervical vertebrae appear to be in contradiction with the hypothesis of the introduction in the cave of the whole carcass and unaccountable in terms of differential preservation or of recovery method. It is thus possible that some of these anomalies are related to the way man exploited the carcass.

The analysis performed in order to ascertain the existence of traces of human activities on fox bones was carried out on the entire osteological sample. It was extremely difficult to identify any intentional fractures or the existence of points of impact, while a comparatively large number of cut marks were found. Observation was performed under the optical microscope and, in the case of a number of elements bearing uncertain traces, scanning electron microscope analysis is under way. The elements bearing certain cut marks total 346 and account for about 8.5% of the bone sample (excluding the teeth). Cut marks are found on practically all the main bones (except, oddly enough, the calcaneus and the epistropheus) although with highly variable percentages, even within the same bone, according to the part considered (fig. 6). The bones most frequently bearing traces of cutting are: proximal radius and pelvis (about 20% of cases), proximal femur (19%), distal humerus and scapula (about 14%), skull (12%). The long bones with the fewest traces are the proximal tibiae (4%). There are only a few bones of the limb extremities with traces of cutting: barely 6 metapodials out of 434. The location of the traces on the skeleton is illustrated in figure 7. The data referring to the individual bone elements are summed up below.

Skull: traces are found on two frontal bones (series of short superficial cut marks due to skinning), on the zygomatic process (deeper cut marks), on the retroarticular process, on the ventral part of two condyles and on a tympanic bulla.



Mandible: traces are present on 49 finds, almost all located on the lateral face of the ascending ramus (fig. 2, 14, 16). They are visible on the anterior crest of the coronoid process and in the angular region. They are obviously related and indicate that the masseter muscle prevented the masseter fossa from being cut. The cut marks are generally short, sometimes repeated and close together. Similar traces on a fox mandible from Grotta della Mura (Bon and Boscato, 1993) and on marten mandibles (Trolle-Lassen, 1987) have been interpreted by the authors as traces of skinning. In our

sample these traces are related to those on the zygomatic and on the retroarticular process and may be indicative of an action of disarticulating the mandible from the skull.

Superficial, oblique, straight skinning cut marks are visible on the lateral face of two mandibular bodies at a level with the P_4-M_1 .

On three mandibles, there are cut marks of uncertain interpretation on the medial face of the corpus: in the first case there are two series of cut marks located between P_4-M_1 and between M_1 and the mandibular branch. The second case consists of short, transverse traces below M_1 and the third comprises three series of numerous, marked, transverse, straight cut marks, which are generally deep in the area below M_1-M_2 (fig. 2, 15).

Atlas: deep, transverse, straight traces on the ventral face near the cranial articular facet. In one case, cut marks are located on the caudal facet as a result of the detachment of the epistropheus.

Cervical vertebrae: on the dorsal face of a V and a VII vertebra, there are short and deep cut marks;

Thoracic vertebrae: seven display short, deep, longitudinal cut marks on the dorsal faces or on the lateral faces (in only one case on both faces). On four the cut marks are located in the spinous process. In two cases, traces with the same characteristics are present on the ventral face.

Lumbar vertebrae: there are traces of various types on 28. These generally consist of short, deep, longitudinal cuts on the dorsal face in the vicinity of the mammillary pro-

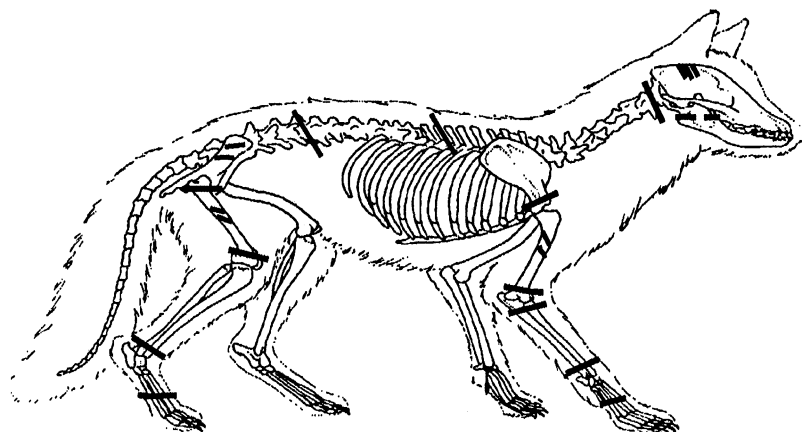


Fig. 7 : Location of the main cut marks on the fox skeletons from Grotta Romanelli.

cesses. Longer cut marks are located on the lateral faces of the corpus vertebrae.

Sternum: on one first sternabra, there is a single, short, deep longitudinal cut running lateral to the external face.

Scapula: 20 present cuts located both on the medial face (more numerous) and on the lateral one. They generally overlie the incisura of the scapula in the vicinity of the supraglenoid tuberculum and the subglenoid tuberculum. They are usually short, deep, straight-lined and run parallel.

Humerus: traces of cuts are present in large numbers on this bone and appear to be located in three main areas where a large number of muscle insertions are found:

a) on the medial face of the proximal portion between the *Tuberositas teres major* and the bicipital groove;

b) on the cranial face of the distal portion, corresponding to the coronoid fossa;

c) on the caudal face of the distal portion, corresponding to the olecranial fossa.

The traces denote a comparatively high variability inside the above-mentioned three areas, although the short, straight, deep cut marks prevail as a result of both disarticulation and filleting.

Other cut marks are also present on the central portion of the diaphysis.

Radius: in most cases, the traces are located on the dorsal and medial faces near the proximal articulation. The cut marks are short, deep, transverse and straight, often in alignment with the two edges of the bone, and range in number from 1 to 5 (fig. 2, 18). In two cases the traces are located on the dorsal face of the central portion of the diaphysis.

In the cases of distal radius, the traces are present on the palmar face: these consist of isolated cut marks (in only one case, there are two) short, transverse, deep and straight.

Ulna: short, deep, transverse or oblique traces are visible on the lateral and medial faces of the olecranon, at the level of the sigmoid incisura.

On the medial face, numerous cut marks are located also below the incisura related to the radius articulation. On one distal extremity in the styloid process, a short, deep, transverse cut mark related to the traces shown on the distal extremity of the radius is visible.

Metacarpals: straight, superficial longitudinal traces are present on the dorsal face of a Mc II and on the palmar face of a Mc V.

Coxal: cut marks are present on the lateral face of 46 finds. Most of the latter are located near the acetabulum, in the pubis branch area and in that of the acetabular incisura in the ischiatic zone. The short, repeated and fairly deep cut

marks can be explained in terms of femur disarticulation. Other traces of different morphology (long, oblique, not perfectly straight, mostly superficial) are visible on the level of the gluteal fossa (fig. 2, 17).

Femur: traces of butchering are present on 38 remains and are located in three main areas:

a) the caudal and medial faces on the neck and the articular head (14 cases) with short, marked, transverse, straight and deep cut marks (fig. 2, 19);

b) on the caudal face of the area of the gluteal tuberosity and of the trochantin (7 cases) with multiple oblique, straight, superficial cut marks;

c) on the caudal face of the distal part, corresponding to the supracondylar crests (16 cases) with generally short, transverse and deep cut marks. Traces of variable morphology (generally superficial, long, oblique, arched or sinusous) are present in the central part of the diaphysis.

Tibia: the main area in which the cut marks are located is the caudal face of the distal extremity (9 cases), above all with short, transverse, straight and deep cut marks. On the medial face, near the proximal extremity, longitudinal or transverse cut marks of average length, straight, somewhat superficial, are present in three cases; long, oblique, straight, superficial cut marks are located in a further three cases on the medio-distal part of the shaft.

Tarsals: on one cuboid, a short, oblique, straight, deep cut mark is present on the dorsal face near the articulation with the metatarsus. On three astragali there are short, straight, deep and transverse cut marks on the medial face.

Metatarsals: three Mt IV and one Mt V display short, oblique, straight, superficial cut marks on the dorsal face. In two cases, these are quite numerous and appear to be related to skinning.

From the morphology of the cut marks alone, it is not always possible to identify the type of action performed as they are always quite homogeneous on the whole. Identification of human action is thus based above all on their location and their repeatability in the various anatomical elements. Some traces, usually superficial and repeatedly present on the skull, the mandibular body and the metapodials point to skinning actions (accompany with a cutting tool the detachment of the skin from the carcass). The cut marks present on the shaft of the long bones (the humerus, femur and tibia, in particular) which are all numerous and found on the surface, can be interpreted as the action of stripping flesh from the bone. A large number of traces can fairly safely be attributed to actions of dismemberment and disarticulation, such as those on the occipital condyles, atlas, scapula, acetabu-

lum, extremities of the radius-ulna, femur and tibia and on the astragalus. In few cases only, the assignment to certain voluntary action was not possible.

On the whole, therefore, the majority of the traces seems to be referable to the action of dismembering the individual anatomical parts for food and, in some cases, to procure the raw material for tools and ornamental objects (fig. 2, 20-22).

On a very small number of fox bones, there are traces of gnawing and punctures (which generally seem to be due to the foxes themselves; fig. 2, 4) as could be accounted for by albeit short periods of abandonment of the cave by man and its use as a shelter by other animals. The fox remains from Grotta Romanelli can, in the vast majority of case, be assigned to human hunting activity and reflect a fairly well codified exploitation model.

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