BUTCHERY AND EXPLOITATION OF LARGE MAMMALS IN THE EPIGRAVETTIAN LEVELS OF GROTTA ROMANELLI (APULIA, ITALY)

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Summary

The Grotta Romanelli excavation allowed the exploration of some important archaeological levels ranging from Middle Palaeolithic to Upper Palaeolithic.

This paper presents the results of the zooarchaeological analysis of the macrofaunal remains from the Epigravettian levels. The main mammal species are Bos primigenius, Equus (Asinus) hydruntinus *and* Cervus elaphus. Vulpes vulpes *is the most common carnivore, whereas mustelids are rare. The great quantity of birds and the occurrence of subarctic and arctic species allowed us to draw some palaeoclimatic and palaeoenvironmental considerations.*

The type of use of the three main mammals (red deer, aurochs and wild ass) is discussed.

Cuts left by a stone tool have been frequently observed and may indicate disarticulation, filleting and skinning activities. Many finds have obvious impact areas that are interpreted as aimed at marrow extraction. The analysis of the anatomical elements suggests a different treatment for the aurochs, which was often butchered outside the cave, as indicated by the rarity of axial bones inside this cave.

Résumé

Traces de boucherie et exploitation des grands mammifères dans les niveaux épigravettiens de la Grotta Romanelli (Pouilles, Italie).

Les fouilles de la Grotta Romanelli (Pouilles, Italie) ont permis l'exploration des niveaux du Paléolithique moyen à ceux de l'Epigravettien final. L'étude de la faune concerne uniquement les niveaux épigravettiens. Parmi les Mammifères, Bos primigenius, Cervus elaphus *et* Equus (Asinus) hydruntinus *sont les espèces les plus représentées.* Vulpes vulpes *est dominant chez les Carnivores, tandis que le nombre de Mustélidés est très faible. L'avifaune est la mieux représentée ; on y relève, en particulier, la présence d'espèces arctiques et subarctiques qui fournissent des indicateurs paléoécologiques et paléoclimatiques.*

L'étude des traces de boucherie et d'exploitation a été effectuée seulement sur les restes d'aurochs, de cerf et d'âne. L'échantillon étudié est composé en grande partie de dents, fait dû à la mauvaise conservation du crâne. Un certain nombre de restes osseux présentent des stries produites par un instrument lithique. On peut les attribuer à différentes actions telles que la désarticulation, la décarnisation et l'écorchage. On note sur plusieurs fragments les points d'impact de percuteur, indicateurs de fractures intentionnelles afin d'extraire la moelle.

Zusammenfassung

Schlachtung und Verwertung der wichtigsten Säuger aus den Epigravettienschichten der Grotta Romanelli (Apulien, Italien).

Die Ausgrabungen in der Höhle Grotta Romanelli ermöglichten die Untersuchung von Straten, die vom Mittelpaläolithikum bis ins Jungpaläolithikum reichen. In diesem Beitrag werden die Ergebnisse archäozoologischer Untersuchungen an den Überresten der Großfauna des Epigravettiens vorgestellt. Die wichtigsten Säugetiere waren Bos primigenius, Equus (Asinus) hydruntinus *und* Cervus elaphus. Vulpes vulpes *ist der am häufigsten vorkommende Carnivore, während Arten der Mustelidae selten sind. Die große Zahl von Vögeln und das Vorkommen arktischer und subarktischer Arten erlauben Aussagen über das Klima und die Umwelt der damaligen Zeit.*

Die Nutzung der drei wichtigsten Säugetierarten (Ur, Wildesel, Rothirsch) wird beschrieben. Von Steingeräten stammende Schnittspuren konnten häufig beobachtet werden. Sie werden mit dem Zerlegen, dem Entfleischen und dem Häuten der Jagdbeute in Zusammenhang gebracht. Viele Knochen weisen Hiebspuren auf, die mit dem intentionellen Zerschlagen der frischen Knochen - um an das Knochenmark zu gelangen - zu erklären sind. Die Begutachtung der vorkommenden Skeletteile belegt eine besondere Behandlung des Auerochsen. Dieser wurde, wie die Seltenheit der Achsenknochen (Wirbel, Rippen) beweist, außerhalb der Höhle zerlegt.

Key Words

Italy, Upper Paleolithic, Faunal analysis, Skeletal element representation, Bone breakage.

Mots clés

Italie, Paléolithique supérieur, Analyse faunique, Représentation des parties anatomiques, Fracture intentionnelle.

Schlüsselworte

Italien, Jungpaläolithikum, faunistische Untersuchungen, Vorhandensein einzelner Skelettelemente, Zerschlagen von Knochen.

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Introduction

Grotta Romanelli is located in the most southern part of Apulia (fig. 1) and presently its entrance is at about 8 m a.s.l., on a sea cliff. The front part of the cave is about 25 m long and about 15 m wide.

Fig. 1: Localization of Grotta Romanelli (Lecce, Apulia).

Early exploration dates back to the beginning of the century (Stasi and Regalia, 1904). In 1914, research was resumed by G. A. Blanc (1920, 1928), who applied modern stratigraphic methods. A number of excavation campaigns (1954, 1958, 1961, 1963, 1964 and 1970) were ultimately carried out by the Istituto Italiano Paleontologia Umana under the direction of L. Cardini (Blanc *et al.*, 1958-61).

Deposition and ecological change had already been discussed by Blanc (1920, 1928). The stratigraphy can be summarized as follows (from top to bottom):

A–E (I–VII) Upper "Terre brune" formation

F (VIII) Thin stalagmitic crust

G (IX) "Terre rose" clay formation

H (XI) Stalagmitic crust

I (XI) Sharp–edged stones

K (XII) Tyrrhenian "beach"

L (XIII) Base rock

Level G, with a fauna dominated by fallow deer (*Dama dama)* fauna and pachyderms, contains archaic Mousterian industry or industry related to the Lower–Middle Palaeolithic transition. The upper formation A–E (with a total thickness of about 3 m) has instead yielded an abundant lithic industry from the Final Epigravettian (Romanellian), together with numerous examples of rock and "mobiliary" art. The palaeoecological evidence, supported by two sets of C 14 dates undertaken by the University of Rome (from 11.930 ± 520 bp, lev. D to 9.050 ± 100 bp) and the University of Gröningen (from 10.640 ± 100 bp, lev. D to 9.980 ± 100 bp, lev. A), link layer E to a damp, forest phase at the end of the Alleröd, layers D–B to a dry cold phase of the Dryas III, while layer A is believed to represent the final, only slightly damp forest environment phase (Cassoli *et al.*, 1979). Several different palaeoenvironments coexisted in the area of the cave: littoral, with desert sands and marshy zones in the coastal plain preceding the cave, a cliff and coastal rock face zone with wooded environments and a steppe–like plateau in the higher area further inland.

Analysis of the species

The analysis refers only to layers A–E of the Epigravettian and concerns a total of 52,238 bone remains determined at species levels for large mammals, birds and fish (tab. 1–2). The material derives from the Blanc and Cardini excavations of 1954 and 1958.

Bird bones (31,954 from over 5520 individuals), with 126 identified species, predominate in the assemblage (61%). Species of steppe environment predominate, i.e great bustard (*Otis tarda*) and, in particular, little bustard (*Tetrax tetrax*), which alone accounts for 68% of the identified bird remains. There are numerous Anseridae (*Anser albifrons* and *A. fabalis*), among which some are typical of an arctic environment (*A. erythropus, A. brachyrhynchos, Branta ruficollis, B. leucopsis* and, in particular, *B. bernicla*). Evidence of the establishment of a Nordic environment of the sub–Arctic–Scandinavian type is represented by the findings of *Buteo lagopus* and *Nyctea scandiaca*. There are numerous bones of typically North Atlantic and sub–Arctic Oceanic species such as *Gavia artica, Gavia stellata, Rissa tridactyla* and *Larus marinus*, in association with *Alca impennis*. The presence of species associated with an arid–desertic environment (*Pterocles alchata* and *P. orientalis*) attests to the presence of sandy coastal plains which confirm the importance of dryness, and not only temperature, in the palaeoclimate of final Pleistocenic southern Italy.

Fish bones account for less than 1% of the assemblage, which indicates that, despite the coastal location of the site, fishing did not play an important role in the subsistence

TABLE 1: Species represented at Grotta Romanelli, NISP data.

	LEVELS																TOTAL	
	A		B		up. C		C		low. C		D		E		A-E			
SPECIES	I-II	%	III	%	IV	%	IV-V	%	V	%	VI	%	VII	%	T.B.	%	NISP	%
Lepus europaeus	13	*2.57*	24	*3.18*	156	*5.40*	27	*6.63*	310	*6.69*	197	*5.67*	27	*8.52*	382	*5.61*	1136	*5.74*
Marmota marmota															5	*0.07*	5	*0.03*
Canis lupus	4	*0.79*	6	*0.80*	6	*0.21*			12	*0.26*	14	*0.40*	1	*0.32*	35	*0.51*	78	*0.39*
Vulpes vulpes	143	*28.26*	127	*16.84*	636	*22.01*	109	*26.78*	1091	*23.53*	781	*22.49*	147	*46.37*	1956	*28.74*	4990	*25.21*
Martes martes	1	*0.20*			2	*0.07*									2	*0.03*	5	*0.03*
Meles meles	6	*1.19*	1	*0.13*	10	*0.35*	4	*0.98*	22	*0.47*	16	*0.46*	3	*0.95*	41	*0.60*	103	*0.52*
Felis silvestris	14	*2.77*	12	*1.59*	22	*0.76*	3	*0.74*	30	*0.65*	26	*0.75*	2	*0.63*	50	*0.73*	159	*0.80*
Monachus monachus															2	*0.03*	2	*0.01*
Sus scrofa	5	*0.99*	7	*0.93*	13	*0.45*			6	*0.13*	11	*0.32*			22	*0.32*	64	*0.32*
Cervus elaphus	172	*33.99*	268	*35.54*	918	*31.76*	131	*32.19*	1104	*23.81*	879	*25.32*	58	*18.30*	1577	*23.17*	5107	*25.81*
Capreolus capreolus	2	*0.40*	2	*0.27*	7	*0.24*	1	*0.25*	16	*0.35*	5	*0.14*	2	*0.63*	13	*0.19*	48	*0.24*
Bos primigenius	77	*15.22*	194	*25.73*	608	*21.04*	82	*20.15*	700	*15.10*	779	*22.44*	39	*12.30*	1306	*19.19*	3785	*19.13*
Equus (A.) hydruntinus	69	*13.64*	113	*14.99*	512	*17.72*	50	*12.29*	1346	*29.03*	764	*22.00*	38	*11.99*	1413	*20.76*	4305	*21.75*
Delphinus delphis															1	*0.01*	1	*0.01*
Total Mammals	**506**	***8.40***	**754**	***15.96***	**2890**	***26.29***	**407**	***99.75***	**4637**	***45.78***	**3472**	***43.44***	**317**	***9.93***	**6805**	***77.63***	**19788**	***37.88***
Aves	5387	*89.40*	3913	*82.81*	8041	*73.14*			5429	*53.60*	4489	*56.17*	2852	*89.32*	1843	*21.02*	31954	*61.17*
Pisces	133	*2.21*	58	*1.23*	63	*0.57*	1	*0.25*	62	*0.61*	31	*0.39*	24	*0.75*	118	*1.35*	496	*0.95*
Total NISP	**6026**	***11.50***	**4725**	***9.10***	**10994**	***21.00***	**408**	***0.80***	**10128**	***19.30***	**7992**	***15.30***	**3193**	***6.10***	**8766**	***16.70***	**52238**	

Table 2: Mammal species represented at Grotta Romanelli, MNI data.

	LEVELS																	
	A		B		up. C		C		low. C		D		E		A-E			
SPECIES	I-II	%	III	%	IV	%	IV-V	%	V	%	VI	%	VII	%	T.B.	%	Total	%
Lepus europaeus	5	*5.95*	4	*3.57*	13	*7.56*	4	*10.26*	38	*13.57*	23	*8.52*	3	*7.14*	35	*7.85*	125	*8.65*
Marmota marmota															2	*0.45*	2	*0.14*
Canis lupus	2	*2.38*	2	*1.79*	3	*1.74*			4	*1.43*	5	*1.85*	1	*2.38*	4	*0.90*	21	*1.45*
Vulpes vulpes	9	*10.71*	20	*17.86*	25	*14.53*	7	*17.95*	49	*17.50*	49	*18.15*	7	*16.67*	117	*26.23*	283	*19.58*
Martes martes	1	*1.19*			1	*0.58*									1	*0.22*	3	*0.21*
Meles meles	4	*4.76*	1	*0.89*	3	*1.74*	2	*5.13*	4	*1.43*	4	*1.48*	1	*2.38*	7	*1.57*	26	*1.80*
Felis silvestris	7	*8.33*	5	*4.46*	7	*4.07*	1	*2.56*	7	*2.50*	6	*2.22*	1	*2.38*	8	*1.79*	42	*2.91*
Monachus monachus															1	*0.22*	1	*0.07*
Sus scrofa	3	*3.57*	1	*0.89*	3	*1.74*			2	*0.71*	2	*0.74*			4	*0.90*	15	*1.04*
Cervus elaphus	21	*25.00*	39	*34.82*	51	*29.65*	11	*28.21*	73	*26.07*	81	*30.00*	10	*23.81*	129	*28.92*	415	*28.72*
Capreolus capreolus	2	*2.38*	2	*1.79*	2	*1.16*	1	*2.56*	3	*1.07*	2	*0.74*	1	*2.38*	4	*0.90*	17	*1.18*
Bos primigenius	14	*16.67*	23	*20.54*	31	*18.02*	8	*20.51*	41	*14.64*	66	*24.44*	11	*26.19*	85	*19.06*	279	*19.31*
Equus hydruntinus	16	*19.05*	15	*13.39*	33	*19.19*	5	*12.82*	59	*21.07*	32	*11.85*	7	*16.67*	48	*10.76*	215	*14.88*
Delphinus delphis															1	*0.22*	1	*0.07*
Total MNI	**84**	***5.81***	**112**	***7.75***	**172**	***11.90***	**39**	***2.70***	**280**	***19.38***	**270**	***18.69***	**42**	***2.91***	**446**	***30.87***	**1445**	

economy. There are remains of different species such as: *Labrus bergylta, Mugil cephalus, Dicentrarchus labrax* and though less common *Sparidae*.

The mammals (tab. 1–2) are characterized by a smaller number of species (14). Some of the species listed by Blanc - hyena (*Crocuta*), otter (*Lutra lutra*), lynx (*Lynx lynx*) and ibex (*Capra ibex*) have not been found. The presence of the marmot (*Marmota marmota*) is attested, for the first time, by only 5 remains.

There are 19,788 mammal remains. The most frequent species are: *Cervus elaphus* (25.8%), *Vulpes vulpes* (25.2%), *Equus (Asinus) hydruntinus* (21.7%) and *Bos primigenius* (19.1%). The *Artiodactyla* also include *Sus scrofa* and *Capreolus capreolus*. There are also numerous remains of *Lepus europaeus* (5.7%). The carnivores are represented by *Felis silvestris, Meles meles, Canis lupus* and the extremely rare *Martes martes*. *Monachus monachus* and *Delphinus delphis* are represented by only 3 remains.

From an ecological point of view, the various levels are characterized by a substantial uniformity, with red deer always predominant on wild ass and aurochs. In level lower C (V), there is however an evident increase of wild ass. The increase of this species seems to be linked to a dryer and colder phase which probably affected the whole level C (IV–V). This phase has also produced a smaller number of wood mammals (roe deer, wild boar, wildcat), bones or great and little bustards and a larger number of remains of the Arctic and Northern birds described above.

Analysis of the three main species

A more detailed analysis was carried out on the remains of the larger mammals *Bos primigenius, Equus (Asinus) hydruntinus* and *Cervus elaphus* in order to gain information concerning their exploitation, butchery and introduction into the cave (tab. 3). As far as the age at death of the animals is concerned (tab. 4), the analysis of the whole assemblage reveals a difference in the way the wild ass was exploited. This is illustrated in particular by a higher frequency of very young and old animals (Biondi, 1995). The mortality curves of red deer and aurochs are similar, though there is a larger number of young aurochses.

Red deer is overall the dominant species, followed in NISP by wild ass and in MNI by aurochs. The predominance in NISP of the wild ass can essentially be related to the large number of molars and premolars (tab. 3-5), due to their greater durability. The analysis of the anatomic elements, with a large number of skull elements and limb extremities, suggests the introduction into the cave of portions of the entire carcass of the animals. The axial elements point, instead, to a different treatment of the aurochs. Vertebrae and ribs of aurochs are extremely rare, while

Table 4: Age classes of main mammals.

	Bos		*Equus*		*Cervus*	
Age classes	MNI	%	MNI	%	MNI	%
Neonatal	6	*2.15*	16	*7.44*	11	*2.65*
Juvenile	69	*24.70*	42	*19.50*	103	*24.80*
Subadult	48	*17.20*	26	*12.10*	43	*10.40*
Adult I	90	*32.30*	66	*30.70*	110	*26.50*
Adult II	44	*15.80*	26	*12.10*	108	*26.00*
Senile	22	*7.89*	39	*18.10*	40	*9.64*
Total MNI	**279**	***30.70***	**215**	***23.70***	**415**	***45.70***

Table 3: Main mammals NISP and MNI data.

	Levels																Total	
	A		**B**		**up. C**		**C**		**low. C**		**D**		**E**		**A-E**			
Species	I-II	%	III	%	IV	%	IV-V	%	V	%	VI	%	VII	%	T.B.	%	NISP	%
Bos primigenius	77	*24.21*	194	*33.74*	608	*29.83*	82	*31.18*	700	*22.22*	779	*32.16*	39	*28.89*	1306	*30.40*	3785	*28.68*
Equus (A.) hydruntinus	69	*21.70*	113	*19.65*	512	*25.12*	50	*19.01*	1346	*42.73*	764	*31.54*	38	*28.15*	1413	*32.89*	4305	*32.62*
Cervus elaphus	172	*54.09*	268	*46.61*	918	*45.04*	131	*49.81*	1104	*35.05*	879	*36.29*	58	*42.96*	1577	*36.71*	5107	*38.70*
Total NISP	**318**	***2.41***	**575**	***4.36***	**2038**	***15.44***	**263**	***23.87***	**3150**	***23.87***	**2422**	***18.35***	**135**	***1.02***	**4296**	***32.55***	**13197**	
Bos primigenius	14	*27.45*	23	*29.87*	31	*26.96*	8	*33.33*	41	*23.70*	66	*36.87*	11	*39.29*	85	*32.44*	279	*30.69*
Equus hydruntinus	16	*31.37*	15	*19.48*	33	*28.70*	5	*20.83*	59	*34.10*	32	*17.88*	7	*25.00*	48	*18.32*	215	*23.65*
Cervus elaphus	21	*41.18*	39	*50.65*	51	*44.35*	11	*45.83*	73	*42.20*	81	*45.25*	10	*35.71*	129	*49.24*	415	*45.65*
Total MNI	**51**	***5.61***	**77**	***8.47***	**115**	***12.65***	**24**	***2.64***	**173**	***19.03***	**179**	***19.69***	**28**	***3.08***	**262**	***28.82***	**909**	

Table 5: Skeletal elements of main mammals.

Skeletal Elements	*Bos*		*Equus*		*Cervus*	
	NISP	%	NISP	%	NISP	%
Antler/Horn	7	*0.18*			96	*1.88*
Cranium	29	*0.77*	22	*0.51*	57	*1.12*
Maxilla	3	*0.08*	4	*0.09*	47	*0.92*
Decidui	100	*2.64*	96	*2.23*	86	*1.68*
Premolars	85	*2.25*	85	*1.97*	186	*3.64*
Molars	211	*5.57*	89	*2.07*	250	*4.90*
Prem/Molars			500	*11.61*		
Mandible	71	*1.88*	40	*0.93*	225	*4.41*
Decidui	91	*2.40*	89	*2.07*	117	*2.29*
Premolars	180	*4.76*	89	*2.07*	194	*3.80*
Molars	373	*9.85*	79	*1.84*	396	*7.75*
Prem/Molars			424	9.85		
Incisors	220	*5.81*	447	*10.38*	349	*6.83*
Canines			23	*0.53*	24	*0.47*
Indet. Teeth	244	*6.45*	108	*2.51*	130	*2.55*
Atlas			21	*0.49*	25	*0.49*
Epistropheus	2	*0.05*	22	*0.51*	19	*0.37*
Scapula	46	*1.22*	22	*0.51*	142	*2.78*
Humerus	121	*3.20*	65	*1.51*	119	*2.33*
Radius	148	*3.91*	129	*3.00*	165	*3.23*
Ulna	75	*1.98*	22	*0.51*	102	*2.00*
Carpals	112	*2.96*	132	*3.07*	154	*3.02*
Metacarpal	113	*2.99*	158	*3.67*	268	*5.25*
Rud. Metacarpal	11	*0.29*	110	*2.56*	18	*0.35*
Pelvis	29	*0.77*	31	*0.72*	81	*1.59*
Femur	119	*3.14*	66	*1.53*	78	*1.53*
Patella	10	*0.26*	11	*0.26*	19	*0.37*
Tibia	173	*4.57*	166	*3.86*	151	*2.96*
Fibula			9	*0.21*		
Calcaneus	35	*0.92*	34	*0.79*	110	*2.15*
Astragalus	68	*1.80*	96	*2.23*	126	*2.47*
Tarsals	105	*2.77*	83	*1.93*	87	*1.70*
Metatarsal	179	*4.73*	100	*2.32*	356	*6.97*
Rud. Metatarsal			108	*2.51*		
Metapodials	165	*4.36*	143	*3.32*	197	*3.86*
First Phalanx	267	*7.05*	316	*7.34*	381	*7.46*
Second Phalanx	182	*4.81*	130	*3.02*	222	*4.35*
Third Phalanx	78	*2.06*	140	*3.25*	99	*1.94*
Sesamoid	133	*3.51*	96	*2.23*	31	*0.61*
Total NISP	**3785**	***28.68***	**4305**	***32.62***	**5107**	***38.70***

Table 6: Comparison between skeletal elements of main mammals (level IV, V, VI and total).

Skeletal Elements	*Bos*	*Equus*	*Cervus*	*Bos*	*Equus*	*Cervus*
	NISP	NISP	NISP	%	%	%
R 58 IV						
lower M3	7	8	11	*26.90*	*30.70*	*42.30*
Humerus dist.	7	4	11	*31.80*	*18.20*	*50.00*
Radius prox.	14	2	16	*43.80*	*6.30*	*50.00*
Metacarpal prox.	13	13	9	*37.80*	*37.10*	*25.70*
Tibia dist.	20	9	18	*42.60*	*19.10*	*38.30*
Astragalus	4	6	16	*15.40*	*23.10*	*61.50*
Metatarsal prox.	9	4	21	*26.50*	*11.80*	*61.80*
Subtotal	**74**	**46**	**102**	***33.60***	***20.90***	***45.50***
R 58 V						
lower M3	8	13	10	*27.60*	*44.80*	*27.60*
Humerus dist.	5	8	11	*20.80*	*33.30*	*45.80*
Radius prox.	12	3	15	*40.00*	*10.00*	*50.00*
Metacarpal prox.	16	12	19	*34.00*	*25.50*	*40.40*
Tibia dist.	7	19	13	*17.90*	*48.70*	*33.30*
Astragalus	11	10	25	*23.90*	*21.70*	*54.30*
Metatarsal prox.	15	10	31	*26.80*	*17.90*	*55.40*
Subtotal	**74**	**75**	**124**	***25.80***	***41.90***	***45.40***
R 58 VI						
lower M3	2	4	8	*14.20*	*28.60*	*57.10*
Humerus dist.	7	2	9	*38.90*	*11.10*	*50.00*
Radius prox.	7	3	15	*28.00*	*12.00*	*60.00*
Metacarpal prox.	4	5	8	*23.50*	*29.40*	*47.10*
Tibia dist.	2	10	7	*10.50*	*52.60*	*36.80*
Astragalus	10	10	16	*27.80*	*27.80*	*44.40*
Metatarsal prox.	9	1	10	*45.00*	*5.00*	*50.00*
Subtotal	**41**	**35**	**73**	***27.50***	***23.50***	***49.00***
R 58 IV-VI						
lower M3	17	25	29	*23.90*	*35.20*	*40.80*
Humerus dist.	19	14	31	*29.60*	*21.80*	*48.40*
Radius prox.	33	8	46	*37.90*	*9.10*	*52.80*
Metacarpal prox.	33	30	36	*33.30*	*30.30*	*36.30*
Tibia dist.	29	38	38	*27.70*	*36.10*	*36.10*
Astragalus	25	26	57	*23.10*	*24.10*	*52.70*
Metatarsal prox.	33	15	62	*30.00*	*13.60*	*56.30*
Total	**189**	**156**	**299**	***29.30***	***24.20***	***46.40***

those of red deer and wild ass are comparatively abundant. This is indicated by the ratio between the first two vertebrae (atlas and epistropheus) and the number of individuals: in aurochs only two elements are present for 279 individuals (less than 1%), for the red deer there are 25 remains for 415 individuals (6%) and for the wild ass 21 remains for 215 individuals (10%). This cannot be due only to differential preservation.

In the three species, radius is the best preserved anatomical element of the forelimb; carpal bones are

numerous. In wild ass scapula and ulna are under–represented. In the hindlimb the best represented element is the tibia, in particular due to the greater size of the distal portion. Metapodials of red deer are over-represented because of their easy identification and for the presence of working wasters. The ratio between calcaneus and astralagus is difficult to explain. The latter is always more frequent than calcaneus in all the three species but with different proportions: 1: 1.2 for red deer, 1: 2 for aurochs and 1: 3 for wild ass. As far as the ratio between phalanges is concerned, the first phalanx is in all species more frequent than the second and the third probably because of its higher fragmentation. The ratio between the third and first phalanx for both red deer and aurochs is 1: 4.

The results of this preliminary analysis may have been affected by factors linked to the way the material was collected (e.g. the selection of particular anatomical parts, the absence of unidentifiable elements in the older collections) as can be detected by the differences between the various excavation campaigns. To offset the effect of these factors, as well as to check the reliability of the results, several anatomical elements were selected (lower M3, distal humerus, proximal radius, proximal metacarpus, distal tibia, astragalus and proximal metatarsus) from the three levels (upper C, lower C and D = IV, V, VI) from the 1958 excavation campaign (tab. 6). This approach also compensated for the quantitative differences in the number of bones of the three species (teeth and phalanges, in particular).

It is again the red deer which has the largest number of remains in the three levels (46.4%). The aurochs (29.3%) and the wild ass (24.2%) follow. The evidence from these levels confirms the higher frequency of very young and old individuals of wild asses (tab. 7). Compared with the previous analysis, the predominance of young animals in aurochs increases up to 55%. Adult individuals of red deer predominate, although there is also a fair number of young animals. Clear variation in the frequency of different species become evident when individual anatomical elements are compared: if the proximal metatarsal is taken as a parameter the red deer increases to 56.3%, while it drops to 32% if the distal tibia is used. Once again a slight increase is observed in wild ass remains in level lower C (V), particularly if lower M3, and distal humerus and tibia are taken into consideration. This increase is also found in the MNI, thus confirming the hypothesis that this level represents the driest climatic phase in the stratigraphic series. If a detailed analysis is made of the wild ass body parts, the proximal radius appears to be under–represented. In level VI this is also associated with the low frequency of the distal humerus. In the other two levels, the ratio of 1: 3 between the two anatomical elements is difficult to account for. The distal tibia of wild ass is under–represented in level IV, the proximal metatarsus in level VI. Anomalies are found also in bones of red deer (metacarpus and proximal metatarsus) and aurochs (distal tibia). These quantitative variations are difficult to interpret and appear to be due more to chance (location and size of the explored area) than to any selection in the introduction of anatomical parts.

Table 7: Age classes of main mammals (Levels IV, V, VI and complessive).

	Bos		*Equus*		*Cervus*	
Age classes	MNI	%	MNI	%	MNI	%
R 58 IV						
Neonatal	1	*5.00*	1	5.26	1	*3.45*
Juvenile	6	*30.00*	5	26.32	13	*44.83*
Subadult	4	*20.00*	2	10.53	2	*6.90*
Adult I	4	*20.00*	4	21.05	4	*13.79*
Adult II	3	*15.00*	2	10.53	7	*24.14*
Senile	2	*10.00*	5	26.32	2	*6.90*
Subtotal	**20**		**19**		**29**	
%	*29.41*		*27.94*		*42.6*	
R 58 V						
Neonatal	1	*4.76*	2	*8.33*	1	*3.85*
Juvenile	7	*33.33*	6	*25.00*	8	*30.77*
Subadult	3	*14.29*	3	*12.50*	3	*11.54*
Adult I	5	*23.81*	5	*20.83*	6	*23.08*
Adult II	3	*14.29*	3	*12.50*	6	*23.08*
Senile	2	*9.52*	5	*20.83*	2	*7.69*
Subtotal	**21**		**24**		**26**	
%	*29.6*		*33.8*		*36.6*	
R 58 VI						
Neonatal		*0.00*	1	8.33	1	*5.00*
Juvenile	6	*37.50*	3	25.00	4	*20.00*
Subadult	4	*25.00*	1	8.33	2	*10.00*
Adult I	3	*18.75*	4	33.33	5	*25.00*
Adult II	2	*12.50*	1	8.33	5	*25.00*
Senile	1	*6.25*	2	16.67	3	*15.00*
Subtotal	**16**		**12**		**20**	
%	*33.3*		25		*41.87*	
R 58 IV-VI						
Neonatal	2	*3.51*	4	7.27	3	*4.00*
Juvenile	19	*33.33*	14	25.45	25	*33.33*
Subadult	11	*19.30*	6	10.91	7	*9.33*
Adult I	12	*21.05*	13	23.64	15	*20.00*
Adult II	8	*14.04*	6	10.91	18	*24.00*
Senile	5	*8.77*	12	21.82	7	*9.33*
Total	**57**		**55**		**75**	
%	*30.5*		*29.4*		*40.1*	

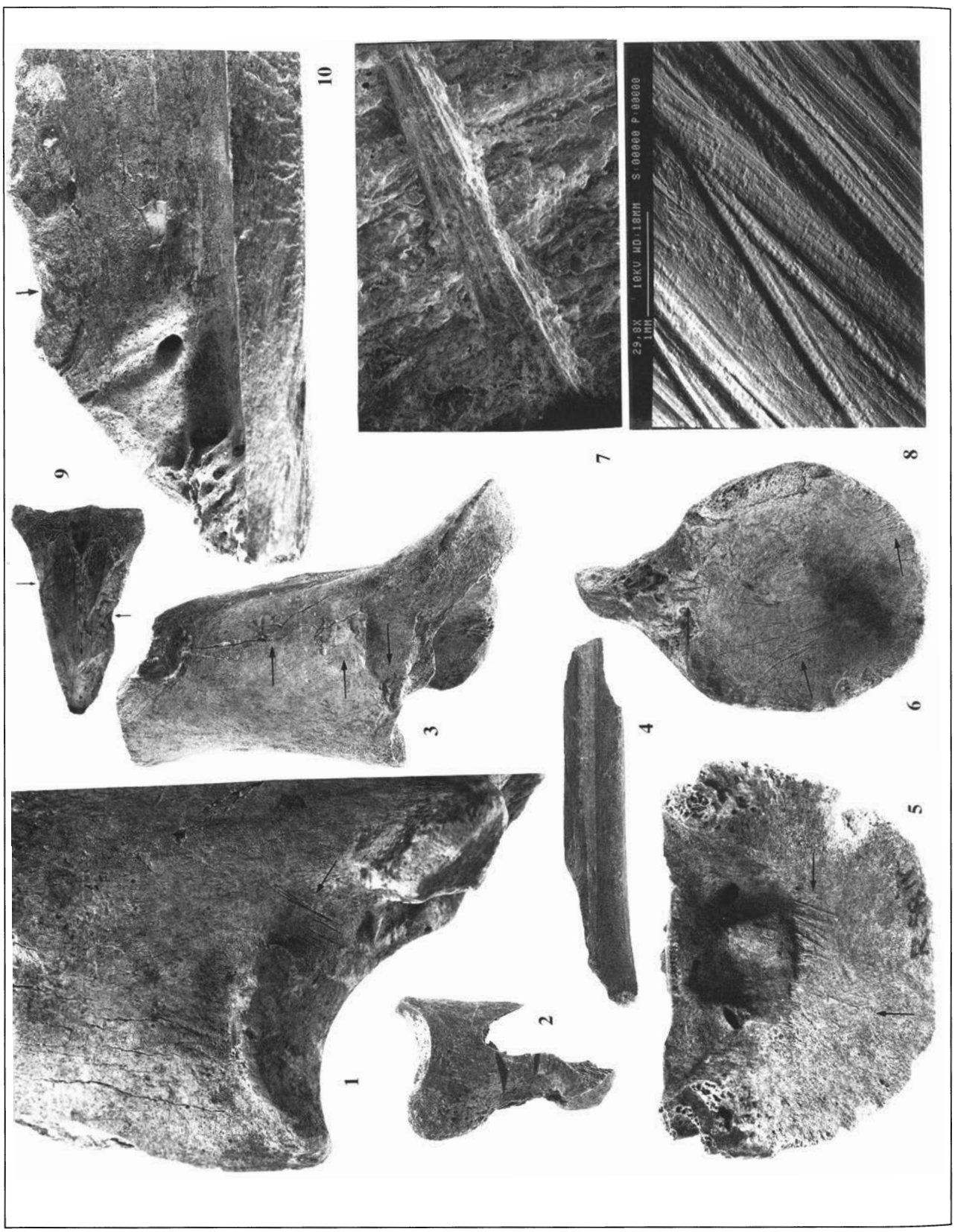
Analysis of butchery marks

The analysis discussed in this section is aimed at identifying the points of impact and cut marks left by stone tools used for butchery. It was carried out on 5525 bone remains, 1670 of which belong to *Bos primigenius*, 1549 to *Equus (Asinus) hydruntinus* and 2306 to *Cervus elaphus*, from the 1958 excavation campaign. Gnawing marks by small rodents have been found only on some bones, mainly the first and second phalanges. Clear gnawing marks and punctures of small carnivores are often visible on the ends of calcaneus and metapodials.

Butchery marks were found on 554 elements representing 10% of the total sample. This value increases to about 17% if we exclude the 2020 teeth identified and the 127 sesamoids. Aurochs (tab. 8), although not the predominant species, provides the largest number of bone elements with butchery marks (222 remains, or 20%); it is followed by the wild ass (147, or 18.4%) and the red deer (185, or 12.1%). This may be due to the greater size of aurochs which implies a more intense use of lithic tools for filleting, disarticulation and skinning and thus a higher probability of leaving traces on the bone surface than in the case of the two smaller mammals (fig. 2: *7*). In aurochs the elements with the highest frequency of cut marks and points of impact are: humerus (46 specimens out of 81; 56.8%), femur (36 out of 47; 47.4%), metatarsal (32 out of 70; 45.7%), radius (28 out of 71; 39.4%) and tibia (39 out of 106; 36.8%). On these elements the position of the cut marks, most of which are located along the diaphysis, points to filleting. Only in metatarsus, traces of disarticulation and skinning predominate. 112 points of impact have been identified in aurochs remains, 57 in the red deer and only 36 in the wild ass (fig. 2: *3, 9, 10*). The higher number of impacts in aurochs remains could be either due to their easier identification, as marks left on the surface of a large element are more evident, or to the resistance of aurochs bones, which sometimes require a higher number of

Table 8: Distribution of butchery marks and impact point. MKD = Number of marks and impact point.

Skeletal Elements	*Bos primigenius*					*Equus (A) hydruntinus*					*Cervus elaphus*				
	NISP	MKD	%	Impact	Cut Marks	NISP	MKD	%	Impact	Cut Marks	NISP	MKD	%	Impact	Cut Marks
Cranium	10					11					34	3	*8.82*		3
Mandible	24	2	*8.33*		2	11	2	*18.20*		2	72	2	*2.78*	2	
Atlas						13	3	*23.10*		3	12	1	8.33		1
Epistropheus	1					8	1	*12.50*		1	5				
Scapula	23	6	*26.10*		6	17	7	*41.20*		7	63	18	*28.60*	3	18
Humerus	81	46	*56.80*	29	39	24	8	*33.30*	2	6	59	15	25.40	6	12
Radius	71	28	*39.40*	15	22	43	16	*37.20*	3	12	88	12	*13.60*	7	8
Ulna	48	9	*18.80*	2	8	11	1	*9.09*		1	44	5	*11.40*		5
Carpals	52					60					83				
Metacarpal	51	16	*31.40*	14	10	62	17	*27.40*	9	11	103	32	*31.10*	6	28
Rud. Metacarpal	2					26	4	*15.40*		4	8	1	*12.50*		1
Pelvis	13	2	*15.40*		2	16	8	*50.00*		8	41	6	*14.60*		6
Femur	76	36	*47.40*	16	32	28	6	*21.40*	2	5	47	10	*21.30*		10
Tibia	106	39	*36.80*	18	31	63	10	*15.90*	4	9	66	8	*12.10*	3	6
Fibula						1	1			1					
Calcaneus	21	2	*9.52*		2	8	2	*25.00*		2	45	3	*6.67*		3
Astragalus	29	4	*13.80*		4	30	4	*13.30*		4	70	8	*11.40*		8
Tarsals	54					41	1	*2.44*		1	39	2	*5.13*		2
Metatarsal	70	32	*45.70*	18	21	28	11	*39.30*	6	6	165	32	*19.40*	19	22
Rud. Metatarsal						21	2	*9.52*		2					
Metapodials	95					60	16	*26.70*	6	10	138				
First Phalanx	124					126	17	*13.50*	4	17	179	19	*10.60*	9	14
Second Phalanx	83					48	4	*8.33*		4	113	7	*6.19*	2	5
Third Phalanx	66					44	6	*13.60*		6	49	1	*2.04*		1
Total	1100	222	*20.20*	112	179	800	147	*18.40*	36	122	1523	185	*12.10*	57	153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blows. The anatomical elements of wild ass on which the largest number of butchery marks have been found are: pelvis (8 out of 16; 50%), scapula (7 out of 17; 41.2%), metatarsus (11 out of 28; 39.2%) and radius (16 out of 47; 37.2%). The analysis of the positions of cut marks on anatomical elements shows that they can generally be attributed to disarticulation, even although filleting marks are also numerous. In wild ass the cutmarks are located on the neck of the scapula, near the glenoid cavity, as a result of the disarticulation of the humerus; on the acetabulum of the pelvis as a result of disarticulation of the femur. Cutmarks have indeed also been found on femur heads. Cut marks on the other limb elements are located near the proximal and distal epiphyses and can also be explained in terms of disarticulation. Cut marks due to skinning can also be found on the bones of limb extremities.

For red deer, cut marks can also be explained in terms of disarticulation and, in the bones of limb extremities, of skinning rather than filleting (fig. 2: *1*). The elements displaying the greatest number of butchery marks are the metacarpus (32 out of 103; 31.1%), the scapula (18 out of 63; 28.6%) and the humerus (15 out of 59; 25.4%).

Skinning marks are found on all three phalanges of wild ass and red deer, whereas they have not been observed on the numerous aurochs phalanges.

In some cases the marks are not due to butchery but perhaps to the use of the bone as raw material. This is the interpretation given to the numerous cut marks observed inside the glenoid cavity of the scapula (2 of red deer and 1 of wild ass), as well as to those found on the plantar face of a third phalanx of wild ass (fig. 2: *5, 6*). The use of the bone as raw material is attested at Grotta Romanelli by numerous artifacts and working wasters, mostly metapodials (fig. 2: *4*) and, in one case, a red deer antler. Two red deer scapulae were possibly used as a support, as is indicated by dozens of longitudinal marks located on the flat medial face. SEM (Scanning Electron Microscope) examination of these cut marks (carried out by Prof. G. Giacobini at the Istituto di Paleontologia Umana, Università di Torino) suggests that they were produced by (burin-like) flint incising tools judging by the characteristics of the walls and the bottom of the cut marks, which have a wavy appearance (fig. 2: *8*).

As concerns the points of impact and the methods of fracturing the different anatomical elements in the various species, previous studies have shown that the type of fracture is not due so much to the type of percussion but is related to the morphological characteristics of each single anatomical element (Sadek-Kooros, 1975; Binford 1981; Johnson 1985; Lyman 1987; Olsen and Shipman 1988; Fiore and Curci, 1995). Points of impact are chosen accordingly to which parts are more suitable for percussion. At Grotta Romanelli the analysis of the fragments confirms the tendency of the diaphysis of the distal portions of the humerus, radius, tibia and metapodials to fracture transversely and to maintain the epiphysis intact. Slight differences in the length of the shaft left intact have been noted in the various species. These differences are probably due to variations in the thickness, volume and area of the trabecular zone. Longitudinal fractures of the epiphysis are frequent in the proximal extremities of radius and metapodials. An interest in phalanx marrow is attested by the presence of several points of impact on these bones.

The first phalanx is in most cases fractured in all three species. Longitudinal and oblique (i.e. with the whole proximal epiphysis and half of the distal one missing) fractures are frequent, while transverse fractures are rare. The same type of fracturing can be found in the second phalanges of aurochs and red deer (fig. 2: *2*). In wild ass, on the other hand, the phalanges II are usually complete because the medullary cavity is almost completely absent.

Several red deer remains show fractures with sharp edges on the proximal ulna (due to the detachment of the radius–cubitus from the humerus), under the acetabulum of the pelvis and below the articular head of the femur. These were caused by dismemberment.

From the results of the analysis of the three species all the steps involved in dismemberment and utilization of the carcass are generally fairly clearly indicated: disarticulation of the skull from the trunk (cut marks observed on atlas and epistropheus), disarticulation of the long bones of the limbs, filleting and skinning (cut marks on metapodials and phalanges).

Fig. 2: (1) Ulna of red deer: marks of dismemberment. (2) Phalanx II of red deer: oblique fracture and chopping scars. (3) Humerus diaphysis of aurochs: chopping scars. (4) Metapodial diaphysis of red deer: working waster. (5-6) Phalanx III of ass and scapula of red deer: striae due perhaps to the use of the bone as raw material. (7) Femur articular head of aurochs: stria of dismemberment (Photo SEM). (8) Scapula of red deer: striae due to the use perhaps as a support (Photo SEM). (9) Metatarsal of red deer: impact point (negative). (10) Metapodial diaphysis of aurochs: impact point (negative) (n^{os} 3, 4, 9: x 0.42; others: x 0.83).

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