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Ibex exploitation at Dalmeri rockshelter (TN) and "specialized hunting" in the sites of the Eastern Alps during the Tardiglacial and the Early Holocene

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ABSTRACT - The faunal data from Dalmeri rockshelter, one of the few high altitude Italian deposits where faunal remains have been preserved, suggested that it represents a seasonal site specialized for ibex hunting both for its location and for the large number of remains. The relevance of Dalmeri is in its important contribution to the reconstruction of hunting strategies and the identification of the main prey species during the Tardiglacial in the Eastern Alps because such reconstructions were based mainly on the information from lowland sites.

Key words: Dalmeri rockshelter, Eastern Alps, Epigravettian, *Capra ibex*, seasonal hunting
Parole-chiave: Riparo Dalmeri, Alpi Orientali, Epigravettiano, *Capra ibex*, stagionalità

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1. INTRODUCTION

Dalmeri rockshelter is located on the Sette Comuni plateau, at an altitude of 1240m, in the municipality of Grigno (TN). Research has been carried out since 1991 by the Museo Tridentino di Scienze Naturali of Trento (DALMERI & LANZINGER, 1989; DALMERI 1993; DALMERI, this volume). The stratigraphy is represented by a sequence of strata where the upper levels suggest a weak anthropization (US4a,5-13,14-14a) and where the lower levels suggest a strong anthropization (US14b,25,26 and 28 and relative sub-units). The anthropic occupation is testified by the presence of hearths, ash-filled pits, abundant Epigravettian lithic industry, bone industry and faunal bone remains. The radiometric dating (11,260±100 BP for US14; 11,000±115 BP for US26b) attributes the occupation of the site to the Alleröd interstadial.

2. ANALYSIS OF THE FAUNAL BONE REMAINS

The faunal analysis presented here takes into account the bone remains of the 1991-1993 excavations of the lower levels of the deposit, 14b and 26 and relative sub-levels (Fig.1). More than 17,500 bone remains were collected, mainly tiny indeterminable fragments. Only 982 mammal remains were identified to species level, along with 310 fish remains, most of which were indeterminable, apart from trout (*Salmo trutta*) and the *Leuciscus* and *Barbus* genera. The high fragmentation of the bone sample was probably due to anthropic factors (butchering, bone working, combustion), animal action (presence of gnawed and digested bones) and also post-depositional processes (freezing/thawing, solifluction, etc.).

The most represented mammal species (90% of the remains) is ibex (*Capra ibex*); a small amount of red deer bone remains (*Cervus elaphus*) and very few remains of roe deer (*Capreolus capreolus*), bear (*Ursus arctos*), fox (*Vulpes vulpes*), wolf (*Canis lupus*), badger (*Meles meles*), beaver (*Castor fiber*), marmot (*Marmota marmota*), hare (*Lepus* cf. *europaeus*) and hedgehog (*Erinaceus europaeus*). Ibex was the most frequent species also as minimum number of individuals (the remains of each stratigraphic unit are considered as belonging to different individuals) (CASSOLI *et al.*, 1999; TAGLIACOZZO & FIORE, 2000). Different parts of the red deer skeleton were found belonging to 14 individuals. Even though there are more adults, there

are also three very young individuals under 6 months of age and two 1 to 2 year old young animals. With regard to bear, there are mainly metapodials and phalanges belonging to 6 individuals, at least one of which is young. The fox remains (only teeth) are attributable to 4 individuals, one adult and three very young ones. Wolves were certainly young while the remains of badger, roe deer, hare, marmot and beaver probably refer to adults.

The ibex is represented by 885 bone remains referable to 59 different individuals. Animals belonging to different age classes are represented. There are mainly young and young-adult animals of an estimated age of between 6 months and 4 years (Fig.2). There are also 5 very young individuals under 6 months, two of which are newly born animals of about 2 months. The adults are mainly 4 to 8 years old but there are also older ones, including 4 seniles.

The ibex is represented by bones of the whole skeleton. The proportion of these bones differs considerably (Fig.3-4). The most frequent ones belong to the skull (mainly loose teeth) and distal limb elements (carpals, tarsals, phalanges, sesamoids). There are more of these bones in the skeleton and they are generally more resistant than the limb and axial bones, therefore can be identified more easily. Regarding the long bones, the humerus, radius, femur and tibia are represented in a different way than the metapodials bones (Fig.5). These latter are mainly represented by the distal epiphysis of the bone, whereas there are mainly diaphysis fragments of the former. This difference is obviously due to the different processes of preservation of the elements as well as human action (higher fragmentation of diaphyses rich in marrow, removal of fatty parts) and carnivore action as they prefer the epiphyses of the bone.

2.1. *The analysis of the surfaces of the bone remains*

There are evident traces of carnivores action (scoring and pitting) and rodent gnaw marks. Some of the unidentifiable fragments are thinned and show shiny and altered surfaces (Cassoli *et al.*, 1999). They seem to have been corroded by acids and are probably remains digested by carnivores re-deposited in the excrements. There are irregular and U-shaped wavy traces caused by roots. Other fragments present a exfoliated surface due to weathering before burial. There are also cuts made by lithic implements and percussion points due to the butchering of the hunted animals.

Cuts made by lithic implements were found on 85 remains (8.6% of the 982 determined) and as expected are present mainly on ibex bones. There are some skinning marks on one second phalanx of a red deer and clear defleshing marks on a tibia diaphysis, a rib and a vertebra. Striae produced by lithic implements caused by skinning were found on a fragment of a bear distal metapodial (Fig.6:3).

Similar modifications are also present on a fragment of distal humerus of a badger that was found in the levels that are still being studied (level 25a). These marks were caused by butchering and indicate that badger was eaten (Fig.6:4-5).

2.2. *Butchering methods of the ibex*

There are 80 ibex bones with cuts made by lithic implements and they represent 12,2% of the total remains excluding loose teeth (Fig.7). Traces are widely distributed on different elements, meaning that the carcasses were reduced to small portions. Skinning is documented by cuts on parts of the skull and on the phalanges (Fig.8). Those found at the base of the horn-core on a frontal fragment are particularly significant (Fig.6:1).

The cuts found near the joints are referred to disarticulation. Marks on the first cervical vertebra indicate the removal of the head from the trunk. The mandible was also separated from the skull as can be seen from the cuts near the condyles. There are striae located on the scapula, near the pelvis acetabulum, which testify that the limbs were separated from the axial skeleton. The fore limb is further sectioned and the radius-ulna is disjointed from the humerus and from the metacarpus; cuts were found on the distal humerus, the proximal radius-ulna and the metacarpus, whereas there are no traces on the carpals. Only the anterior part of the metatarsals, the tarsal bones (scaphocuboid and large cuneiform) and the malleolus of the hind limb show disarticulation marks. Long arched or wavy defleshing traces were found on most of the long bones of the limbs usually related to muscle insertions.

Spiral fractures were found on many diaphyses suggesting that fresh bones were fractured. Percussion points were found on 30 ibex remains and are located on the diaphysis of the long bones. Among the indefinite flakes there are also percussion cones. The practice of fracturing the bones for extracting the marrow is also used on bones with little marrow and is testified by the fact that, apart from two phalanges, no bones with marrow cavity were found whole.

2.3. *Periods of occupation of the rockshelter*

Considering that ibex are born in May-June and since 2-6 month old animals were hunted the rockshelter was definitely used in summer-autumn. Also the data on red deer confirm this with the presence of 3 individuals of less than 6 months old. The seasonal

occupation of the site is also attested by the analysis of the thin sections (Fig.6:2) and by counting the annuli on the teeth of adult ibex and deer (CURCI & TAGLIACOZZO, 2000).

Ibex were probably hunted in autumn when the different unisexual groups (females and very young individuals, young males, young-adult males and isolated adult males) which characterize the social organization of the ibex gather together for the mating season. Unfortunately there is not enough evidence on the sex of the animals to confirm this hypothesis because the high fragmentation of the bones does not allow morphological determination nor osteometric analysis.

3. "SPECIALIZED HUNTING" IN THE EASTERN ALPS DURING THE TARDIGLACIAL AND THE EARLY HOLOCENE

Unlike other highland Epigravettian sites, in Dalmeri rockshelter animal bones were well preserved, providing important information on hunting strategies, the settlement occupation period and the butchering practices. Ibex is the most frequent species, but red deer was also hunted. Animals such as roe deer, bear, badger, marmot, beaver and hare were only occasionally captured. Scarce evidence of butchering confirms that badgers were eaten whereas beavers were mainly exploited for their fur. Traces of skinning on bear bones document that this large mammal was also probably hunted. However, it is not sure whether wolves and foxes were hunted. Foxes in particular are represented by teeth of very young individuals that could be remains of a lair or may have been left there by other predators. The presence of bone remains with gnaw marks and small digested fragments indicate that carnivores also occupied the rockshelter.

Considering the data on the seasons and the altitude, the rockshelter was a seasonal site occupied during summer and autumn. The large proportion of ibex suggests that the highland was used for exploiting the meat and the hide of this animal. We can therefore refer to Dalmeri rockshelter as a "specialized hunting" site for ibex. Part of the meat was probably eaten in the valley floor sites during the winter. The anatomical elements recovered indicate that the whole carcass was transported to the shelter because also low utility parts such as the skull and distal limb elements, are present. Unfortunately it is difficult to know exactly which parts were intentionally taken out of the rockshelter and carried to the valley floor sites because ice action has affected the preservation of the bones. The presence of defleshing marks could well suggest that, at least sometimes, only the meat was taken to the valley floor sites.

The osteological documentation of the valley floor sites of the Tardiglacial is more complete than that of higher altitude sites, as the bones are better preserved. Nevertheless, it is sometimes possible to compare these sites with Dalmeri rockshelter if there is sufficient data on hunting and animal-exploitation strategies

During the Early Dryas, in the hilly prealpine area, the only faunal data refer to levels 17-13 of Tagliente rockshelter, in the Lessini mountains, dated to about 13,500 BP in non-calibrated chronology (CAPUZZI & SALA, 1980; BROGLIO & IMPROTA, 1995). Ibex was the most hunted species, but many aurochses and perhaps bisons were also hunted. Among the Cervids the elk was quite common while red deer and roe deer were rare. Marmots and hares were mainly hunted for their fur. These levels reflect a cold arid phase, with poor arboreal vegetation, confirmed by pollen and sedimentological data (SALA, 1992). The upper levels, 8-10 (approx. 12,000 BP, non-cal.), represent the temperate interstadial of Bölling. The fauna changes considerably and ibex remains decrease while deer, roe deer and wild boar increase. Bovines and elk also decrease and chamois is present. Forest species prevail and there are hardly any marmot remains indicating that the weather had become more temperate-humid.

The lower levels 16-10, of Villabruna rockshelter refer to the end of the Bölling and to the middle Dryas periods. This rockshelter is situated in the Cismon Valley, at 500m a.s.l. (AIMAR *et al.*, 1994). The fauna (AIMAR & GIACOBINI, 1995) is mainly represented by caprines. Ibex is the most abundant species, followed by chamois prevailing on red deer and there is also a sporadic presence of wild boar. Faunal remains are mainly due to anthropic activities and there are traces of butchering on the animal bones. The rockshelter was repeatedly occupied for short periods. Hunting preys were usually adults and the whole carcass was carried into the rockshelter.

The first occupations of the Soman rockshelter, near Ceraino at the beginning of the Adige Valley, date back to a more recent moment in time referring to the Middle Dryas-Alleröd period (about 11,900 BP, non-cal.). Caprines prevail, but there is also abundant red deer along with other forest species (roe deer, wild boar, wolf, marten and lynx). Among the caprines, chamois is more abundant than ibex suggesting a less dry period; cold but humid periods are confirmed by the presence of elk (CASSOLI & TAGLIACOZZO, 1994).

It is during the Alleröd phase that the forest vegetation of conifer and deciduous trees develop (but not permanently yet) in the prealpine valleys and the real human occupation of pre-alpine highlands between 1000 and 1600m a.s.l. like Dalmeri rockshelter occurs. Levels 9-4 of Villabruna A rockshelter could refer to

this period when forest species like red and roe deer prevail along with caprines.

During the final cold phase of the Tardiglacial, recent Dryas, the fauna of the second phase of the Epigravettian levels of Soman rockshelter (approx. 10,500 years BP, non-cal.) attest that wide prairies were still present on the valley floor. This is confirmed by the increase of chamoix and ibex remains, in comparison to the preceding phase, and the contemporary decrease of animals related to woody-forest environments (Cassoli & Tagliacozzo, 1994). In this phase the aurochs is still hunted. This species is absent in the valley floor sediments of the prealpine area during the Preboreal and the Boreal period.

The hunting of mammals in the valley floor sites seems to be highly influenced by the ecological changes of the Tardiglacial period. The hunted species changed according to the climatic shifts and the different micro-environments that developed in the areas of the settlements. A real type of "specialized hunting" cannot be confirmed even though the ibex seemed to be the "favourite prey". It would seem that the choice of a specific prey was not based on "cultural" reasons, but rather on the availability of the species. Unfortunately, for the moment, it is not possible to determine if there was a choice in the hunting strategies for a particular age or sex classes or, as already mentioned, whether the animals or parts of the animals were taken to the valley floor sites from the higher lands. At the moment, only the Dalmeri rockshelter suggests a "specialized hunting" strategy in the choice of one particular species and that the anatomic portions of ibex were taken to the valley floor sites.

The same problems remain unsolved for the initial phase of the Holocene. The faunas of some rockshelters (Romagnano III, Pradestel, Vatte di Zambana, Acquaviva, and Soman) in the Adige Valley were studied along with Mesolithic industries referring to the Preboreal and Boreal (Boscato & Sala, 1980; Riedel, 1982; Cassoli & Tagliacozzo, 1994). Red deer, roe deer and wild boars were constantly favourite preys even though ibex and chamois were still abundant particularly at Soman and Romagnano. Along with these there are also abundant beavers, and frequently other fur-bearing animals from forest environments such as martens, foxes, bears, lynxes, wild cats. Activities such as fowling, fishing, the collection of tortoises and molluscs were also carried out. This suggests an increase in the exploitation of resources influenced by the progressive changes towards as a temperate-humid climate. Human occupation of mid- and high mountain areas became more intense in these periods and often relates to the ibex hunting seasons. The scarce data available at the moment does not confirm this theory completely. At Grotta Ernesto, 1130m a.s.l., human occupation is sporadic and the presence of bone assemblages is due to carnivores and therefore it is difficult to detect precise hunting strategies (Awsiuk *et al.*, 1994). At Mondeval de Sora, 2150m a.s.l. red deer is more abundant than ibex (Alciati *et al.*, 1994). At Plan de Frea IV, 1930m a.s.l., deer and ibex are hunted in similar percentages. There are also many lagomorph remains as well as wild boar, bear, fish (Angelucci *et al.*, 1999). The faunal data suggest that the area was used from early summer to late autumn. These were obviously seasonal sites but were not only used for the specialized hunting of ibex. The fact that there was a higher presence of chamoix and ibex bones in the valley floor areas than in the Tardiglacial period is very significant as, in theory, human occupation of mid-high mountain areas became more intense during this period. Perhaps hunting still went on at the bottom of the valley or selected portions of the animals hunted at higher altitudes were taken there. At the moment there are no studies on the anatomic parts represented in the various Mesolithic deposits or on seasonal hunting sites that could help clarify this point. It is possible that ibex were present on the lowlands during cold periods and were consequently hunted there.

In the final Upper Paleolithic sites located between the Cantabrian Cordillera and the Pyrenées there are often faunal associations where ibex (*Capra pyrenaica*) is the most common species (Altuna, 1972, 1981, 1982, 1986, 1990; Altuna & Mariezkurrena, 1984, 1986, 1988) Straus (1987) distinguished the different sites on the basis of the percentage of ibex in comparison to the other ungulate species. There are sites (Les Églises, Rascaño, Erralla levels IV-V) where ibex dominate in all the levels, reaching 80-99% of the total remains and 57-89% of the minimum number of individuals (MNI). In other sites (Riera, Ekain, Ermittia), ibex is the most frequent species with 63-79% of the remains, but has a lower MNI percentage, with values that fall to around 40% of the ungulate species. Lastly there are sites (Urtiaga) where ibex is important, but represent only 20% of the remains and of the individuals. The sites of the first and second group that present levels with abundant ibex are all located in the highlands. The areas that are not situated in the highlands but where there is a reasonably high presence of ibex are however only a few hours' walk away.

The value of anatomic portions of the different sites were also compared (skull, limbs, trunk, etc.) in order to understand how the animals were exploited within the different settlements. In places like Les Églises and Rascaño there were abundant elements with low meat content, such as the skull, the trunk and the distal limbs. These places are located near hunting areas. Other places where the percentage values of the different anatomical parts are more balanced could suggest that the portions with a low meat content were left at the hunting and butchering sites. The distance

from the hunting area was taken into consideration; the Ekain and Erralla areas are about two hours' walk from probable hunting places. Furthermore, with regard to the seasonal use of the areas, the data confirm specialized ibex hunting at Les Églises between late autumn and early winter and at Ekain and Erralla, between summer and winter.

A recent revision of the data of Les Églises (Delpech & Villa, 1993) confirm the presence of a seasonal site specialized for ibex hunting. Moreover, both the data on the age and sex classes confirm that the animals were hunted when the groups of female and young animals joined up with the males for the mating season between autumn and early winter. These authors have doubts as to the correct interpretation of the evidence of the different areas regarding the composition of the anatomical parts and consequently in assessing the parts that were carried away and the distance from the hunting site. In order to do this the reliability of the samples which may have been influenced by their representation in the excavations, the different state of preservation, the clearing out of inhabited areas as well as animal action must all be assessed.

On the basis of the other mountain sites together with the faunal data, Dalmeri rockshelter definitely represents a specialized site for ibex hunting. The fact that it is located in the highlands, near areas with abundant ibex, the high percentage of ibex remains (more than 90% of the ungulate species), the seasonal hunting of the animals between late summer and autumn when unisexual group meet up for the mating season all confirm this theory.

On the basis of the data on the frequency of the skeletal portions, hypotheses can be made as to the transportation of the anatomical parts to the bottom of the valley and as to the sites where the animals were killed. The fact that portions with low meat content prevail suggests however that the hunting places were not far off.

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SUMMARY - The Dalmeri rockshelter is located on the Asiago Plateau (Trento), at an altitude of 1240m a.s.l.. The Late Würmian Tardiglacial stratigraphy is represented by a sequence of breccia levels with abundant faunal remains and Epigravettian lithic industry. The upper levels indicate an occasional human occupation with the archaeological materials showing signs of movement and fluitation. On the contrary, the lower levels suggest a strong anthropization and palaeosurfaces have also been identified. The faunal analysis presented here takes into account only this lower levels (14, 26, 26b and 26c), dated about 11,000±115 BP. Ibex is the most frequent species, but also red and roe deer were hunted; the presence of beaver, hare, wolf, fox, brown bear, marmot, badger, and hedgehog has also been reported. Fishing is suggested by many fresh water fish remains referable to *Leuciscus*, *Barbus,* and *Salmo trutta*. Bone remains are highly fragmented, this principally results from butchering and marrow extraction activities, but also from the use of bone as raw material for tools. On the surface of several specimens also carnivore (some remains show signs of corrosion due to gastric acids) and rodent gnaw marks as well as traces of roots and other natural agents have been identified. Striae produced by lithic tools during ibex butchering are frequent and widely distributed on the various anatomical elements indicating different stages of carcass processing. The data from Dalmeri rockshelter, one of the few high altitude Italian deposits where faunal remains have been preserved, were compared with those from other Western European sites referred to the Upper Palaeolithic where ibex has often been identified as the most frequent species. Such comparison suggested that Dalmeri rockshelter represents a seasonal site specialized for ibex hunting both for its location near the areas used by this species and for the large number of remains which represent 93.7% of the ungulate NISP and 79.9% of the MNI. The season of ibex hunting, between the end of the summer and the autumn, is confirmed both by the age measured on the eruption of the teeth and by the analysis of the thin sections of the teeth. The relevance of Dalmeri is in its important contribution to the reconstruction of hunting strategies and the identification of the main prey species during the Tardiglacial in the Eastern Alps because, up to the present time, such reconstructions were based mainly on the information from lowland sites. From the palaeoenvironmental point of view the presence of ibex and marmot indicates the prevalence of alpine prairie environments, with some wooded areas (red and roe deer, bear, badger) and wet zones (beaver).

RIASSUNTO - Il Riparo Dalmeri è situato sull'Altopiano dei Sette Comuni, a quota 1240m, nel Trentino sud-orientale. La frequentazione umana del sito, in base alle datazioni radiometriche (11,260±100, 10,800±110, 11,000±115 BP), si colloca nell'interstadio di Allerod. Si tratta di uno dei pochi siti d'altura in cui si sono conservate le ossa animali. L'esame dei resti ossei ha permesso di ricavare importanti informazioni sugli animali cacciati, le strategie di caccia, la stagionalità dell'insediamento e sulle pratiche di macellazione. La caccia era diretta quasi esclusivamente allo stambecco ed in misura minore al cervo. La cattura degli altri animali quali: capriolo, orso, tasso, marmotta, castoro e lepre appare del tutto occasionale. La presenza di numerose vertebre di pesci d'acqua dolce riferibili a *Leuciscus*, *Barbus* e a *Salmo trutta*, potrebbe documentare l'attività di pesca. La presenza di resti di lupo e di volpe (rappresentati da denti decidui di animali giovanissimi) potrebbe indicare un utilizzo del riparo da parte di questi animali come tana. I resti ossei con rosicature di carnivori e i piccoli frammenti residui della loro digestione sono, infatti, indicatori di una frequentazione del riparo in alternanza all'uomo. Lo stambecco è rappresentatato da animali di differenti classi di età, tra i quali prevalgono i giovani e giovani-adulti di età stimabile tra i 6 mesi ed i 4 anni. Sono presenti elementi dell'intero scheletro, anche se con proporzioni notevolmente differenti. I resti più frequenti appartengono alla regione craniale (in prevalenza denti isolati) e all'estremità degli arti (carpali, tarsali, falangi). Le tracce da strumento litico, riconducibili ad azione di macellazione, sono frequenti ed ampiamente distribuite sui diversi elementi scheletrici, documentando le diverse operazioni di riduzione della carcassa in porzioni consumabili. I dati sulla stagione di cattura mostrano che stambecchi e cervi sono stati catturati nel periodo estate-autunno, ed è a questo periodo che si può ricondurre la più intensa frequentazione umana del riparo. É probabile che la caccia allo stambecco venisse effettuata in autunno quando i diversi gruppi unisessuali (femmine e giovanissimi, maschi giovani, maschi adulti isolati), si riuniscono per la riproduzione. I dati faunistici, anche alla luce delle considerazioni effettuate in altri siti montani sia italiani che dell'Europa Occidentale, indicano che il riparo Dalmeri rappresenta un sito stagionale per la caccia specializzata dello stambecco. La sua localizzazione in quota, l'altissima percentuale dei resti di stambecco (superiore al 90% degli ungulati), la stagionalità nell'abbattimento degli animale, sono tutte indicazioni a sostegno di questa interpretazione. I dati della frequenza delle porzioni scheletriche non permettono invece di ricostruire le modalità del trasporto delle parti anatomiche nei siti di fondovalle e della distanza dai siti di uccisione. Il prevalere di porzioni con bassa resa in carne (cranio e ossa delle estremità) indicano che i luoghi di uccisione non dovevano essere lontani dal riparo.

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Species	26c t.	26c	26b t.	26b	26	15l-14b	4a-14b	15	14b	Total	%
	NISP										
Erinaceus europaeus							1		1	**2**	***0,20***
Lepus cfr. *europaeus*				1		1				**2**	***0,20***
Marmota marmota					2			1		**3**	***0,31***
Castor fiber				2				1	5	**8**	***0,81***
Canis lupus						1				**1**	***0,10***
Vulpes vulpes				3				1	6	**10**	***1,02***
Meles meles					1					**1**	***0,10***
Ursus arctos				2	1		1	1	6	**11**	***1,12***
Cervus elaphus			1	9	10	1		9	28	**58**	***5,91***
Capreolus capreolus									1	**1**	***0,10***
Capra ibex	8	10	67	57	195	22	12	114	400	**885**	***90,12***
Total Mammals	**8**	**10**	**68**	**74**	**209**	**25**	**14**	**127**	**447**	**982**	***5,58***
Pisces		23	2	3	52	13	2	46	169	**310**	
Total NISP	**8**	**33**	**70**	**77**	**261**	**38**	**16**	**173**	**616**	**1292**	***7,34***
Unidentified Large Frgs.	9	160	56	784	1811	148	100	766	3155	**6989**	***42,79***
Small Frgs.	15	120	20	605	1582	233	125	575	3895	**7170**	***43,90***
Burned Frgs.		11	3	181	389	38	25	114	1412	**2173**	***13,31***
Total Unidentified	24	291	79	1570	3782	419	250	1455	8462	**16332**	***92,66***
TOTAL	**32**	**324**	**149**	**1647**	**4043**	**457**	**266**	**1628**	**9078**	**17624**	
	MNI										
Erinaceus europaeus							1		1	**2**	***2,06***
Lepus cfr. *europaeus*				1		1				**2**	***2,06***
Marmota marmota					1			1		**2**	***2,06***
Castor fiber				2				1	2	**5**	***5,15***
Canis lupus						1				**1**	***1,03***
Vulpes vulpes				1				1	2	**4**	***4,12***
Ursus arctos				1	1		1	1	2	**6**	***6,19***
Meles meles					1					**1**	***1,03***
Cervus elaphus			1	3	3	1		2	4	**14**	***14,43***
Capreolus capreolus									1	**1**	***1,03***
Capra ibex	1	3	5	5	8	5	3	9	20	**59**	***60,82***
TOTAL MNI	**1**	**3**	**6**	**13**	**14**	**8**	**5**	**15**	**32**	**97**	

Fig. 1 - Total Number of Identifiable Specimens (NISP) and Minimum Number of Individuals (MNI).

Capra ibex **Age Classes**	MNI	%
Neonatal	**5**	*8,47*
Juvenile	**17**	*28,81*
Subadult	**13**	*22,03*
Adult I	**12**	*20,34*
Adult II	**8**	*13,56*
Senile	**4**	*6,78*
Total MNI	**59**	

Fig. 2 - *Capra ibex*: Minimum Number of Individuals (MNI) and age classes.

Capra ibex Skeletal Elements	NISP	%
Horn	**14**	*1,58*
Cranium	**25**	*2,82*
Maxilla	**4**	*0,45*
Upper Teeth	**39**	*4,41*
Mandible	**20**	*2,26*
Lower Teeth	**116**	*13,11*
Teeth frgs	**60**	*6,78*
Atlas	**3**	*0,34*
Axis	**1**	*0,11*
Vertebrae	**15**	*1,69*
Ribs	**58**	*6,55*
Scapula	**6**	*0,68*
Humerus	**18**	*2,03*
Radius	**22**	*2,49*
Ulna	**20**	*2,26*
Carpals	**20**	*2,26*
Metacarpus	**24**	*2,71*
Vestig. Metac.	**3**	*0,34*
Pelvis	**13**	*1,47*
Femur	**26**	*2,94*
Rotula	**2**	*0,23*
Tibia	**30**	*3,39*
Calcaneus	**8**	*0,90*
Astragalus	7	*0,79*
Tarsals	**25**	*2,82*
Metatarsus	**47**	*5,31*
Vestig. Metat.	7	*0,79*
Metapodials	**22**	*2,49*
1st Phalanx	**66**	*7,46*
2st Phalanx	**59**	*6,67*
3st Phalanx	**21**	*2,37*
Sesamoid s	**84**	*9,49*
Total NISP	**885**	*100,00*

Fig. 3 - *Capra ibex*: summary table of the anatomical elements.

Capra ibex Skeletal Portions	NISP	%
Head	**278**	*31,41*
Axial	**77**	*8,70*
Anterior limb	**113**	*12,77*
Posterior limb	**165**	*18,64*
Unidentified limb	**252**	*28,47*
Total	**885**	*100,00*

Fig. 4 - *Capra ibex*: summary table of the anatomical portions.

Capra ibex	NISP	%	NISP	%	NISP	%	Total
Skeletal Elements	**Prox.**		**Diaph.**		**Dist.**		
Humerus	2	*11,11*	14	*77,78*	2	*11,11*	**18**
Radius	5	*22,73*	16	*72,73*	1	*4,55*	**22**
Metacarpus	14	*58,33*	8	*33,33*	2	*8,33*	**24**
Total	**21**		**38**		**5**		**64**
Femur	4	*15,38*	18	*69,23*	4	*15,38*	**26**
Tibia	2	*6,67*	24	*80,00*	4	*13,33*	**30**
Metatarsus	38	*80,85*	7	*14,89*	2	*4,26*	**47**
Total	**44**		**49**		**10**		**103**

Fig. 5 - *Capra ibex*: summary table of the different long bone portions.

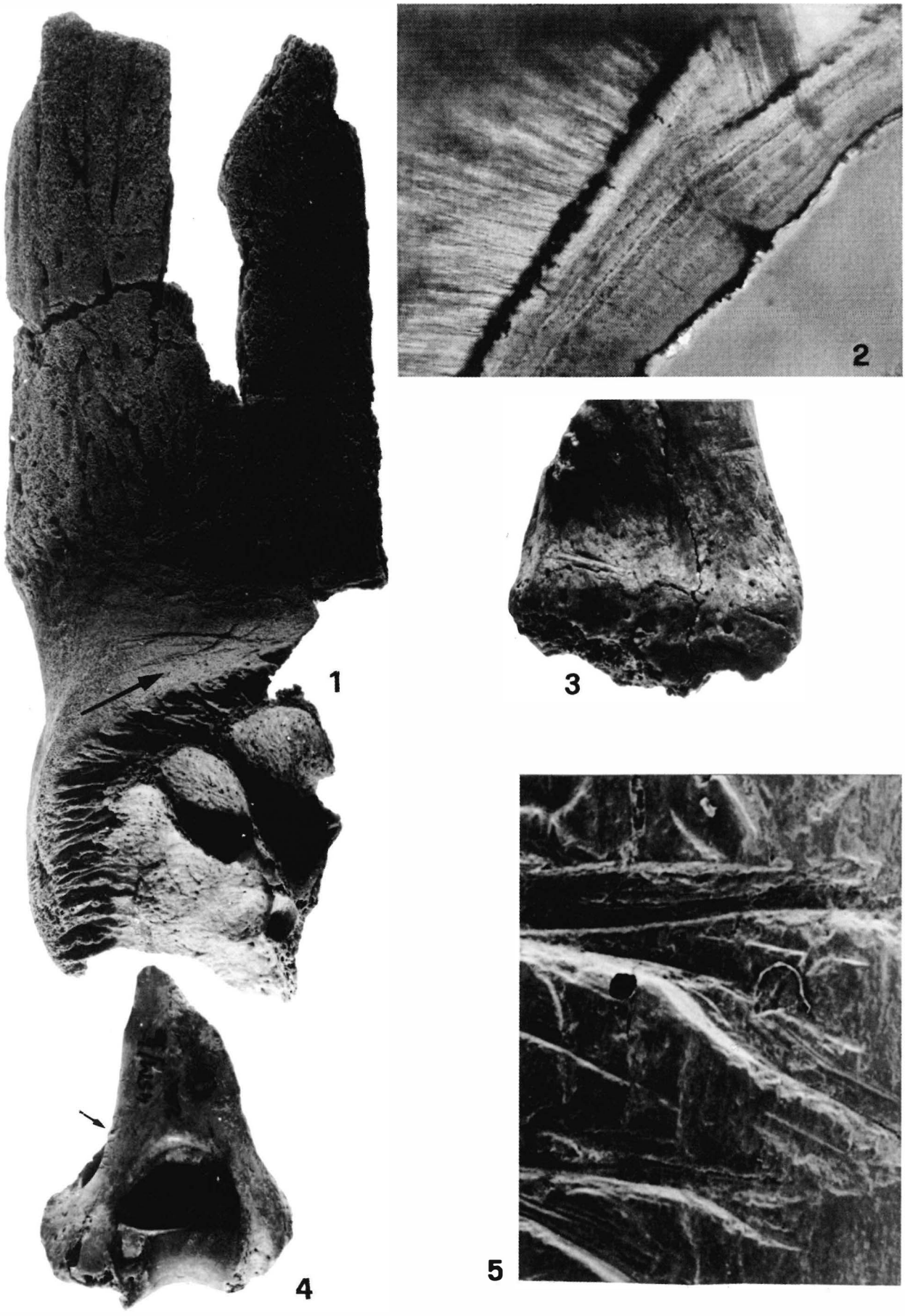

Fig. 6 - 1) cranial portion of ibex with skinning marks (nat. size); 2) dentine incremental *annuli* of a lower M1, thin section from an adult ibex; 3) distal metapodial of bear with skinning marks (2x); 4) distal humerus of badger with disarticulation striae (nat. size); 5) magnification with SEM of the marks of n. 4.

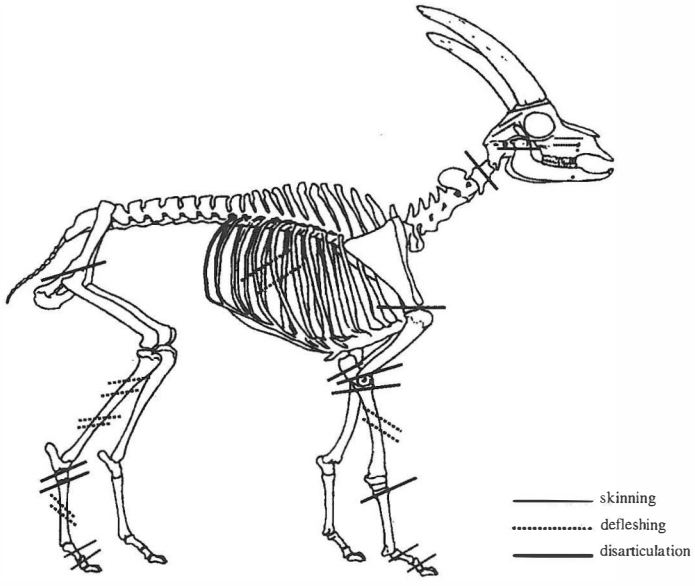

Fig. 7 - *Capra ibex*: localization of cut marks on the skeleton.

Skeletal Elements	NISP	Whit Marks	%	Impact	Cut
Cranium	25	3	12,00		3
Maxilla	4	1	25,00		1
Mandible	20	3	15,00		3
Atlas	3	1	33,33		1
Axis					
Ribs	58	4	6,90		4
Vertebrae	15	1	6,67		1
Scapula	6	3	50,00		3
Humerus	18	7	38,89	6	4
Radius	22	8	36,36	4	5
Ulna	20	2	10,00		2
Carpals	20				
Metacarpus	24	4	16,67	1	3
Vestig. Metac.	3				
Pelvis	13	3	23,08		3
Femur	26	8	30,77	6	7
Rotula	2				
Tibia	30	11	36,67	8	6
Calcaneus	8				
Astragalus	7				
Tarsals	25	6	24,00		6
Metatarsus	47	9	19,15	1	9
Vestig. Metat.	7				
Metapodials	22				
1st Phalanx	66	5	7,58	3	3
2st Phalanx	59	1	1,69	1	2
3st Phalanx	21				
Sesamoid s	84	1	1,19		1
Total NISP	**655**	**80**	12,21	**30**	**66**

Fig. 8 - *Capra ibex*: skeletal elements with butchering marks.