Landscape use in Northeast Italy during the Upper Palaeolithic

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SUMMARY - *Landscape use in Northeast Italy during the Upper Palaeolithic* - This paper explores changes in landscape use, mobility patterns and hunting organisation during the Upper Palaeolithic in Northeast Italy through the study of the faunal assemblages from the ibex-rich sites of Fumane, Villabruna, Soman and Dalmeri. Fumane was occupied during the early Upper Palaeolithic (c. 34-31 kyr) whereas the other three sites were occupied during the Late Glacial (Villabruna c. 12 kyr; Soman c. 12-10 kyr and Dalmeri c. 11 kyr), when the mountains were again available for occupation after the end of the Last Glacial Maximum. Data on the anatomical composition and the age profiles provide the most reliable results. The changing nature of the exploitation of wild caprids (*Capra ibex* and *Rupicapra rupicapra*) is highlighted. It is proposed that some assemblages were created by activities primarily focused on hunting and initial butchery of the prey (Dalmeri, Fumane, Soman chamois and partly Villabruna), whereas other assemblages (Soman ibex and partly Villabruna) were created through more consumption and processing-oriented activities. Moreover, characteristics of the Fumane ibex assemblage corroborate suggestions of an absence of selective hunting during the Aurignacian. These results are used to inform models of site distribution and territory exploitation patterns that have been proposed for the region of the Veneto-Trento provinces during the Late Glacial, based primarily on site location and lithic industries. Two main categories of sites had been identified: valley-bottom rockshelter base camps and high altitude open-air short term sites. The faunal analysis presented here brings under scrutiny the notion of uniformity within the valley-bottom rockshelter site category: Soman and Villabruna, sites presumed to be "valley-bottom base camps" were also occupied as hunting camps; at Dalmeri the specialised ibex-hunting activities took place in the context of a mountain site with base-camp characteristics (lithics, art, children present). It is, thus, proposed that during deglaciation not only do we witness a large scale movement into the mountains, as indicated by the larger number of sites discovered, but a settlement system which involved increased mobility, greater variability in on-site activities coupled with a less structured and patterned use of the landscape. Similar settlement patterns have been proposed for other regions of Southern Europe during the Late Glacial, as possible ways people coped with changing food resources, demographic pressures and climatic fluctuations.

RIASSUNTO - *L'utilizzo del territorio durante il Paleolitico superiore nell'Italia nord-orientale* - Questo articolo analizza i cambiamenti nell'uso del territorio, nei modelli di mobilità e nell'organizzazione della caccia durante il Paleolitico superiore nell'Italia nord-orientale, mediante lo studio degli insiemi faunistici con forte presenza di stambecco provenienti dai siti di Fumane, Villabruna, Soman e Dalmeri. Fumane fu occupato durante la fase iniziale del Paleolitico superiore (c. 34.000-31.000), mentre gli altri tre ripari furono sfruttati durante il Tardiglaciale (Villabruna c. 12.000; Soman c. 12.000-10.000 and Dalmeri c. 11.000), quando l'area montana diventò nuovamente accessibile dopo la fine dell'ultimo massimo glaciale. I dati sulla composizione scheletrica e sull'età di morte hanno fornito i risultati più attendibili ed è stata evidenziata la natura del cambiamento nello sfruttamento dei capridi selvaggi (*Capra ibex* e *Rupicapra rupicapra*). Abbiamo ipotizzato che alcuni insiemi faunistici siano frutto di attività principalmente legate alla caccia e alla fase iniziale della macellazione delle carcasse (Dalmeri, Fumane, Soman-camoscio e in parte Villabruna) e che altri insiemi (Soman-stambecco e in parte Villabruna) siano invece il risultato delle attività di consumo e di sfruttamento. Inoltre, le caratteristiche dell'insieme faunistico dello stambecco di Fumane convalidano l'ipotesi dell'assenza di caccia selettiva durante l'Aurignaziano. Questi risultati sono stati utilizzati per riconsiderare i modelli di distribuzione dei siti e di sfruttamento del territorio durante il Tardiglaciale, proposti per l'area veneto-trentina principalmente sulla base della localizzazione dei siti e dei caratteri delle industrie litiche. Due principali categorie di siti sono state identificate: ripari di fondovalle, interpretati come campi basi (*base-camps*) e siti in quota all'aperto utilizzati per brevi periodi (*short term sites*). Il presente studio faunistico riconsidera la nozione di uniformità all'interno della categoria dei ripari di fondovalle. Soman e Villabruna, insediamenti interpretati come "campi base nel fondovalle", sono stati in realtà utilizzati anche come siti per la caccia (*hunting camps*); inol-

tre, a Riparo Dalmeri l'attività specializzata di caccia allo stambecco si è verificata nel contesto di un sito montano con caratteristiche di campo base (industria litica, arte, presenza di bambini). Abbiamo quindi ipotizzato che, durante lo scioglimento dei ghiacci, spostamenti su larga scala in area montana siano ben testimoniati da un incremento nel numero di siti identificati. Questi spostamenti sono deducibili anche da un sistema insediativo che implica un aumento di mobilità, una maggior variabilità delle attività svolte in un sito, associata a un utilizzo del territorio meno strutturato. Sistemi insediativi simili sono stati proposti per altre regioni dell'Europa meridionale durante il Tardiglaciale, come possibili risposte dei gruppi umani di fronte ai cambiamenti delle risorse alimentari, alla pressione demografica e alle fluttuazioni climatiche.

Key words: Northeast Italy, Upper Palaeolithic, Late Glacial, settlement patterns, ibex hunting
Parole chiave: Italia nord-orientale, Paleolitico superiore, Tardiglaciale, modelli d'insediamento, caccia allo stambecco

1.   INTRODUCTION

This paper aims to explore changes in landscape use, mobility patterns and hunting organisation during the Upper Palaeolithic, focusing on sites in Northeast Italy (Veneto, Trento) and on ibex hunting. This is a well-studied region of Italy with a large number of Palaeolithic locales. A model of landscape use in this region has already been proposed (Broglio 1992; Broglio & Lanzinger 1990; Lanzinger 1990), providing an interpretative framework for the exploitation of the Alpine region. The faunal data from sites in the region presented in this paper will be incorporated into this interpretative framework. The aim is to increase our understanding of past human exploitation of the Northeast Alpine region by providing new data, to offer new insights through the study of faunal

remains and to assess this model, which was originally based on lithic evidence.

A brief description of our current understanding of landscape use in Northeast Italy during the Upper Palaeolithic, and specifically during the Late Glacial, will be presented, followed by a short description of the four sites whose faunal assemblages will be studied: Fumane, Villabruna, Soman and Dalmeri. Fumane dates to the Early Upper Palaeolithic (Aurignacian), whereas the other three sites date to the Late Glacial (Final Epigravettian) (Fig. 1).
Among the faunal variables examined, anatomical representation and age profiles will prove to be the most informative regarding on-site economic activities, transport decisions, site function and mobility patterns. Differences in food procurement strategies

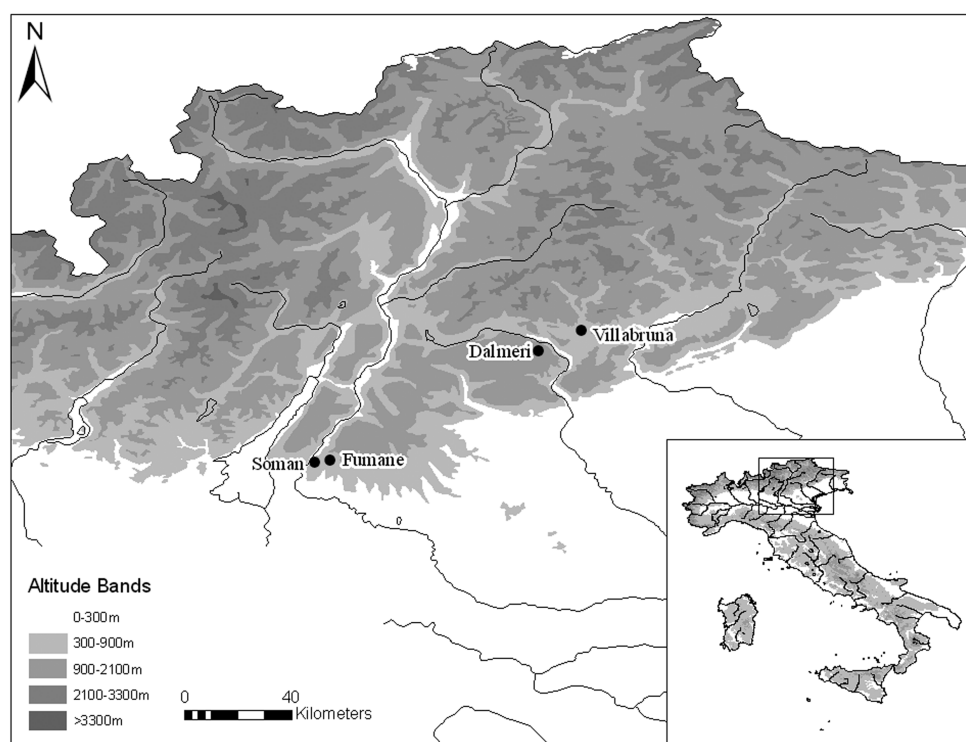Fig. 1 - Map of Italy: location of the sites studied. Map data derived from the *Digital Chart of the World* (Copyright ESRI Inc.) supplied by Pennsylvania State University at http://maproom.psu.edu/dcw. *Fig. 1 - Mappa dell'Italia: localizzazione dei siti analizzati. I dati della pianta derivano dal* Digital Chart of the World *(Copyright ESRI Inc.) fornito dalla Pennsylvania State University al http://maproom.psu.edu/dcw.*

between sites – as evidenced through contrasts between assemblages dominated by food-poor bones and those dominated by food-rich bones and indicative of sites located closer to, or further away from, the kill location – will be used to discuss the landscape-use model.

2. PAST MODELS OF LANDSCAPE USE IN NORTHEAST ITALY DURING THE LATE GLACIAL

Tens of sites of Epigravettian age are known from the Alpine region of Northeast Italy (Veneto, Trentino, Friuli Venezia Giulia), with at least 10 open air (e.g., Battaglia, Fiorentini, Terlago, Val Lastari), and 5 cave sites (Tagliente, Soman, Villabruna, Dalmeri, La Cogola) having been excavated (Broglio 1992; Dalmeri *et al.* 1995). Sites from the earlier periods of the Upper Palaeolithic are much fewer, as will be discussed in the conclusions. Broglio and Lanzinger (e.g. Broglio 1992; Broglio & Lanzinger 1990, 1996; Lanzinger 1990) have proposed a model of site distribution and territory exploitation pattern for this region during the Late Glacial (c. 14-10 kyr), the period that witnessed the earliest penetration of the mountainous zone to a considerable degree.

In their model they divide the known sites into two main categories. The first one includes sites located along valleys at the foothills of the Pre-Alpine area, predominantly rockshelters, that are interpreted as representing base camps occupied repeatedly during the year, including winter (Broglio & Lanzinger 1990; Dalmeri & Lanzinger 1998: 16; Lanzinger 1990: 175). The second one includes sites located in higher altitudes (500-1600 m a.s.l.), predominantly open-air sites, that are interpreted as specialised hunting camps occupied seasonally, during the summer given their high altitude (*ibid*; Lanzinger 1990: 174). Higher altitude open-air locales with increased frequency of microliths are interpreted as short term hunting stands; they are often considered to constitute a third site category. Site location and lithic inventories are used to support this model, although the significance of the latter can remain equivocal. Technologically and typologically, the lithic assemblages from the valley and mountain sites are the same; the existence of a similar lithic tradition is considered indicative of the same groups of people occupying the various locales (Broglio & Lanzinger 1990). The ratio of the various tool types might (Broglio 1992; Broglio & Improta 1995) or might not (Broglio & Lanzinger 1990; Lanzinger 1990) differ.

The ratio of the tool types is considered indicative of on-site activities, mountain sites having a higher frequency of burins, than endscrapers, and of microgravettes i.e. backed points, than backed and truncated bladelets as in valley sites (Broglio 1992; Broglio & Improta 1995).

People's seasonal movements and the functional division of the sites is assumed rather than demonstrated, with no systematic examination of particular categories of data across sites, such as seasonality, intra-site spatial organisation, art. Such a critique has been made in the past (Peresani *et al.* 2002) and this paper aims to redress the balance through a discussion of subsistence and economic activities. As in all studies of landscape use, it is important to realise that the known sites need not necessarily have formed part of the same settlement system or have been occupied simultaneously, even if their dates might seem contemporaneous. Models of dualistic characterisations of sites and simple transhumance patterns (upland in summer and lowland in winter) still persist in the archaeological literature but have come under rigorous criticism (for further discussions see Bailey 1997 on the Upper Palaeolithic in Northwest Greece; Mellars & Dark 1998 on Mesolithic Britain).

3. GENERAL INFORMATION ON THE SITES AND FAUNAL ASSEMBLAGES CONSIDERED

3.1. The sites

The five sites examined, all rockshelters, are: Fumane, Villabruna, Soman and Dalmeri. Although a small sample, they constitute the main sites from this region of Northeast Italy, which have yielded faunal remains and have formed the backbone of the Broglio and Lanzinger model. Other sites could not be included in the present study: the faunal assemblage from Riparo Tagliente was not available for study and there is no equivalent published information to be included comparatively in this present study (Capuzzi & Sala 1980); Riparo La Cogola is still under study (Dalmeri *et al.* 1995); the faunal assemblages of Grotte Paina, Trene and Broion are dominated by cave bear and seem to be primarily carnivore accumulated (Bartolomei *et al.* 1988; Sala 1983), although the exclusive presence of armatures (microlithic pointed back bladelets and shoulder points) might be indicative of short term hunting visits (Broglio & Lanzinger 1996). The five sites are presented chronologically, based on the ^{14}C dates available.

3.1.1. Grotta Fumane

The site is located in the pre-alpine area of the Monti Lessini, in the Veneto province, at an altitude of 350 m a.s.l. The present study examines the faunal material from the Aurignacian levels A2-A1 (excavated in 1988-1991; A3 is sterile), which were c. 20 cm thick and in which habitation structures have been identified including stone-lined hearths (Bartolomei *et al.* 1992a; Broglio *et al.* in prep.; Cassoli & Tagliacozzo 1994a). The Aurignacian levels D7-D1 have been excluded from the analysis for the faunal remains represent to a large degree natural accumulations. Although stone and bone tools, decorative objects and structures were recovered, especially in level D3, (Bartolomei *et al.* 1992a) the bones are largely unfragmented and skeletal portions in articulation were recovered (personal observations; Cassoli & Tagliacozzo 1994a). New dates from levels A2-A1 point to an occupation of 2000-3000 years starting at 34 kyr (Broglio *et al.* 2002; Broglio *et al.* in prep.); an early occupation (38-33 kyr), which was proposed based on previous dates, might need to be reconsidered (Broglio 1996; Broglio & Improta 1995; Mellars 1999 - but see Giaccio *et al.*). The lithic assemblage has been attributed to the "Protoaurignacian with Dufour" phase made on local flint; it is strongly dominated by Dufour bladelets and blades generally, and it contains typical Aurignacian tools, such as burins, carinated scrapers and Aurignacian blades (Bartolomei *et al.* 1992a; Broglio & Improta 1995).

3.1.2. Riparo Villabruna

The Riparo Villabona is a small site, located on the left side of the Cismòn Valley at its confluence with Rosna creek in the Veneto Dolomite area, at an altitude of 500 m. Two metres of deposit were excavated (1988-1989); the lower levels (17-10), dominated by ibex, are considered in the present study (Aimar *et al.* 1992; Aimar & Giacobini 1995). All four dates point to an occupation around 12 kyr (12,040 ± 125 BP - 11,910 ± 160 BP; R-2022, UtC-1771) during the Late Glacial Interstadial (Aimar *et al.* 1992). Broglio (Broglio & Improta 1995) equates this period with the Bølling and the beginning of Dryas II equivalents of the Northern European sequence. The stone tool assemblage is small, consisting mainly of short frontal endscrapers, few burins and armatures in the form of backed and truncated bladelets with fewer backed points (microgravettes); it is a Recent Epigravettian industry (Aimar *et al.* 1992).

3.1.3. Riparo Soman

The site is located at the left bank of the Adige Valley in the Monti Lessini, at an altitude of 100 m; it was excavated in 1984-1988 (Broglio & Lanzinger 1985, 1995). This study will focus on the purely Epigravettian levels (levels 23-16); the choice of levels was based on the excavator's stratigraphic scheme (Tagliacozzo pers. comm.), also supported by Lanzinger (in Battaglia *et al.* 1992) who comments that the Epigravettian levels 14-13 have been eroded and have Mesolithic admixtures. The Epigravettian levels, 30 cm thick, are divided into two occupation phases, denoted as Phase I and Phase II. Phase I (levels 23-22) has been dated to the Late Glacial Interstadial (11,800 ± 170 BP; Gd-6158) and Phase II (levels 21-16) to the Younger Dryas (10,510 ± 180 - 10,370 ± 110 BP; Gd-4511, Gd-6163) (Battaglia *et al.* 1992; Broglio & Lanzinger 1995). The Final Epigravettian lithic industry is composed mainly of armatures (backed pieces; >70% of retouched tools): backed truncated bladelets, some backed microgravette points and a few geometrics; short frontal endscrapers are also present, whereas burins are rare. The partially open-work breccia had a negative effect on the types of remains uncovered, including the bad preservation of the bones (Phoca-Cosmetatou 2005); in Phase II a hearth with a stone structure around it was identified (Battaglia *et al.* 1992).

3.1.4. Riparo Dalmeri

The site is located in the valley of the Ombra tributary, at the northern limit of the Marcesina plateau (Altipiano di Asiago, Trento), at an altitude of 1240 m (Dalmeri & Lanzinger 1989). The material included in this study comes from levels 14b-26 (excavated in 1991-1993) located at a depth of 2 m and below, 40 cm thick and rich in archaeological remains (Bassetti *et al.* 1998; Cassoli *et al.* 1999; Dalmeri & Lanzinger 1989). All five ^{14}C dates, spanning most of the stratigraphy, fall within the period 11,260 ± 100 - 10,800 ± 100 BP (KI-3634; ROME 425 RD-1; Dalmeri *et al.* 2002), indicating a brief period of occupation. They point towards the boundary between the warmer Late Glacial Interstadial and the very beginning of the Younger Dryas (Lowe 1992; Lowe & Watson 1993), although the excavators date it to the very end of the Late Glacial Interstadial (end of the Allerød; Dalmeri *et al.* 2002). The lithic industry belongs to the Final Epigravettian tradition. Made on local flint, about 3500 tools were recovered from these levels, the main types including burins, short frontal endscrapers, bac-

ked and truncated microgravettes as well as geometrics; the site is also very rich in débitage (c. 74,000 pieces) (Bassetti *et al.* 1995; Cassoli *et al.* 1999).

3.2.   The ibex and ungulate faunal assemblages[1]

3.2.1. Fumane

A2-A1 are the only clearly anthropic Upper Palaeolithic levels; the fauna is ibex dominated. Ibex is represented by 252 bones, yielding an MNI of nine. It makes up 50% of the ungulate assemblage (44% of the total assemblage), followed by red deer (21%) and chamois (11%) (Cassoli & Tagliacozzo 1994a).

3.2.2. Villabruna

Levels 17-10 are dominated by ibex, comprising 57% of the assemblage. 134 bones were examined, representing seven individuals making it the smallest assemblage of those considered. The species of secondary importance is chamois (21%), followed by red deer (18%). There are no indications of any large carnivore remains having been identified (Aimar *et al.* 1992; Aimar & Giacobini 1995).

3.2.3. Soman

The emphasis in the study of Soman is on the exploitation of caprids generally; chamois is the dominant species (47%), followed by ibex (20%) in the two Epigravettian phases (I+II) combined (Tagliacozzo & Cassoli 1992). I identified 158 ibex remains, corresponding to seven individuals, and 387 chamois remains, corresponding to 12 individuals. Red deer was of slightly more importance than ibex (26%). During the second occupation phase of the Younger Dryas ibex becomes more frequent (24%) at the expense of red deer (19%); the frequency of chamois remains constant during the two phases (46-48%).

3.2.4. Dalmeri

Dalmeri is the strongest ibex-dominated Upper Palaeolithic site in Italy, with ibex representing 94%

of the ungulate remains (90% of the total assemblage) and red deer just 6% (Cassoli *et al.* 1999). It is also the largest of the faunal assemblages considered; 876 ibex bones were studied, which yielded an MNI value of 12. Following the suggestion of the excavators, most levels were grouped together (14b, 15tetto, 15letto-14b, 4A-14b, 26) in calculating MNE and MNI values; from these levels all the material excavated was examined. From levels 26b and 26c, which form two "palaeoliving floors", only part of the material was included, since the rest was still in the process of being studied (Fiore pers. comm.); this was calculated separately and then added to the above group, thus creating the "total" sample referred to in all subsequent analyses.

3.3.   General comments

The discrepancies in the numbers of bones presented here compared to those in the original faunal publications are due to the different quantification methods that were dictated by the present research agenda and not to any shortcomings in the original analyses. The premise adopted in calculating the number of fragments (NISP values) was that they represent the number of fragments excavated rather than the number of bones originally present, hence all teeth, even those in mandibles and maxillae were given a NISP of one (Miracle 1995; see Phoca-Cosmetatou 2001 for more examples). All levels of each site were combined into a single analytical unit in calculating MNI values and not treated separately as in the original faunal publications, given that the present research focused on inter-site comparisons. Other complications favouring this decision included the existence of sub-levels and spits in some sites (e.g., Fumane and Dalmeri), different groupings of the levels among the faunal and lithic specialists in the site publications (Bartolomei *et al.* 1992a) as well as inconsistencies in level attribution between publications (Soman). The relatively short, by Palaeolithic standards, timescales of occupation (Phoca-Cosmetatou 2003b) and the quite small sample sizes also supported this decision. This resulted in smaller MNI values than those in the site publications.

Despite such discrepancies, my results are not in any qualitative way different from those in the original publications. The data provided here are directly comparable between sites, since the same methods were consistently used across all assemblages. Although access to non-identifiable bones was not possible, such imposed biases are similar in all cases. All faunal assemblages, apart from Villabruna, were

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[1] NISP (Number of Identified SPecimens) values for the whole ungulate faunal assemblage and the percentage frequency of ibex and of other species (always in NISP terms) are based on values in the original reports; data on the ibex and chamois at Soman, NISP, MNE (Minimum Number of Elements) and MNI (Minimum Number of Individuals) values are based on my own calculations.

originally studied by the same team of archaeozoolo-gists; a good quality of recovery at Villabruna, simi-lar to that from the other sites, was suggested by a study of the 1st to 2nd phalanx ratio (Maltby 1985; Phoca-Cosmetatou 2001).

4.   FAUNAL ASSEMBLAGE ANALYSIS: METHODOLOGY

The faunal variables examined are primarily anato-mical representation and age profiles, together with burning, cut marks and seasonality. Each site will be presented in turn. Emphasis is placed on the nature of on-site activities, since the aim is to throw light on food procurements strategies and the wider use of landsca-pe. Sites with faunal assemblages dominated by bones and age classes poorer in food are considered to have been located close to the killing locations and are label-led "primary butchery" sites. Whereas those located further away, where additional processing of bones yielding richer returns might have occurred, are label-led "secondary consumption" sites (see Phoca-Cosmetatou 2004b for further elaboration). Despite small assemblage sizes, the combination of ageing and body part data yielded consistent results.

An assessment of weathering and taphonomic pro-cesses has indicated that the comparison between the assemblages is meaningful in human behavioural terms. This is because of a lack of correlation bet-ween the extent of weathering and the frequency of teeth, being elements which survive best in bad pre-servation conditions, and of a great difference in body parts between the two Soman assemblages, the site which has the worst preservation (Phoca-Cosmetatou 2005). Similarly, there is no correlation between stronger weathering and reduced presence of juvenile bones and teeth (with the sole exception of the Soman ibex assemblage) and there is a discrepancy between the mortality profiles of the two Soman assemblages (Phoca-Cosmetatou 2001). Note that due to taphono-mic and fragmentation processes (Phoca-Cosmetatou 2005), results on seasonality and human modification on bones are not conclusive.

4.1.   Anatomical representation

The anatomical data from each site is discussed in terms of three groupings (Fig. 2): Anatomical Groups; Supergroups and food Utility Groups (Figs. 6, 8, 10, 12, 14 based on Appendices 1-5, for each assemblage). The three Supergroups (Teeth, Upper Limbs and Lower Limbs and Extremities) divide the

SUPERGROUPS

Teeth (T):
Upper and Lower Teeth
All upper teeth (UT): dp^2, dp^3, dp^4, P^2, P^3, P^4, M^1, M^2, M^3
All lower teeth (LT): dp_2, dp_3, dp_4, P_2, P_3, P_4, M_1, M_2, M_3
Upper Limbs (UL):
Upper Front and Upper Hind Limbs
Upper Front Limbs (UFL): scapula, humerus, radius, ulna
Upper Hind Limbs (UHL): pelvis, femur, tibia, patella
All Lower Limbs and Extremities (LLE):
Lower Front Limbs, Lower Hind Limbs, Extremities and Metapodials
Lower Front Limbs (LFL): metacarpals
Lower Hind Limbs (LHL): calcaneus, astragalus, metatarsals
Extremities (E): first, second and third phalanges

UTILITY GROUPS

High food Utility (HU): Upper Hind Limbs
Medium food Utility (MU): Upper Front Limbs and Lower Hind Limbs
Low food Utility (LU): Teeth, Lower Front Limbs and Extremities

Fig. 2 - Anatomical groupings (modified from Gamble 1997).
Fig. 2 - Raggruppamento degli elementi scheletrici (da Gamble 1997 modificato).

bones based on their anatomical position, whereas the Utility Groups (High, Medium and Low Utility) divi-de the bones based on the quantity and quality of food (meat, marrow, fat) provided. The Utility Groups, as used by Gamble (1997), were based on Binford's (1978) calculations of the Modified General Utility Index (MGUI) for sheep (Phoca-Cosmetatou 2004b).

Although the data have been studied in terms of NISP (Number of Identified SPecimens) and MNE (Minimum Number of Elements), MNI (Minimum Number of Individuals) values are preferred for the final analysis in that they take in to account the diffe-rential frequency of elements within a skeleton (Phoca-Cosmetatou 2005). MNE and MNI values were calculated through a combination of the "frac-tion summation" and the "overlap" approach (Marean *et al.* 2001; Phoca-Cosmetatou 2001), taking age groups into consideration. The use of age profiles in the calculation of anatomical group frequencies might have resulted in an overrepresentation of teeth in MNI terms, although this is not the case in all sites.

The under-representation of teeth in MNE terms is probably due to the unit used being the mandible rather than the tooth; the dominance of Lower Limbs and Extremities can be explained by the presence of eight of each 1st, 2nd and 3rd phalanges in the skeleton, all providing separate MNE counts, as opposed to just two mandibles (left and right). These observations, thus, further support the choice of MNI counts for the following analyses.

4.2. Age distribution

The age profiles were calculated by combining two methods: eruption and wear of teeth, and epiphyseal fusion of bones. Both methods were integral to bone quantification and MNE/MNI calculations.

TOOTH	WEAR STAGE
Juvenile (pre 2yrs)	
Ldp4	all stages
LP4	erupting- unworn
LM1	pre-6 (maybe 8)
LM2	2-3a (pre-6)
LM3	erupting- unworn
Young Adult (2-4yrs)	
LP4	2-6
LM1	8
LM2	8 (and less)
LM3	6
Adult (4yrs onwards)	
LP4	8
LM1	9-10
LM2	(8)-9
LM3	10

Notes:
1. Modern comparative data include 36 *Capra* and 19 *Rupicapra* double mandibles from collections from the Natural History Museum, London (Mammal Section); the Zoology Museum and the Grahame Clark Laboratory (Department of Archaeology), Cambridge; the Pigorini Museum, Rome; and the Human Palaeontology Laboratory (Department of Anatomy, Pharmacology and Legal Medicine), Torino.
2. Ldp4: lower 4th deciduous premolar; LP4: lower 4th premolar; LM1/2/3: lower 1st/2nd/3rd molar.
3. Numbers refer to order of stages in the wear sequence provided by Payne (1973).
4. Old adults defined as wear LP4 stage 9, LM stage 10, LM3 stage 11 or more & swollen roots.

Fig. 3 - Lower Tooth Wear Stages and Age Categories.
Fig. 3 - Denti inferiori, stadi di usura e classi di età.

The tooth wear stages and age categories used (Figs. 3, 4) were based on data from domestic goats (Deniz & Payne 1982; Moran & O'Connor 1994), compared to eruption ages for ibex (Couturier 1961) and modern ibex data collected for the purposes of the present research. Both upper and lower teeth were included, so as to incorporate the most information from the available samples and try to examine differential head transport decisions. Isolated teeth were incorporated into age profile estimates through the study of equivalence in wear stages in the modern comparative data, rather than relying on the most frequent tooth (e.g., P4 and dp4) to calculate age groups (Stiner 1994). The three age groups, juveniles, young adults and adults, were based both on biological studies of the life history of ibex (Alados 1985; Pérez *et al.* 1994) and on archaeological studies of the timing of tooth wear (Gamble 1997; Stiner 1994).

Bone fusion was the second method used to calculate age profiles (Fig. 5). As with teeth, although the exact timing might differ, the order of fusion should be similar for all *Capra* species. Moreover, it should be in accordance with the tooth eruption and wear sequence (Ducos 2001): the Early Fusing bones

UP4	UM1	UM2	UM3
5	8	5/6/7	erupting/2/3
5	8	8	5-6
6	8	8	8 (most common pattern)
6	8/14	8	3/4/5/7 (once even erupting!)
8	10/11/128	8/10	
9	11/14	8	8

Notes:
1. Modern comparative data include 29 *Capra* and 26 *Rupicapra* double maxillae from collections from the Natural History Museum, London (Mammal Section); the Zoology Museum and the Grahame Clark Laboratory (Department of Archaeology), Cambridge; the Pigorini Museum, Rome; and the Human Palaeontology Laboratory (Department of Anatomy, Pharmacology and Legal Medicine), Torino.
2. UP4: Upper 4th premolar; UM1/2/3: Upper 1st/2nd/3rd molar.
3. Numbers refer to the equivalent wear stages for lower teeth (based on Payne, 1973): UP4 based on main cusp of LP4; UM1/2/3 on LM1/2.
4. UP4 stage 5= young adult; UP4 stage 6-8= adults; UP4 stage 9= old adults.

Fig. 4 - Upper tooth wear stages.
Fig. 4 - Denti superiori, stadi di usura.

BONE	FUSION AGE
Early Fusing	
Humerus Distal	6-9 mths
Radius Proximal	6-9 mths
Scapula	0.5-1 yrs
Phalanges Proximal	1 yr
Tibia Distal	1.5-2 yrs
Metacarpal Distal	2 yrs
Metatarsal Distal	2-2.5 yrs
Late Fusing	
Radius to Ulna	2.5 yrs
Ulna Proximal	2-3 yrs
Calcaneum	2-3 yrs
Femur Proximal	3 yrs
Humerus Proximal	3-3.5 yrs
Radius Distal	3-3.5 yrs
Femur Distal	3-3.5 yrs
Ulna Distal	3.5-4 yrs
Tibia Proximal	4 yrs

Notes:
Fusion age is the average age by which the bones are fully fused. Data derived from Moran & O'Connor (1994), combined with Barker *et al.* (1990), Gamble (1997) and Reitz & Wing (1999).

Fig. 5 - Bone fusion ages.
Fig. 5 - Età di fusione delle ossa.

fuse during the animal's "juvenile" stage (before the shedding of deciduous teeth at 2 yrs) and the Late ones fuse before adulthood ("young adult" stage until 4 yrs; LP4 stage 6 defines Stiner's (1994) "prime adult" category). The order of bone fusion in three archaeological ibex studies that use bone fusion as an ageing estimate (Barker *et al.* 1990; Cassoli & Tagliacozzo 1994b; Gamble 1997) is very similar, thus making the present study directly comparable to past ones.

Bone fusion data provide positive age attribution only for Juveniles (unfused Early Fusing bones) and Adults (fused Late Fusing bones); young adults can only be identified based on teeth. Despite this coarse age profile and the biases against the preservation of the softer epiphyses (Klein & Cruz-Uribe 1984; Lyman 1994; but see Phoca-Cosmetatou 2001), bone fusion data were crucial in calculating MNE and MNI values and in studying differential transport of cranial and post-cranial elements when compared against tooth-age profiles.

5.   FAUNAL ASSEMBLAGE ANALYSIS: RESULTS

5.1.   *Fumane*

The Fumane ibex assemblage (Appendix 1, Fig. 6) is strongly dominated by Teeth, Lower Teeth being more frequent. Hind Limbs, both Upper and Lower, are rarer than Front Limbs which are quite frequent (MNI counts). Extremities (E) are relatively scarce despite being dense, easily preserved and identified bones, and despite the relatively good preservation of the assemblage (Phoca-Cosmetatou 2005). Their absence is likely to be meaningful in behavioural terms, implying that E were left behind and not brought back to the site, or that they were transported by default away from the site, either with the hide or as part of a bundle of skin used to transport meat (Bartram *et al.* 1991: 101). Among Supergroups there is a strong presence of Upper Limbs (UL; MNI counts); the low frequency of Lower Limbs and Extremities (LLE) is due to the rarity of E. In terms of Utility Groups, the dominance of Low Utility (LU) values is affected by the high frequency of Teeth (T). Medium Utility (MU) elements are well represented but, given the very low frequency of High Utility (HU) parts, Fumane fits better in a primary site pattern.

Adults make up the greatest part of the population, with a total frequency of 56%. Juveniles and young adults are represented in fairly moderate, but equal, percentages. Juveniles and adults were brought whole to the site, in that both their cranial and post-cranial elements are present in relatively similar percentages (Fig. 7). The tooth data available for seasonality were too limited; thus, despite an indication for summer occupation (see also Broglio *et al.* in prep.), no definite conclusion can be reached.

Fumane's age profile is different from those of the other primary sites (Dalmeri, Soman chamois, probably Villabruna), having a higher frequency of adults: one of the adults is old (Appendix 1), resulting in a fairly even representation of the various age groups, with 22% juveniles and 11% old adults. There are four MNE from old adults, coming from different levels, but because the site is here treated as one unit their numbers are underestimated. The strong presence of juveniles and old adults had also been noted by Cassoli & Tagliacozzo (1994a). A preference for young and old animals could indicate either that hunting was not directed towards "prime adults" (*sensu* Stiner 1994), or that the latter were preferentially removed from the site. A, possibly, attritional profile could be related to the high frequency of carnivores

Anatomical Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
UT	14	10%	9	11%	5	63%
LT	45	31%	14	18%	8	100%
UFL	19	13%	12	15%	6	75%
LFL	7	5%	5	6%	3	38%
UHL	13	9%	7	9%	2	25%
LHL	6	4%	5	6%	2	25%
E	42	29%	28	35%	3	38%
Total	146	-	80	-	-	-
Supergroups	NISP	%NISP	MNE	%MNE	MNI	%MNI
T	59	38%	23	28%	8	100%
UL	32	21%	19	23%	6	75%
LLE	63	41%	41	49%	3	38%
Total	154	-	83	-	-	-
Utility Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
HU	13	9%	7	9%	2	25%
MU	25	17%	17	21%	6	75%
LU	108	74%	56	70%	8	100%
Total	146	-	80	-	-	-
	Tooth & bone	Tooth wear	Bone fusion			
Age Classes	MNI	%MNI	MNI	%MNI	MNI	%MNI
Juveniles	2	22%	2	25%	1	14%
Young Adults	2	22%	1	13%	2	29%
Adults	5	56%	5	63%	4	57%

Notes:
1. For abbreviations see figure 2.
2. Data based on Appendix 1.
3. Two Young Adults from Bone data derived from coupling the fused distal tibia with two unfused proximal tibia.
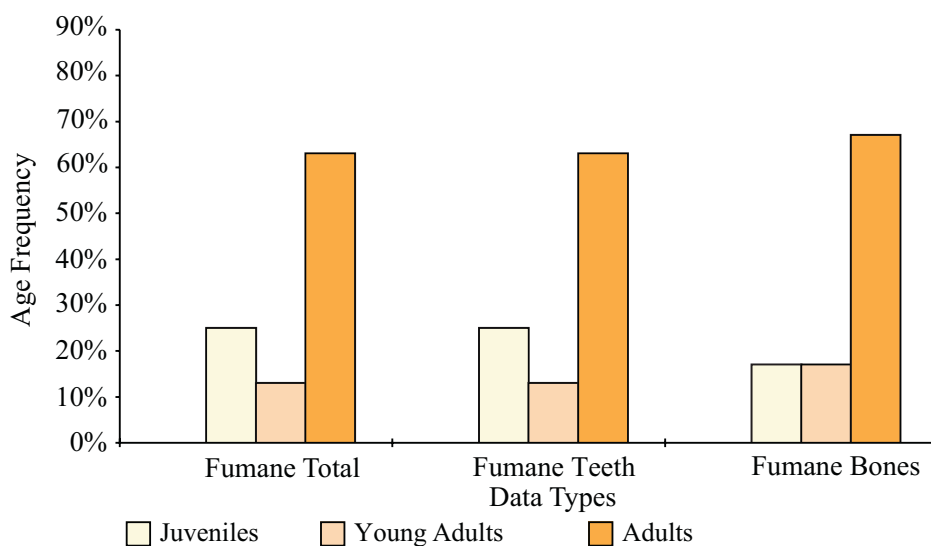4. NISP = Number of Identified Specimens; MNE = Minimum Number of Elements; MNI = Minimum Number of Individuals, anatomical % MNI = Standardised percentages.

Fig. 6 - Fumane. Ibex: Anatomical and ageing data.
Fig. 6 - Fumane. Stambecco: elementi scheletrici e classi di età.

Fig. 7 - Fumane. Ibex: Age distribution.
Fig. 7 - Fumane. Stambecco: classi d'età.

(Phoca-Cosmetatou 2003b); however, there are very few animal tooth marks present (Phoca-Cosmetatou 2001). Tool cut marks are also extremely rare (Fig. 16); given the moderate weathering of the bones (Phoca-Cosmetatou 2005), this could be due to a less intensive occupation. All three cases are on phalanges, possibly indicative of skinning. The assemblage is burnt to a similar degree as Dalmeri (7%).

Fumane dates from the early Upper Palaeolithic, thus seemingly conforming with Gamble's (1995) predictions about systematic ibex hunting first occurring during the later Upper Palaeolithic. Consequently, despite the ageing data being similar to a secondary site, Fumane is still considered a primary site, given the possible existence of an attritional profile, which suggests that the less nutritious animals, juveniles and old adults, were left behind at the site.

5.2. Villabruna

The anatomical representation of the ibex assemblage from Villabruna (Appendix 2, Fig. 8) is different to that from the other sites. It is strongly dominated by Teeth (T) but virtually lacking in Extremities (E). Upper Limbs (UL), both Front and Hind, are quite well represented, especially so UHL, which are the meatiest parts of the skeleton; in terms of NISP values, Villabruna has the highest frequency of UL. Compared to the other sites, the High Utility (HU) component (50% in MNI counts) is relatively high, a result of strong UL presence (67%). This high frequency of Limb elements is of particular note given the large number of shaft fragments in the assemblage (Phoca-Cosmetatou 2001) which might have resulted in their underrepresentation in the MNI values, in that shafts cannot be aged properly and thus provide MNI figures. Hence, despite the dominance of Teeth and Low Utility (LU) parts, the strong presence of HU and UL indicates an emphasis on meat and marrow-rich bones. Although the LU dominance would indicate that Villabruna is a primary site, it does display some characteristics of secondary sites.

The age distribution is fairly even with an increased emphasis on frail animals in that one of the three adults is old (14%; Appendix 2). The strong presence of young adults counteracts any suggestion for an attritional profile, in contrast to Fumane. Moreover, the seasonality data indicate an autumn occupation, a period during which animals are not particularly frail (Phoca-Cosmetatou 2001). This line of evidence would support the proposition of Villabruna being a primary site, people having left behind the least nutritious animals. The difference in the teeth and

bone age distributions (Fig. 9) suggests a contrast in the way the carcasses of young and old animals were treated. The few young animals were brought to the site whole with their heads, given the similar frequencies of juvenile cranial and post-cranial elements, whereas only the adult post-cranial skeleton was brought to the site, given the higher frequency of adult bones. The paucity of juvenile post-cranial elements is probably the result of past human subsistence strategies, for this is the best preserved of the assemblages (Phoca-Cosmetatou 2005). Consequently, such pattern accords better with a secondary, rather than primary, site in that the bodies of adults, which are larger and richer in meat, were brought to the site for butchering and consumption, whereas heads and horns are under-represented.

Further lines of evidence continue to provide contrasting indications. The increased length of the pieces (Phoca-Cosmetatou 2005), not satisfactorily explained by the limited weathering of the bones, could be more indicative of primary activities, in that sites which constituted the locus of secondary processing activities might be expected to display higher degrees of bone fragmentation. There is a quasi-absence of burning (1%), a pattern to be expected more at primary sites; however, there is no correlation between site type and burning frequency among the assemblages examined here. In contrast to burning, Villabruna has by far the highest incidence of tool cut marks (29%) (Fig. 16); this disparity is notable in that both damage types are caused by humans during similar butchery and processing activities. The great majority of cut marks are placed longitudinally along the diaphyses, probably a result of skinning activities (Binford 1981: 129), a finding which highlights the secondary character of Villabruna.

Describing Villabruna as a secondary site might sound more plausible given the relatively low percentage of ibex at the site (57%), despite its high altitude location, indicating that a variety of prey was brought to the site from several kill sites. However, given the contrasting indications from the site's faunal assemblage, it is suggested that Villabruna does not fit into either the primary or the secondary site category but, rather, was the locus for diverse activities. The very small faunal assemblage, which might exaggerate the pattern, means that no definite answer can be provided. The body part distribution of the red deer bones (levels 17-4) resembles that from secondary sites (Phoca-Cosmetatou 2004b). Not only can it not be pigeonholed into one site category for the activities centring around ibex exploitation, Villabruna might have been used in a different way for the exploitation of various species.

Anatomical Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
UT	22	21%	7	16%	4	67%
LT	28	26%	8	19%	6	100%
UFL	25	23%	11	26%	4	67%
LFL	5	5%	2	5%	2	33%
UHL	15	14%	8	19%	3	50%
LHL	5	5%	2	5%	2	33%
E	7	7%	5	12%	2	33%
Total	107	-	43	-	-	-
Supergroups	NISP	%NISP	MNE	%MNE	MNI	%MNI
T	50	45%	15	34%	6	100%
UL	40	36%	19	43%	4	67%
LLE	21	19%	10	23%	2	33%
Total	111	-	44	-	-	-
Utility Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
HU	15	14%	8	19%	3	50%
MU	30	28%	13	30%	4	67%
LU	62	58%	22	51%	6	100%
Total	107	-	43	-	-	-

	Tooth & bone	Tooth wear	Bone fusion			
Age Classes	MNI	%MNI	MNI	%MNI	MNI	%MNI
Juveniles	2	29%	2	33%	1	25%
Young Adults	2	29%	2	33%	-	-
Adults	3	43%	2	33%	3	75%

Notes:
1. See notes of figure 6.
2. Data based on Appendix 2.

Fig. 8 - Villabruna. Ibex: Anatomical and ageing data.
Fig. 8 - Villabruna. Stambecco: elementi scheletrici e classi di età.

Fig. 9 - Villabruna. Ibex: Age distribution.
Fig. 9 - Villabruna. Stambecco: classi di età.

5.3. Soman

The ibex and the chamois assemblage will be first presented separately, before concluding for the site as a whole.

Although Extremities (E) form the most numerous Anatomical Group (in NISP and MNE counts), the Soman ibex assemblage (Appendix 3, Fig. 10) is the only one with a higher frequency of Upper Front Limbs (UFL) rather than Lower Teeth (LT), in all NISP, MNE and MNI counts. This denotes an emphasis on meat yielding bones. Upper and Lower Teeth provide very similar MNI values, suggesting that whole heads, even horns, might have been introduced to the site. Upper Limbs (UL) and Medium Utility (MU) values dominate (MNI counts), rather than Teeth (T) and Low Utility (LU) ones, as in all the other assemblages. This difference is considered very significant in terms of on-site activities and is, consequently, interpreted as suggestive of secondary consumption ones. The frequency of High Utility (HU) parts (50% in MNI counts) and the paucity of Lower Limbs and Extremities (LLE) also support this conclusion. It is the only assemblage, together with Villabruna, with such a strong presence of HU elements.

Both ageing methods, of teeth and bones, produce similar results. There is a clear dominance of adult animals, the slightly higher frequency of juveniles and young adults in the tooth age profiles is probably due to the ease of ageing these teeth. The similar pattern produced by teeth and bones, both displaying a clear dominance of adults and a rare presence of juveniles, is suggestive of animals of all ages being treated in a similar way and whole skeletons being brought to the site. Adults are primarily represented by post-cranial, rather than cranial, elements (Fig. 11). The dominance of adults could be a result of bad preservation on site (Phoca-Cosmetatou 2005); however, this is not a sufficient condition given the high frequency of juveniles among the chamois bones from Soman, which are equally badly weathered.

Consequently, both anatomical and ageing data support the suggestion of the Soman ibex assemblage being the result of secondary activities. No further insights can be gleaned either from seasonality, since none of the ibex teeth are informative (Phoca-Cosmetatou 2001), or from tool cut marks (Fig. 16), whose absence is presumably due to the intense weathering and frequent concretions covering the surface of the bones (Phoca-Cosmetatou 2005), rather than to any lack of intensity in human occupation. Although a higher incidence of burning could have been corre-

lated to secondary site activities, this is not the case for the Soman ibex assemblage (just 4%).

The chamois bones (Appendix 4, Fig. 12) display a contrasting pattern to the ibex bones. In terms of Anatomical Groups, Teeth (LT and UT) followed by Extremities (E) dominate the chamois assemblage (MNI counts). Although it could be a result of bad preservation, this interpretation has to be discounted given the dominance of limb elements among the ibex bones, which have undergone similarly intense weathering. The various parts of the post-cranial skeleton, e.g., Front and Hind Limbs, are equally represented, especially so in MNI terms. This is not simply due to the small sample size in that it is not the smallest of the assemblages considered. Among Supergroups, Teeth (T) are the dominant group in MNI terms, but both UL and LLE are present in equal percentages; in particular, LLE are quite frequent compared to the other assemblages examined. Given the dominance of Low Utility (LU) elements, and the very few High Utility (HU) ones, it is proposed that the site functioned as a primary butchery site during chamois procurement activities, preferentially transporting away from the site HU and UL parts.

Animals from all age categories are recovered in fairly equal frequencies; of the five adults, one of them is certainly an old adult (8%; Appendix 4). Younger animals are very frequent, especially so young adults, being as frequent as juveniles. The comparison of the tooth to the bone age data indicate that younger and older animals were treated in a fairly similar way, humans bringing to the site both the heads and the post-cranial skeleton. There is an emphasis, though, on juvenile bodies and adult teeth (Fig. 13). This pattern is similar to Dalmeri, also a primary site, where juvenile bodies and adult heads were left behind at the site, the richer parts having been preferentially removed. This is in contrast to the treatment of ibex bones at Soman where adults were preferentially brought to the site. This difference in the age profile of ibex and chamois was also noted by Tagliacozzo & Cassoli (1992), but they did not provide an explanation for it.

As with the ibex assemblage, the other faunal variables do not provide important insights. Seasonality indicators among the chamois teeth point towards an autumn occupation and the foetal bone (Epigravettian phase II) indicates some occupation during late winter/ early spring during the Younger Dryas period. Tagliacozzo & Cassoli (1992), on the other hand, have proposed a summer occupation; they do not, however, clarify on which ungulate remains they based these conclusions. As with the ibex bones,

Anatomical Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
UT	13	12%	5	8%	4	67%
LT	24	21%	8	12%	5	83%
UFL	22	19%	15	23%	6	100%
LFL	3	3%	2	3%	1	17%
UHL	7	6%	6	9%	3	50%
LHL	9	8%	7	11%	2	33%
E	35	31%	22	34%	2	33%
Total	113	-	65	-	-	-
Supergroups	NISP	%NISP	MNE	%MNE	MNI	%MNI
T	37	33%	13	20%	5	83%
UL	29	26%	21	32%	6	100%
LLE	47	42%	31	48%	2	33%
Total	113	-	65	-	-	-
Utility Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
HU	7	6%	6	9%	3	50%
MU	31	27%	22	34%	6	100%
LU	75	66%	37	57%	5	83%
Total	113	-	65	-	-	-

	Tooth & bone		Tooth wear		Bone fusion	
Age Classes	MNI	%MNI	MNI	%MNI	MNI	%MNI
Juveniles	1	14%	1	25%	1	17%
Young Adults	1	14%	1	25%	-	-
Adults	5	71%	2	50%	5	83%

Notes:
1. See notes of figure 6.
2. Data based on Appendix 3.

Fig. 10 - Soman. Ibex: Anatomical and ageing data.
Fig. 10 - Soman. Stambecco: elementi scheletrici e classi di età

Fig. 11 - Soman. Ibex: Age distribution.
Fig. 11 - Soman. Stambecco: classi di età.

Anatomical Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
UT	38	15%	12	12%	7	70%
LT	55	22%	17	17%	10	100%
UFL	30	12%	18	17%	6	60%
LFL	13	5%	8	8%	4	40%
UHL	16	6%	8	8%	3	30%
LHL	45	18%	16	16%	6	60%
E	52	21%	24	23%	6	60%
Total	249	-	103	-	-	-
Supergroups	NISP	%NISP	MNE	%MNE	MNI	%MNI
T	93	36%	29	26%	11	100%
UL	46	18%	26	24%	6	55%
LLE	122	47%	55	50%	6	55%
Total	261	-	110	-	-	-
Utility Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
HU	16	6%	8	8%	3	27%
MU	75	30%	34	33%	6	55%
LU	158	63%	61	59%	11	100%
Total	249	-	103	-	-	-

	Tooth & bone	Tooth wear	Bone fusion			
Age Classes	MNI	%MNI	MNI	%MNI	MNI	%MNI
Juveniles	4	33%	3	27%	1	33%
Young Adults	3	25%	3	27%	-	-
Adults	5	42%	5	45%	1	33%

Notes:
1. See notes of figure 6.
2. Data based on Appendix 4.
3. 1 foetal MNI included in the juvenile Tooth & bone data; not included in the bone fusion data, but plotted in figure 13.

Fig. 12 - Soman Chamois: Anatomical and ageing data.
Fig. 12 - Soman. Camoscio: elementi scheletrici e classi di età.

Fig. 13 - Soman. Chamois: Age distribution.
Fig. 13 - Soman. Camoscio: classi di età.

Anatomical Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
UT	42	10%	12	6%	7	47%
LT	69	16%	23	12%	15	100%
UFL	51	12%	30	15%	10	67%
LFL	20	5%	8	4%	5	33%
UHL	45	10%	21	11%	5	33%
LHL	56	13%	26	13%	5	33%
E	146	34%	74	38%	8	53%
Total	429	-	194	-	-	
Supergroups	NISP	%NISP	MNE	%MNE	MNI	%MNI
T	111	25%	35	18%	15	100%
UL	96	21%	51	26%	10	67%
LLE	245	54%	108	56%	8	53%
Total	452	-	194	-	-	-
Utility Groups	NISP	%NISP	MNE	%MNE	MNI	%MNI
HU	45	10%	21	11%	5	33%
MU	107	25%	56	29%	10	67%
LU	277	65%	117	60%	15	100%
Total	429	-	194	-		-

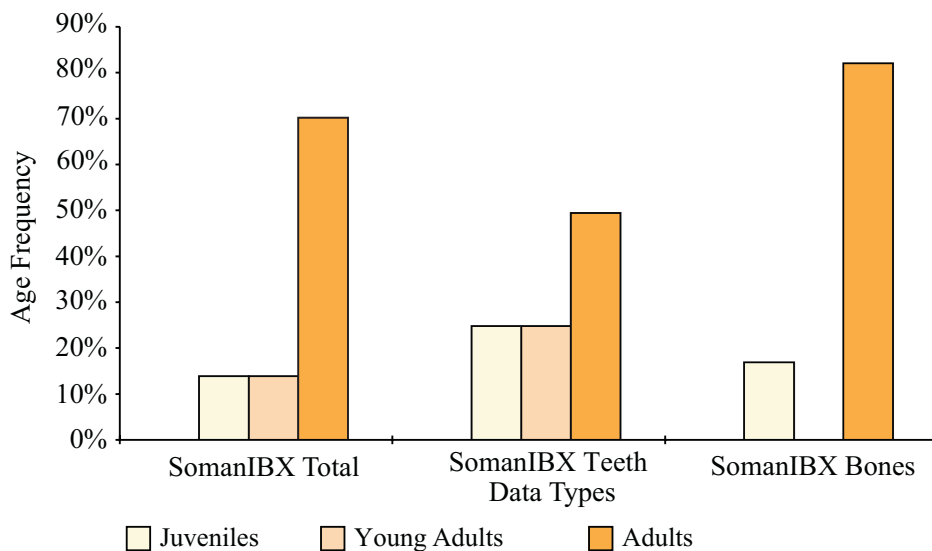|	Tooth & bone		Tooth wear		Bone fusion	
Age Classes	MNI	%MNI	MNI	%MNI	MNI	%MNI
Juveniles	4	33%	4	33%	3	60%
Young Adults	4	33%	4	33%		-
Adults	4	33%	4	33%	2	40%

Notes:
1. See notes of figure 6.
2. Data based on Appendix 5.

Fig. 14 - Dalmeri Ibex: Anatomical and ageing data.
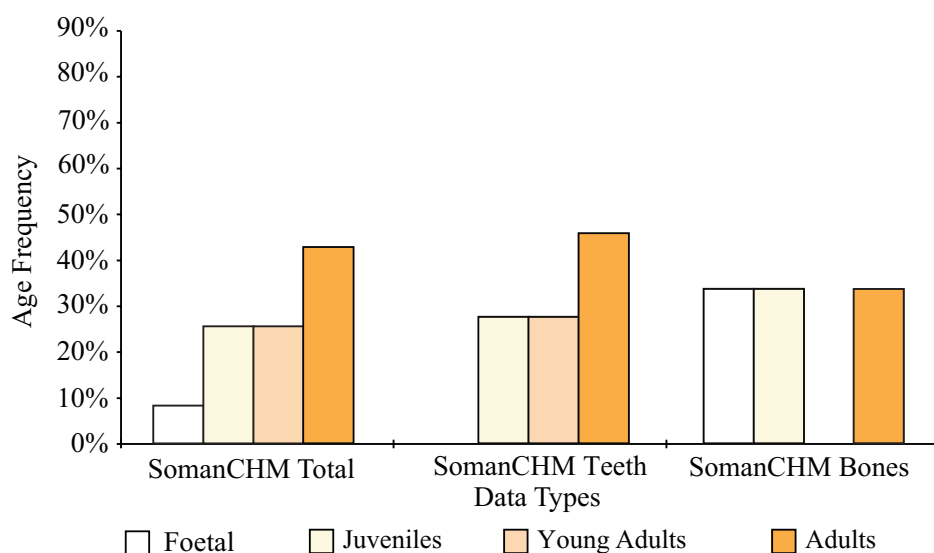*Fig. 14 - Dalmeri. Stambecco: elementi scheletrici e classi di età.*

Fig. 15 - Dalmeri. Ibex: Age distribution.
Fig. 15 - Dalmeri. Stambecco: classi di età.

the absence of tool cut marks is notable; all three marks on the chamois bones are impact scars. In contrast to the ibex assemblage, the chamois one has the highest incidence of burning among all six assemblages.

It is concluded that the chamois assemblage from Soman is the result of primary butchery activities, being dominated by marginal elements both in terms of food utility and age.

It is proposed that two distinct procurement strategies took place at the same time, depending on the species exploited. Soman acted as the locus for primary butchery activities with respect to chamois, the dominant prey at the site, whereas it acted as the locus for secondary food procurement activities with respect to ibex, which constituted a prey of secondary importance. This duality in the nature of Soman cautions against using an umbrella term to characterise a site in its totality, a theme to be discussed further below; rather, the nature of the site's occupation is directly related to a particular set of activities each time (e.g., compare Gordon 1988 to Burke 1995).

5.4.   Dalmeri

The ibex assemblage from Dalmeri (Appendix 5, Fig. 14) is dominated by extremities and teeth, i.e. Low Utility (LU) elements, irrespective of which anatomical grouping or bone quantification method is used; the rest of the skeleton is represented in equal proportions, albeit quite low ones. This may indicate that the meatier parts of the skeleton were removed from the site for consumption elsewhere, a conclusion also supported by the very scarce presence of Upper Hind Limbs (UHL; 33% in MNI terms), which constitute the richest part of the skeleton in meat.

The combined age data indicate a higher frequency of younger animals (juveniles and young adults) compared to older ones; the strong presence of younger animals was also noted in the original publication (Cassoli et al. 1999). Juveniles are represented primarily by post-cranial elements, implying that their remains, which provided fewer returns, were left behind at the site. Adults, on the other hand, are represented in similar frequencies by cranial and post-cranial elements; it could be proposed that whole carcasses were brought to the site, but the heads were not removed again (Fig. 15); this conclusion is also supported by the greater number of adults represented by Upper rather than Lower Teeth (Appendix 5).

The seasonality indicators, based on tooth wear,

point to a late summer to autumn occupation, in accord with the conclusion reached in the original faunal reports (Cassoli et al. 1999; Curci & Tagliacozzo 2000; Tagliacozzo & Fiore 2000). Compared to the other sites considered below, a small number of bones were burnt (6%), whereas the frequency of tool marks is high (11%) (Fig. 16). Most stages of butchering and processing are represented by dismemberment marks (scapula, humerus, ulna, metapodials), filleting marks (scapula and humerus) and skinning marks (base of horn core, phalanges). Impact scars are relatively numerous, found especially on 1st and 2nd phalanges and pointing towards marrow extraction.

In sum, it is proposed that Dalmeri was a primary butchery site with people removing the meatier parts, such as higher utility and adult post-cranial elements, for consumption at sites at lower altitudes. This conclusion is endorsed in previous work on the site (Tagliacozzo & Fiore 2000; Fiore et al. 1998). Dalmeri is the most ibex-focused of all Upper Palaeolithic Italian sites (Phoca-Cosmetatou 2003a), having the highest ibex frequency (94%), being located very high up in the mountains (1240 m) and having been occupied for a short time: all ^{14}C dates fall within the same period (11.3- 10.7 kyr) coinciding with the shift from the warmer Late Glacial Interstadial to the cold conditions of the Younger Dryas. The prevailing environmental conditions were seemingly not very favourable for longer-term human occupation.

Site	Burning	Tool Marks	Sample Size
Dalmeri	6%	11%	348
Fumane	7%	3%	108
Villabruna	1%	29%	78
Soman IBX	4%	0%	76
Soman RUP	12%	2%	176

Notes:
1. Sample size refers to part of the total assemblage (Appendices 1-5), mainly teeth and short bones being excluded.
2. Tool cut mark frequency is not affected by sample size (Phoca-Cosmetatou 2001).

Fig. 16 - Burning and Tool Cut Marks frequency.
Fig. 16 - Frequenza dell'alterazione termica e delle tracce di taglio da strumento litico.

6. CONCLUDING REMARKS: FAUNAL REMAINS, MOBILITY AND SETTLEMENT PATTERNS

The analysis of the ibex faunal assemblages from ibex-rich sites in Northeast Italy occupied during the Upper Palaeolithic has allowed to draw inferences regarding the changing nature of on-site economic activities. The sites considered were: Fumane, Villabruna, Soman and Dalmeri; from Soman both caprid species, ibex and chamois, were examined. Data on the anatomical composition of the assemblages and the age profiles provided the most reliable results; seasonality, burning and tool marks analysis were not as conclusive because the data available were, respectively, too limited, inconclusive and directly affected by taphonomic processes (Phoca-Cosmetatou 2005). It was proposed that some assemblages were created by activities primarily focused on hunting and initial butchery of the prey (Dalmeri, Fumane, Soman chamois and partly Villabruna) whereas other assemblages (Soman ibex and partly Villabruna) were created through more consumption and processing-oriented activities.

These four sites provide a good starting point to explore changes in mobility and settlement patterns during the Upper Palaeolithic, since they are among the best studied sites in Northeast Italy and have played a pivotal role in the landscape-use model proposed by Broglio and Lanzinger. Inferences should be made cautiously: the total number of known sites in the region is small, and those with faunal analyses even smaller; some sites (e.g., Dalmeri) are often the only ones in the area with good faunal preservation; and ibex-hunting need not necessarily have been the main focus of occupation in the mountainous regions in North Italy (Fedele 1993; Phoca-Cosmetatou 2004a).

During the Aurignacian a number of sites and flint locales provide evidence for human use of the hinterland (e.g., Tagliente, Fumane, Monte Avena; Broglio & Improta 1995). The small number of sites coupled with general arguments for the lack of selective hunting during the Aurignacian (e.g., Alhaique & Tagliacozzo 2000; Cassoli & Tagliacozzo 1994a; Kozlowski 1990) corroborate well with the data from Fumane: low dominance of the main species (ibex; just 50%), attritional age profile with large number of juveniles and old animals, strong presence of carnivores (Phoca-Cosmetatou 2003b). Suggestions for targeted resource exploitation and use of the rugged hinterland cannot be supported on such evidence, further confirming Gamble's (1993, 1995) predictions

about less intensive occupation of mountainous regions and absence of specialised ibex hunting during the early Upper Palaeolithic (c. 40-24 kyr).

The Alpine region of Northeast Italy was uninhabited during the Last Glacial Maximum (c. 24-15 kyr), given the prevailing cold conditions and the extended snow cover. The only sites with evidence of human occupation during this period are the caves of Paina, Trene and Broion, all located in the pre-alpine region of Colli Berici, Vicenza; although the faunal assemblages has not been studied yet (Gurioli pers. comm.), the numerous cave bear bones and the specialised lithic assemblage point to ephemeral visits (Bartolomei *et al.* 1988; Broglio 1992).

The region of Northeast Italy was repopulated with the deglaciation; the earliest site occupied is Tagliente (Monti Lessini, Verona) with a date of 13,360 ± 160 BP (Bartolomei *et al.* 1992b). People's infiltration of the alpine region during the Late Glacial Interstadial did not follow a slow and gradual path: based on the available dates Villabruna, located furthest inland, was occupied before Soman or Dalmeri; Dalmeri, given its high altitude, is the last of the ibex-sites occupied. Ibex hunting took place both in the pre-alpine region (e.g., Soman, Tagliente), and at higher altitudes (e.g., Dalmeri, Villabruna). Open air sites (e.g., Val Lastari, Battaglia, Fiorentini, Viotte del Bondone) in altitudes of 1000-1500 m have been attributed to this period (Broglio & Lanzinger 1990; Broglio *et al.* 1992; Peresani 1992).

Continuity in exploitation of the mountainous regions during the cold phase of the Younger Dryas is indicated by several open air locales (e.g., Bus de la Lum, Viotte, Terlago, Andalo; Broglio & Lanzinger 1990; Broglio *et al.* 1992; Peresani *et al.* 1999-2000). Although the environmental signature of the Younger Dryas in the Northeast Alps (Avigliano *et al.* 2000) is not as strong as in the Apennines (Lowe & Watson 1993), the smaller number of sites dating from this period[2], coupled with the absence of inner-mountain rockshelter sites (with the exception of La Cogola; Dalmeri *et al.* 1995; Dalmeri & Lanzinger 1998), could be indicative of a more ephemeral utilisation of the mountainous hinterland with people retreating further south (e.g., Soman), in contrast to the wide-scale penetration during the preceding interglacial

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[2] It should be noted that the smaller number of sites might be due to the short duration of the Younger Dryas, lasting less than 1000 years, to the difficulties of providing absolute dates for open-air sites with no organic remains preserved and to the uncertainties of assigning a lithic assemblage to such a specific chrono-zone based simply on typo-technological grounds.

and the ensuing Mesolithic (Broglio 1992; Bagolini *et al.* 1984; Dalmeri & Lanzinger 1998)?

What new insights into the Broglio and Lanzinger landscape-use model can the faunal data presented here provide? Broglio and Lanzinger had identified two main categories of sites: valley-bottom rockshelter base camps and high altitude open-air short term sites. The faunal analysis has brought under scrutiny the notion of uniformity within the valley-bottom rockshelter site category.

Based on the analysis of the ibex faunal remains, Dalmeri was identified as a primary site, with a summer occupation, thus concurring with Broglio's (1992) suggestion that it was a mountain site given its high altitude. He did not have information on its lithic inventory at the time; more recent studies have supported this attribution, in that the lithic assemblage is very similar to that from the open-air site of Val Lastari in the relative frequencies of tools and armatures, and in an equal frequency of burins and endscrapers; however, the high frequency of segmented backed bladelets, with few backed points and almost no backed knives resembles more the Soman lithic assemblage (Bassetti *et al.* 1998; Peresani *et al.* 2002). This picture, thus, contradicts Broglio's (Broglio & Improta 1995) original hypothesis, of more burins and backed points in mountain sites. The interpretation of the site as "specialised" (see also Fiore *et al.* 1998) need not be contradicted by the fascinating discovery of 23 painted stones (Dalmeri *et al.* 2002). Such a characterisation is aimed to account specifically for the economic activities. The existence of the painted stones should be placed in the wider context of similar finds in other sites, such as the schematic painted stones at Villabruna (Aimar *et al.* 1992), and a hypothesis that the site could also have acted as a social focus for group congregations (*sensu* Conkey 1980) could be testable. Moreover, the recovery of 4 human milk teeth shed in life (Alciati *et al.* 2002), suggesting that whole groups, rather than just hunters, were present on site, lends further support to the notion of a more established occupation of this region during the Late Glacial Interstadial.

Villabruna is considered a valley site (Broglio 1992; Lanzinger 1990), despite its inner mountain location relatively close to Dalmeri. The lithic data support such a position in the landscape-use model, with more endscrapers than burins and more backed blades than points (Aimar *et al.* 1992). The faunal data presented here, however, makes us question such a neat fit in a settlement system of winter valley-bottom base camps, given the anatomical and ageing data which indicated that some primary butchering

activities had taken place, as well as the suggestion for a late summer to autumn occupation.

The study of Soman highlighted further the existing variability. Located at only 100 m altitude, in the pre-alpine region, it is a valley bottom site. But it cannot be characterised as a base camp since it had a dual function as a primary and secondary site; moreover, although winter occupation would be suggested by the presence of chamois foetal bones, this was during the use of Soman as a primary hunting site, rather than as a secondary, maybe more generalised, consumption site, as would have been expected according to the Broglio and Lanzinger model. A comparison of the lithic industry with that from Dalmeri (Bassetti *et al.* 1998) shows that they differ, with Soman having a much higher frequency of backed pieces than endscrapers/burins; however, both sites have more backed blades than backed points, as would be expected in valley bottom sites according to the landscape-use model.

In conclusion, the landscape-use model proposed for Northeast Italy has strong merits, such as providing a timeframe of human expansion into the mountains, proposing distinctions between sites; it is most useful as a model rather than as a specific explanation. The data presented in this paper, although not comprehensive, should, hopefully, have provided further insights into fine-tuning the model. It has been argued that the function and character of each site is directly dependent on the specific activities geared towards the exploitation of different prey species, and that no one umbrella term can be used (e.g., Soman and Villabruna). Secondly, it was argued that the particular characterisations of each site are only applicable to the activities being studied (e.g., Dalmeri's economic vs. symbolic material remains; see also Fedele 1993). More importantly, it demonstrated the need to move away from simple dualistic site characterisations: we do not necessarily have two categories of sites, lowland and upland, base camp and hunting camp. The faunal data indicated that there was increasing variability in the economic activities which had taken place on these sites. For example, Soman and Villabruna, sites presumed to be "valley-bottom base camps" were also occupied as hunting camps; at Dalmeri the specialised ibex-hunting activities took place in the context of a mountain site with base-camp characteristics (lithics, art, children present). During deglaciation not only do we witness a large scale movement into the mountains, as indicated by the larger number of sites discovered, but a settlement system which involved increased mobility, greater variability in on-site activities coupled with a less

structured and patterned use of the landscape. Similar settlement patterns have been proposed for other regions of Southern Europe during the Late Glacial as possible ways people coped with changing food resources, demographic pressures and climatic fluctuations (e.g., Miracle & O'Brien 1998; Straus 1992). This pattern supports Gamble's (1993, 1995) suggestion that it was increased planning and organisation skills, increased specialisation and logistic mobility that allowed people to overcome the environmental demands they faced during the Late Glacial.

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Appendix 1 - Fumane ibex faunal data (264NISP; levels A2-1). Mandible and Maxilla MNE/MNI values provided by combining the Teeth data. Otherwise, the anatomical values are those stated for the specific element. Numbers in brackets do not contribute to total counts. Carpals etc.: carpals, tarsals, sesamoids.
Appendice 1 - Fumane: dati archeozoologici relativi allo stambecco (264NISP; livelli A2-1).

Data on Anatomical Groups			
Element	NISP	MNE	MNI
UM1/2	5	(4)	(3)
UM3	1	(1)	(1)
UP4	8	(8)	(4)
UP3	0	0	0
UP2	0	0	
Udp4	0	0	0
Udp2/3	0	0	0
Maxilla'	(0)	9	5
LM1/2	19	(10)	(5)
LM3	5	(4)	(4)
LP4	7	(7)	(6)
LP3	6	(6)	(3)
LP2	6	(6)	(3)
Ldp4	1	(1)	(1)
Ldp3	2	(2)	(1)
Ldp2	0	0	0
Mandible'	(11)	14	8
Scapula	1	1	1
Humerus	0	0	0
Radius	8	5	5
Ulna	10	6	5
Metacarpals	8	5	3
Pelvis	3	2	2
Femur	5	2	1
Tibia	6	3	2
Patella	1	1	1
Calcaneum	2	2	2
Astragalus	1	1	1
Metatarsals	4	2	1
Metapodials	(8)	(3)	(2)
Ph1	17	11	2
Ph2	19	10	3
Ph3	8	8	2
Total	153	82	-
HornCores	3		
Cranial	2		
Atlas	0		
Axis	0		
Hyoid	0		
Ribs	0		
Vertebrae	0		
Carpals etc.	43		
ToothFragm.	25		
I/C (di/c)	19		

Age Distribution									
Element	MNE	MNI	0-2yrs	2-4yrs	0-4yrs	>2yrs	>4yrs	4-11yrs	>11yrs
UM1/2	4	3	1	-	-	-	2	(1)	(1)
UM3	1	1	-	-	-	-	1	-	-
UP4	8	4	-	1	-	-	3	(2)	(1)
Mandible	7	4	-	-	-	-	3	-	-
LM1/2	10	5	2	-	-	-	3	(1)	-
LM3	4	4	-	1	-	-	3	(2)	(1)
LP4	7	6	-	1	-	-	5	(4)	(1)
LP2	6	3	-	-	-	3	-	-	-
LP3	6	3	-	-	-	3	-	-	-
Ldp4	1	1	1	-	-	-	-	-	-
Ldp2	2	1	1	-	-	-	-	-	-
Scapula	1	1	-	-	-	1	-	-	-
Hum	0	0	-	-	-	-	-	-	-
Rad	5	5	-	-	1	-	4	-	-
Ulna	6	5	-	-	2	-	3	-	-
MC	5	3	-	-	-	2	-	-	-
Pelvis	2	2	-	-	-	-	-	-	-
Fem	2	1	-	-	1	-	-	-	-
Tib	3	2	-	1	-	1	-	-	-
MT	2	1	-	-	-	-	-	-	-
MP	3	2	1	-	-	1	-	-	-
Ast	1	1	-	-	-	-	-	-	-
Calc	2	2	-	-	-	-	-	-	-
Ph1	11	2	1	-	-	1	-	-	-
Ph2	10	3	1	-	-	2	-	-	-
Ph3	8	2	-	-	-	-	-	-	-
Total	-	8	2	1	(2)	(3)	5	(4)	(1)

Appendix 2 - Villabruna ibex faunal data (134NISP; levels 17-10). Mandible and Maxilla MNE/MNI values provided by combining the Teeth data. Otherwise, the anatomical values are those stated for the specific element. Numbers in brackets do not contribute to total counts. Carpals etc.: carpals, tarsals, sesamoids.
Appendice 2 - Villabruna: dati archeozoologici relativi allo stambecco (134NISP; livelli 17-10).

Data on Anatomical Groups			
Element	NISP	MNE	MNI
UM1/2	13	(7)	(4)
UM3	3	(3)	(2)
UP4	3	(3)	(2)
UP2/3	3	(3)	(3)
Udp4	0	0	0
Udp2/3	0	0	0
Maxilla'	(1)	7	4
LM1/2	13	(7)	(5)
LM3	3	(3)	(2)
LP4	3	(3)	(2)
LP3	3	(3)	(2)
LP2	2	(2)	(1)
Ldp4	2	(2)	(2)
Ldp3	1	(1)	(1)
Ldp2	1	(1)	(1)
Mandible'	(8)	8	6
Scapula	1	1	1
Humerus	12	2	1
Radius	8	5	4
Ulna	4	3	2
Metacarpals	5	2	2
Pelvis	2	1	1
Femur	5	2	1
Tibia	8	5	3
Patella	0	0	0
Calcaneum	0	0	0
Astragalus	0	0	0
Metatarsals	5	2	2
Metapodials	(4)	(1)	(1)
Ph1	4	3	1
Ph2	3	2	1
Ph3	0	0	0
Total	107	43	-
HornCores	0		
Cranial	2		
Atlas	0		
Axis	0		
Hyoid	0		
Ribs	3		
Vertebrae	2		
Carpals etc.	1		
ToothFragm.	1		
I/C (di/c)	5		

Age Distribution									
Element	MNE	MNI	0-2yrs	2-4yrs	0-4yrs	>2yrs	>4yrs	4-11yrs	>11yrs
Maxilla	1	1	-	-	-	-	1	-	-
UM1/2	7	4	-	1	-	1	2	(1)	-
UM3	3	2	-	-	-	2	-	-	-
UP4	3	2	-	1	-	-	-	1	-
UP2/3	3	3	-	1	-	1	1	-	-
Mandible	6	5	2	1	-	2	-	-	-
LM1/2	7	5	2	1	-	1	1	-	-
LM3	3	2	-	2	-	-	-	-	-
LP4	3	2	1	-	-	-	-	-	1
LP3	3	2	-	-	-	2	-	-	-
Ldp4	2	2	2	-	-	-	-	-	-
Ldp3	1	1	1	-	-	-	-	-	-
Ldp2	1	1	1	-	-	-	-	-	-
Humerus	2	1	-	-	-	-	-	-	-
Radius	5	4	-	-	1	-	3	-	-
Ulna	3	2	-	-	-	-	2	-	-
MC	2	2	-	-	-	-	-	-	-
Pelvis	1	1	-	-	-	-	-	-	-
Fem	2	1	-	-	-	-	-	-	-
Tib	5	3	-	-	-	1	-	-	-
MT	2	2	-	-	-	-	-	-	-
MP	1	1	-	-	-	-	-	-	-
Ph1	3	1	-	-	-	1	-	-	-
Ph2	2	1	1	-	-	-	-	-	-
Ph3	0	0	-	-	-	-	-	-	-
Total	-	7	2	2	(1)	(2)	3	(1)	(1)

Appendix 3 - Soman ibex faunal data (158NISP; Epigravettian Phase I+II). Mandible and Maxilla MNE/MNI values provided by combining the Teeth data. Otherwise, the anatomical values are those stated for the specific element. Numbers in brackets do not contribute to total counts. Carpals etc.: carpals, tarsals, sesamoids.

Appendice 3 - Soman: dati archeozoologici relativi allo stambecco (158NISP; fase epigravettiana I+II).

Data on Anatomical Groups				Age Distribution								
Element	NISP	MNE	MNI	Element	MNE	MNI	0-2yrs	2-4yrs	0-4yrs	>2yrs	>4yrs	4-11yrs	>11yrs
UM1/2	5	(3)	(2)	UM1/2	3	2	-	-	-	2	-	-	-
UM3	3	(3)	(3)	UM3	3	3	-	1	-	-	2	-	-
UP4	2	(2)	(1)	UP4	2	1	-	-	-	-	1	-	-
UP3	1	(1)	(1)	UP3	1	1	-	-	-	-	1	-	-
UP2	1	(1)	(1)	UP2	1	1	-	-	-	1	-	-	-
Udp4	0	0	0	Udp2	1	1	1	-	-	-	-	-	-
Udp3	0	0	0	Mandible	3	3	-	-	-	3	-	-	-
Udp2	1	(1)	(1)	Ldp4	0	0	-	-	-	-	-	-	-
Maxilla'	(0)	5	4	LM1/2	5	3	1	-	-	1	1	-	-
LM1/2	8	(5)	(3)	LM3	2	1	-	1	-	-	-	-	-
LM3	2	(2)	(1)	LP4	2	1	-	-	-	-	1	-	-
LP4	2	(2)	(1)	LP3	4	2	-	-	-	2	-	-	-
LP3	4	(4)	(2)	LP2	8	4	-	-	-	4	-	-	-
LP2	8	(8)	(4)	Scapula	1	1	-	-	-	1	-	-	-
Ldp4	0	0	0	Humerus	1	1	-	-	-	-	-	-	-
Ldp2/3	0	0	0	Radius	5	3	-	-	-	-	3	-	-
Mandible'	(4)	9	5	Ulna	8	6	-	-	1	-	5	-	-
Scapula	1	1	1	MC	2	1	-	-	-	-	-	-	-
Humerus	1	1	1	Pelvis	0	0	-	-	-	-	-	-	-
Radius	12	5	3	Fem	2	1	-	-	-	-	-	-	-
Ulna	8	8	6	Tib	4	3	-	-	1	2	-	-	-
Metacarpals	3	2	1	MT	5	2	-	-	-	-	-	-	-
Pelvis	0	0	0	MP	0	0	-	-	-	-	-	-	-
Femur	2	2	1	Ast	1	1	-	-	-	-	-	-	-
Tibia	5	4	3	Calc	1	1	-	-	1	-	-	-	-
Patella	0	0	0	Ph1	13	2	-	-	-	1	-	-	-
Calcaneum	1	1	1	Ph2	6	2	1	-	-	1	-	-	-
Astragalus	1	1	1	Ph3	3	1	-	-	-	-	-	-	-
Metatarsals	7	5	2	Total	-	7	1	1	(1)	(4)	5	-	-
Metapodials	0	0	0										
Ph1	19	13	2										
Ph2	13	6	2										
Ph3	3	3	1										
Total	113	66	-										
HornCores	0												
Cranial	1												
Atlas	0												
Axis	0												
Hyoid	0												
Ribs	0												
Vertebrae	0												
Carpals etc.	9												
ToothFragm.	18												
I/C (di/c)	13												

Appendix 4 - Soman Chamois faunal data (387NISP; Epigravettian phase I+II). Mandible and Maxilla MNE/MNI values provided by combining the Teeth data. Otherwise, the anatomical values are those stated for the specific element. Numbers in brackets do not contribute to total counts. Carpals etc.: carpals, tarsals, sesamoids.

Appendice 4 - Soman: dati archeozoologici relativi al camoscio (387NISP; fase epigravettiana I+II).

Data on Anatomical Groups				Age Distribution									
Element	NISP	MNE	MNI	Element	MNE	MNI	Foetal	0-2yrs	2-4yrs	0-4yrs	>2yrs	>4yrs	4-11yrs	>11yrs
UM1/2	17	(9)	(5)	Maxilla	2	1	-	-	-	-	-	1	-	-
UM3	5	(5)	(3)	UM1/2	9	5	-	-	-	-	-	5	(4)	(1)
UP4	4	(4)	(2)	UM3	5	3	-	-	-	-	-	3	-	-
UP3	2	(2)	(1)	UP4	4	2	-	-	-	-	-	2	-	-
UP2	4	(4)	(3)	UP3	2	1	-	-	-	-	-	-	-	-
Udp4	1	(1)	(1)	UP2	4	3	-	-	-	-	1	2	(1)	(1)
Udp3	3	(3)	(2)	Udp4	1	1	-	1	-	-	-	-	-	-
Udp2	2	(2)	(1)	Udp3	3	2	-	2	-	-	-	-	-	-
Maxilla'	(2)	12	7	Udp2	2	1	-	1	-	-	-	-	-	-
LM1/2	13	(8)	(4)	Mandible	6	5	-	3	-	-	1	1	-	-
LM3	9	(7)	(5)	Ldp4	5	3	-	3	-	-	-	-	-	-
LP4	10	(10)	(6)	Ldp3	3	2	-	2	-	-	-	-	-	-
LP3	8	(8)	(5)	Ldp2	1	1	-	1	-	-	-	-	-	-
LP2	6	(6)	(3)	LM1/2	8	4	-	2	-	-	1	1	-	-
Ldp4	5	(5)	(3)	LM3	7	5	-	1	-	-	-	4	-	-
Ldp3	3	(3)	(2)	LP4	10	6	-	1	3	-	-	2	-	-
Ldp2	1	(1)	(1)	LP3	8	5	-	-	-	-	5	-	-	-
Mandible'	(21)	17	10	LP2	6	3	-	-	-	-	3	-	-	-
Scapula	1	1	1	Humerus	3	2	-	-	-	-	-	-	-	-
Humerus	5	3	2	Radius	11	6	1	-	-	3	-	1	-	-
Radius	18	11	6	Ulna	3	3	-	-	-	1	-	-	-	-
Ulna	6	3	3	MC	8	4	-	-	-	-	1	-	-	-
Metacarpals	13	8	4	Pelvis	4	3	-	-	-	-	-	-	-	-
Pelvis	11	4	3	Fem	0	0	-	-	-	-	-	-	-	-
Femur	0	0	0	Tib	3	2	-	1	-	-	1	-	-	-
Tibia	4	3	2	MT	12	6	-	1	-	-	-	-	-	-
Patella	1	1	1	MP	7	4	-	1	-	-	1	-	-	-
Calcaneum	1	1	1	Ast	3	2	-	-	-	-	-	-	-	-
Astragalus	3	3	2	Calc	1	1	-	-	-	-	-	1	-	-
Metatarsals	41	12	6	Ph1	9	2	-	1	-	-	1	-	-	-
Metapodials	(12)	(7)	(4)	Ph2	9	2	-	1	-	-	1	-	-	-
Ph1	24	9	2	Ph3	6	2	-	-	-	-	-	-	-	-
Ph2	22	9	2	Total	-	12	1	3	3	(3)	(5)	5	(4)	(1)
Ph3	6	6	2											
Total	249	103	-											
HornCores	3													
Cranial	0													
Atlas	0													
Axis	0													
Hyoid	0													
Ribs	0													
Vertebrae	0													
Carpals etc.	32													
ToothFragm.	30													
I/C (di/c)	38													

Appendix 5 - Dalmeri Ibex Faunal Data (876NISP; levels [14b, 15t, 26, 4A-14t, 15l-14b] +26b+26c). Mandible and Maxilla MNE/MNI values provided by combining the Teeth data. Otherwise, the anatomical values are those stated for the specific element. Numbers in brackets do not contribute to total counts. Carpals etc.: carpals, tarsals, sesamoids.

Appendice 5 - Dalmeri: dati archeozoologici relativi allo stambecco (876NISP; livelli [14b, 15t, 26, 4A-14t, 15l-14b] +26b+26c).

Data on Anatomical Groups

Element	NISP	MNE	MNI
UM1/2	16	(9)	(5)
UM3	6	(6)	(5)
UP4	6	(6)	(3)
UP3	1	(1)	(1)
UP2	6	(6)	(3)
Udp4	0	0	0
Udp3	4	(4)	(3)
Udp2	3	(3)	(2)
Maxilla'	(4)	12	8
LM1/2	30	(17)	(12)
LM3	6	(6)	(5)
LP4	8	(8)	(7)
LP3	5	(5)	(3)
LP2	1	(1)	(1)
Ldp4	5	(5)	(3)
Ldp3	7	(7)	(4)
Ldp2	7	(7)	(4)
Mandible'	(21)	23	15
Scapula	2	1	1
Humerus	13	9	6
Radius	16	8	5
Ulna	20	12	9
Metacarpals	20	8	5
Pelvis	10	7	5
Femur	13	4	2
Tibia	20	8	5
Patella	2	2	1
Calcaneum	8	3	2
Astragalus	7	5	3
Metatarsals	41	18	5
Metapodials	(23)	(9)	(3)
Ph1	69	30	7
Ph2	59	26	6
Ph3	18	18	3
Total	429		-
HornCores	14		
Cranial	23		
Atlas	2		
Axis	2		
Hyoid	5		
Ribs	37		
Vertebrae	10		
Carpals etc.	136		
ToothFragm.	110		
I/C (di/c)	60		

Age Distribution

Element	MNE	MNI	0-2yrs	2-4yrs	0-4yrs	>2yrs	>4yrs	4-11yrs	>11yrs
Maxilla	4	3	1	-	-	-	2	-	-
UM1/2	9	5	1	-	1	-	3	-	-
UM3	6	5	-	-	-	1	4	-	-
UP4	6	3	-	-	-	-	3	-	-
Udp3	4	3	3	-	-	-	-	-	-
Udp2	3	2	2	-	-	-	-	-	-
Mandible	9	6	3	2	-	-	1	-	-
LM1/2	17	12	4	4	1	1	2	-	-
LM3	6	5	1	1	-	-	3	-	-
LP4	8	7	3	3	-	-	1	-	-
LP3	5	3	-	-	-	3	-	-	-
LP2	1	1	1	-	-	-	-	-	-
Ldp4	5	3	3	-	-	-	-	-	-
Ldp3	7	4	4	-	-	-	-	-	-
Ldp2	7	4	4	-	-	-	-	-	-
Humerus	9	6	1	-	-	1	-	-	-
Radius	8	5	-	-	3	-	2	-	-
Ulna	12	9	-	-	7	-	1	-	-
MC	8	5	1	-	-	-	-	-	-
Pelvis	7	5	-	-	-	-	-	-	-
Fem	4	2	-	-	1	-	1	-	-
Tib	8	5	2	-	1	1	-	-	-
MT	18	5	-	-	-	-	-	-	-
MP	9	3	2	-	-	-	-	-	-
Ast	5	3	-	-	-	-	-	-	-
Calc	3	2	-	-	1	-	-	-	-
Ph1	30	7	3	-	-	4	-	-	-
Ph2	26	6	3	-	-	3	-	-	-
Ph3	18	3	-	-	-	-	-	-	-
Total	-	12	4	4	(7)	(4)	4	-	-