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# Hunter-gatherer mobility in the alpine region of Northeast Italy during the Late Glacial

## *Mobilità dei cacciatori raccoglitori nell'area alpina nord orientale durante il Tardoglaciale*

Summary - With the deglaciation of the Late Glacial (14,700 – 11,500 cal BP), hunter-gatherers moved into the newly available areas in the pre-alpine region of Northeast Italy. Intensive research over the last few decades has uncovered a large number of sites dating to this period, enabling the study of settlement patterns and mobility strategies. The faunal assemblages from the sites of Villabruna, Soman, Dalmeri and La Cogola are compared in relation to the exploitation patterns of the dominant prey species, namely wild caprids (ibex, *Capra ibex*, and chamois, *Rupicapra rupicapra*, for Soman). Based on data presented on anatomical representation and age profiles, it is proposed that an unstructured use of the landscape coupled with a redundancy in site use was practiced, as to be expected in conditions of high environmental unpredictability. This pattern is termed structured variability.

*Riassunto - Durante il Tardoglaciale (14.700 – 11.500 cal BP) i gruppi di cacciatori raccoglitori si spostarono verso le nuove aree della regione prealpina dell'Italia nord orientale che erano divenute disponibili a seguito della deglaciazione. Approfondite ricerche, svolte negli ultimi decenni, hanno permesso di individuare numerosissimi siti relativi a questo periodo, consentendo uno studio dei sistemi di insediamento e delle strategie di mobilità. I campioni faunistici dei siti di Villabruna, Soman, Dalmeri e La Cogola sono stati messi a confronto per quanto riguarda le modalità di sfruttamento della preda dominante, i capridi selvatici (stambecco,* Capra ibex*, e camoscio,* Rupicapra ripicapra*, per Soman). I dati presentati, relativi alla frequenza delle parti anatomiche e ai profili di mortalità, suggeriscono un'utilizzazione non strutturata del territorio associata a una ridondanza nell'uso dei siti, come ci si aspetterebbe in condizioni di grande imprevedibilità ambientale. Questo tipo di sistema d'insediamento viene definito variabilità strutturata.*

Key words: Late Glacial, mobility, anatomical representation, age profiles, settlement patterns.
*Parole chiave: Tardoglaciale, mobilità, composizione scheletrica, profili di mortalità, modelli d'insediamento.*

## Introduction

Mobility is often considered an inherent characteristic of hunter-gatherers in the Palaeolithic. It thus constitutes a starting point for the understanding of past hunter-gatherer organisation and the mapping of activities on the landscape. Some studies of archaeological material, such as raw material transport and seasonality, can provide a direct anchor for activities in space and time. Studies of faunal material, including anatomical representation, are of central importance in the study of mobility in that they are informative primarily about the types of activities carried out on site in relation to the transport of food packages for processing and consumption. Kelly (1992: 45) has rightly emphasised that mobility does not simply involve movement of individuals or groups, but that these movements are a result of the organisation of activities of these individuals and groups. It is this organisation that we should strive to study and comprehend; he thus characterises mobility as being behavioural.

This paper focuses on the pre-alpine region of Northeast Italy, a region repopulated from ca. 16,500 cal. BP, during the deglaciation that followed the Last Glacial Maximum. Intensive research over the last few decades has uncovered a large number of sites, allowing for such a study of mobility and settlement systems to be undertaken (Angelucci, Bassetti 2009; Bertola *et al*. 2007). After a brief consideration of the main models for Late Glacial settlement systems, the data from the wild caprid faunal assemblages from the sites of Villabruna, Soman, Dalmeri and La Cogola will be presented and discussed. Adopting an optimal foraging model, the analysis will focus on anatomical representation and age profiles. It will be demonstrated that in most cases the assemblages can be divided into two groups, either dominated by richer elements (high utility elements and adults) or by poorer elements (low utility elements and juveniles), independently of taphonomic and preservation factors. However, these groups do not pattern out in relation to either date of occupation, location and altitude, or dominance of main prey. These different on-site activities can inform us about the use of the sites in the wider settlement system in relation to the food procurement of the species studied. It will be proposed that this lack of patterning supports a model of structured variability in site use and of unpatterned mobility, the latter commensurate with Jochim's (1991) hypothesis about the use of landscape during periods of environmental fluctuations.

## Models of Late Glacial mobility and settlement patterns

The climate shift following the Last Glacial Maximum saw dramatic changes in sea level, climatic warming, increased humidity, spread of vegetation and increased seasonality (Antonioli, Vai 2004; Ravazzi *et al.* 2007). The Late Glacial is divided into the warm period of the Late Glacial Interstadial (14,700 – 12,650 cal BP) and the brief return to cold conditions during the Younger Dryas (12,650 – 11,500 cal BP). In order to cope with ever changing environmental conditions and resource availability, different human mobility and settlement patterns have been identified across Europe.

Increased repetition in activities and in the use of sites has been identified in the Pyrenees and Northwest Greece. In his overview of the faunal spectra exploited in the French Pyrenees during the end of the Upper Palaeolithic, Straus (1992) noted that reindeer was the most abundant prey despite the increasingly warm and humid climatic conditions. He interpreted this pattern as indicative of human groups trying to adapt by persisting in doing what they already knew, until the reindeer herds drastically declined and disappeared in the region to be replaced by other animal resources. Gamble (1997) made similar observations in his study of the faunal assemblage from the Late Glacial site of Klithi in Northwest Greece. He noted that the frequency of the main prey (ibex and chamois) remained constant throughout the 3,500 years of the site's occupation (16,500 – 13,000 BP), despite the rapid and dramatic climatic fluctuations taking place during that period. This observed redundancy in the frequency of the main species can be extrapolated to suggest a redundancy, a repetition, in on-site activities, site use, and thus in settlement systems and mobility.

Increased patterning in settlement systems has been proposed in regions of high relief in both Italy and Greece. Broglio and Lanzinger's (1990) model for site distribution in the pre-alpine region of Northeast Italy during the Late Glacial divided known sites into two main categories. Sites located along valleys, predominantly rockshelters, were interpreted as base camps occupied repeatedly during the year, including winter. Sites located at higher altitudes (ca. 500 – 1600 m above present-day sea level), predominantly open-air sites, were interpreted as specialised hunting camps occupied seasonally, during the summer. A similar model of people's movements between valley-bottom base camps and hinterland specialised camps had been proposed by Higgs *et al.* (1967) for Epirus in Northwest Greece, and subsequently critically assessed by Bailey (1992). Despite the great importance of Higgs' work in introducing a palaeogeographical component in archaeological studies, 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. Though models of dualistic characterisations of sites and simple transhumance patterns (upland in summer and lowland in winter) still persist in the archaeological literature, they have come under rigorous criticism (for further discussions see Bailey 1997 on the Upper Palaeolithic in Northwest Greece; Mellars, Dark 1998 on Mesolithic Britain). More specifically as it appertains to Northeast Italy, criticisms have been levelled with regards to the lack of demonstration of people's seasonal movements and of the functional division of the sites, and to the absence of a systematic examination of particular categories of data across the sites, such as seasonality, intra-site spatial organisation and art. Studies of the lithic and faunal assemblages (Peresani *et al.* 2002; Phoca-Cosmetatou 2005a) have suggested that the divisions suggested by Broglio and Lanzinger (1990) might not be as rigorous.

A contrasting model of increased diversity in site use and of a less structured use of the landscape has been proposed by researchers working in Late Glacial Germany (e.g. Weniger 1990). Jochim (1991) proposed that in situations of high spatial and temporal environmental variability, such as during the Late Glacial that witnessed increased seasonality and climatic fluctuations, a low correlation between the location of a site, the season of its occupation and the activities carried out is to be expected. In his model, which considers the 'longue durée' of the formation processes of the archaeological record, the archaeological correlate of situations of high environmental unpredictability is reduced patterning in the use of sites and resources in the landscapes. The following discussion will examine how mobility patterns in Northeast Italy during the Late Glacial fit with the above mentioned models through a study of faunal assemblages.

## Analyses of faunal assemblages

People started infiltrating the previously depopulated uplands of Northeast Italy with the warming climatic conditions at the start of the Late Glacial (Angelucci, Bassetti 2009; Ravazzi *et al.* 2007). Intensive research has uncovered a number of sites (Bertola *et al.* 2007), thus affording the possibility of discussing past mobility and subsistence strategies. In the region under consideration (Fig. 1) five sites have faunal remains preserved: Tagliente, Villabruna, Soman, Dalmeri and La Cogola. Wild caprids, ibex and in the case of Soman chamois, were the animals predominantly hunted. Red deer predominate among the ungulate remains only in the later phases of occupation at Tagliente (Rocci Ris *et al.* 2005) and Villabruna. The following study will focus on the levels from the above sites where wild caprids were the main prey (Tab. 1); Tagliente will not be included as it has formed part of a separate study (Rocci Ris 2006). The resulting consistency in the hunted species across sites provides a further baseline for comparisons. Villabruna and Dalmeri were occupied during the Late Glacial Interstadial, La Cogola during the Younger Dryas, whereas Soman was occupied during both climatic phases

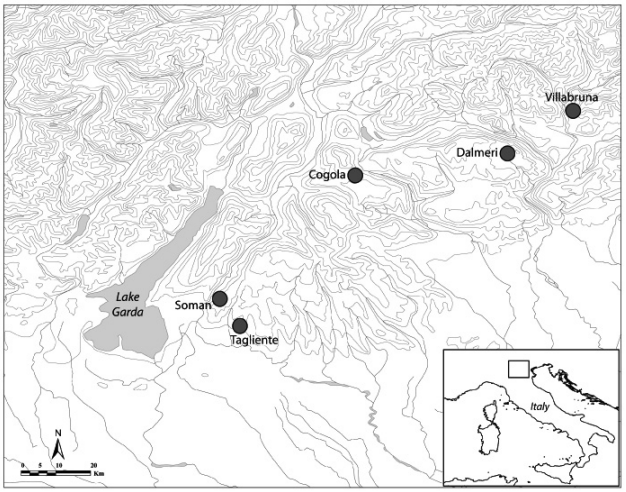


Fig. 1. Map of Northeast Italy showing the location of the sites analysed (table 1). From Phoca-Cosmetatou 2009; kindly provided by Y. Galanakis.

of the Late Glacial. Seasonality estimates for all sites indicate an occupation for the region mainly limited to summer and early autumn.

Taphonomic analyses of the caprid assemblages from Villabruna, Soman and Dalmeri have indicated that anatomical representation and age profiles can be attributed to past human behaviour (Phoca-Cosmetatou 2005b). The frequency of particular element types, such as teeth that are robust, was not affected by weathering, nor was fragmentation, as measured by the length of long bone fragments. Nor was the frequency of age groups, such as that of juveniles, affected by the extent of weathering of the assemblage (Tab. 2; Figg. 2-4)[1]. These assemblages have already been discussed in greater length (Phoca-Cosmetatou 2004, 2005a). That from La Cogola is added for comparative purposes. Despite the lack of equivalent taphonomic data, it is of anthropic origin (Fiore, Tagliacozzo 2004). Different methodological procedures adopted for its analysis means that the comparisons have to be viewed cautiously: e.g. differences in the definition of the categories of the age profiles (compare Fiore, Tagliacozzo 2006: tab. 4 to Phoca-Cosmetatou 2005a: fig. 3), might partly explain the high frequency of adults in the Cogola assemblage. In order to maintain comparability between assemblages, the Dalmeri data from Phoca-Cosmetatou (2005a) have been used as opposed to the larger sample considered in Fiore and Tagliacozzo (2005), though both present a similar picture.

As a framework for comparisons, this analysis utilises two broad categories of food procurement activities that have repercussions on the use of the sites in the wider settlement system (Phoca-Cosmetatou 2004, 2009). The model presupposes that bones poorer in meat, and those of younger animals, were left behind, whereas bones richer in meat, and those of older animals, were transported for further processing and consumption further afield. This division is supported by higher frequencies of burning and cut marks in these latter assemblages (Phoca-Cosmetatou 2005a, 2005b). The former category, considered to have taken place closer to the killing locations, is termed "primary butchery" activities, whereas the latter category, taking place further away and where additional processing of bones yielding richer returns might have occurred, is termed "secondary consumption" activities. The use of the sites, in relation to these food procurement activities can, respectively, be termed "primary butchery" and "seconda-

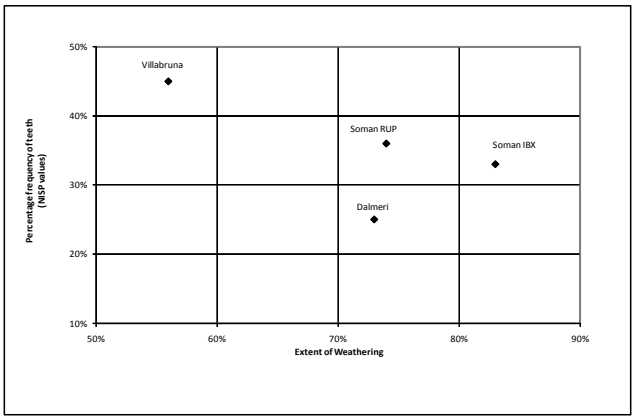


Fig. 2. Northeast Italian Late Glacial sites: weathering and tooth frequency. Data listed in table 2.

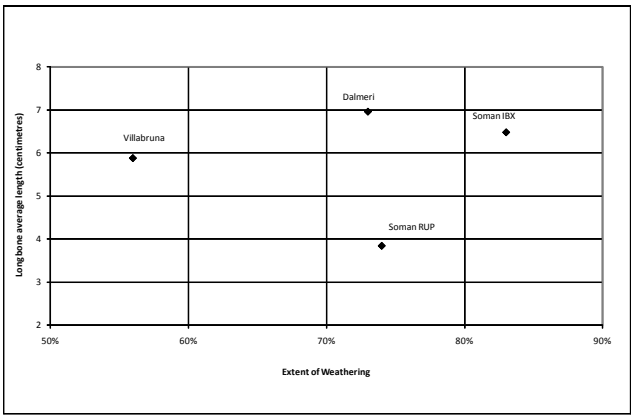


Fig. 3. Northeast Italian Late Glacial sites: weathering and long bone length. Data listed in table 2.

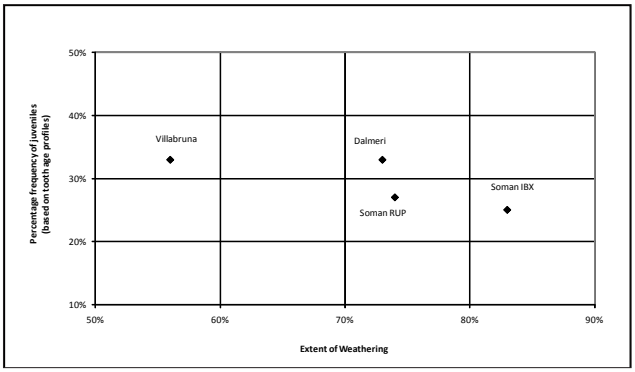


Fig. 4. Northeast Italian Late Glacial sites: weathering and juvenile frequency. Data listed in table 2.

[1] The taphonomic analysis (Tab. 2) explores the difference in the preservation of adult vs. juvenile teeth, hence the MNI values are based only on teeth, as opposed to Table 3 which explores the whole sample. The differences in the samples used are mentioned in note 2 (Tab. 3) vs note 5 (Tab. 2)

ry consumption" sites. This interpretative model aims to create a framework for highlighting any variability between assemblages. The differences between the assemblages hold across most of the faunal variables examined.

This supports the existence of differences in the character of activities at these sites (see Phoca-Cosmetatou 2005a for further details).

The study of anatomical representation (Tab. 3) is presented in terms of Corrected NISP (CNISP) counts that take into account differential element frequency in each anatomical group. This quantification method was preferred above MNE and MNI counts, following Gamble (1997), because the present comparison includes data from La Cogola that were originally published in a different format (Fiore and Tagliacozzo 2004). The results based on MNE and MNI counts for Villabruna, Soman and Dalmeri (Phoca-Cosmetatou 2005a) are similar to those presented here for CNISP counts, thus supporting the reliability of the comparisons. The assemblages are presented in chronological order (Fig. 5). Two groups can be identified, there being no clear distinction between the two climatic phases but, rather, variability within each phase. Dalmeri, La Cogola and both the Soman chamois assemblages are dominated by Lower Limbs and Extremities, and Teeth, mainly bones poorer in meat. These assemblages thus fit in the primary butchery category as defined above. The high frequency of Upper Limb bones, rich in meat, in the ibex assemblages from Villabruna and from Soman phase II suggests they fit better with a secondary consumption designation. The Soman ibex assemblage from phase I also has a relatively high frequency of Upper Limbs.

The age profiles (Tab. 3, Fig. 6) are based on MNI counts and ordered chronologically. The profiles for Villabruna, Soman and Dalmeri combine both teeth and bone fusion data. Three main age categories are defined: juveniles, young adults and adults. Juveniles are identified based on deciduous teeth and early fusing unfused bones; young adults are characterised by the lower 4$^{th}$ premolar in not too worn a stage (pre stage 8A of Payne 1987; see also Sti-

| Site | Levels | Dates | Altitude | Ungulate NISP[1] | Herbivore species | Ibex NISP[2] | Ibex %[3] | Season | Raw material | References |
|---|---|---|---|---|---|---|---|---|---|---|
| **Villabruna** | 17-10 | 14,066±273 cal BP – 13,865±223 cal BP | 500 | 369 | 4 | 134 | 57% | Summer-Autumn | 92% local | Aimar *et al.* 1994; Aimar, Giacobini 1995 |
| **Soman** | Epigravettian Phase I | 13,719±234 cal BP | 100 | 464 | 7 | 215 chamois; 77 ibex | 46% chamois; 17% ibex | Autumn | | Broglio and Lanzinger 1985; Tagliacozzo, Cassoli 1994 |
| **Soman** | Epigravettian Phase II | 12,352±273 cal BP – 12,262±239 cal BP | 100 | 352 | 7 | 170 chamois; 86 ibex | 48% chamois; 24% ibex | Autumn | | Broglio and Lanzinger 1985; Tagliacozzo, Cassoli 1994 |
| **Dalmeri** | 26-14 | 13,156±133 cal BP – 12,792±110 cal BP | 1240 | 944 | 2 | 876 | 95% | Summer-Autumn | local | Dalmeri and Neri 2008; Dalmeri and Cusinato 2005; Fiore, Tagliacozzo 2005 |
| **Cogola** | 19 | 12,634±77 cal BP – 12,304±193 cal BP | 1070 | 138 | 5 | 81 | 59% | Summer-Autumn | >92% local | Dalmeri 2004; Fiore, Tagliacozzo 2004 |

Tab.1. Northeast Italian Late Glacial sites: main features of sites and assemblages analysed. Geographical location of sites illustrated in figure 1
1. Number of bones (NISP) in the ungulate faunal assemblage; values derived from site reports
2. Ibex bone NISP values, and those derived for the following analyses (tables 2-3; figures 2-6), are from my study of the assemblages (Phoca-Cosmetatou 2005a, 2009), with the exception of La Cogola (Fiore, Tagliacozzo 2004). They might differ slightly from the NISP values listed in the site reports
3. Percentages are based on the respective publications

| | Extent of weathering[1] | | Teeth[3] | | Long bone length[4] | | Juveniles[5] | |
|---|---|---|---|---|---|---|---|---|
| | | NISP[2] | | NISP | | NISP | | MNI |
| **Soman I&II IBEX** | 83% | 76 | 33% | 113 | 6.48 | 19 | 25% | 4 |
| **Soman I&II RUPICAPRA** | 74% | 176 | 36% | 249 | 3.84 | 27 | 27% | 11 |
| **Dalmeri IBEX** | 73% | 343 | 25% | 452 | 6.96 | 79 | 33% | 12 |
| **Villabruna IBEX** | 56% | 77 | 45% | 111 | 5.88 | 21 | 33% | 6 |

Tab. 2. Northeast Italian Late Glacial sites: effects of weathering (figures 2-4). Data from Phoca-Cosmetatou 2005b
1. Extent of weathering: percentage of weathered bones in each assemblage
2. NISP values refer to the whole sample considered for each category, of which the percentages mentioned are a part: e.g. for weathering teeth are excluded.
3. Teeth: percentage of teeth in each assemblage (NISP values)
4. Long bone length: average length of long bone fragments in each assemblage (in centimetres)
5. Juveniles: percentage of juveniles in each assemblage (age profiles constructed on teeth; total MNI values)

ner 1994 for discussion of the prime adult category) and unfused late fusing bones (for further details see Phoca-Cosmetatou 2005a). The Dalmeri, Villabruna and Soman chamois assemblages, especially that from Phase II, have numerous young animals, suggesting they fit in the primary category. La Cogola and both Soman ibex assemblages, on the other hand, are dominated by adult remains, thus fitting in the secondary category.

Hence, the separation of the assemblages into two broad categories is consistent in both the faunal variables examined, namely anatomical representation and age profiles. This is especially so for Dalmeri and each of the caprid assemblages from Soman. La Cogola and Villabruna straddle the divide and demonstrate features of both categories; this could be due to the small assemblage sizes and to different age profile methodologies used for La Cogola compared to the other sites, as mentioned above. A more detailed analysis of further aspects of the Villabruna assemblage suggested it might fit more with a secondary site designation (Phoca-Cosmetatou 2005a).

## Discussion

What can this characterisation of on-site food procurement activities tell us about settlement patterns, use of landscape and changing mobility strategies during the Late Glacial? An initial overview of prey dominance, site altitude and date of occupation suggests a correlation between strength of dominance of the main prey and altitude (Fig. 7); at closer scrutiny it does not hold up though. The sites at higher altitude, especially Dalmeri, have stronger ibex dominance, whereas Soman, the most lowland of sites considered, has the weakest dominance (48%) of main ungulate prey. However, the correlation is not strong given that the main species at Soman, Villabruna and Cogola are hunted with a similar intensity (48-59%); only Dalmeri stands out as having a very strongly single prey species dominated assemblage (95%). The species frequencies at Soman remain very stable between the two phases. In this light, the date of site occupation, whether during the warm or cold phase of the Late Glacial, does not have a direct impact on species exploitation. A decrease in ibex exploitation concurrent with the warming climate of the Late Glacial Interstadial (14,700 – 12,650 cal BP) has been identified at Tagliente and Villabruna where red deer becomes increasingly predominant in later phases (Aimar *et al.* 1994; Rocci Ris *et al.* 2005).

With no direct effect of climate on the choice and intensity of the prime species hunted, the next question regards the organisation of hunting and exploitation of animal resources at each location and, thus, on the activities and role of each site within a mobile settlement system. In this discussion, the characterisation of each site, as locus for primary or secondary food procurement activities for the main species exploited, is important. Figure 8 presents the various strands discussed so far, plotting the date of occupation in relation to both the dominance of the main species and the role of each site in the settlement system, as suggested by the faunal analysis presented above.

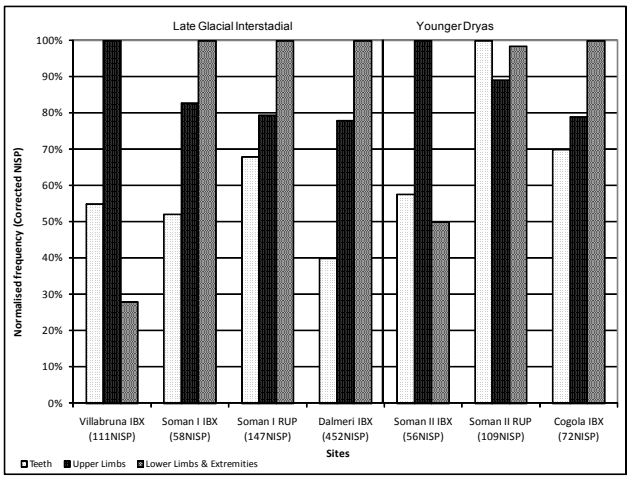


Fig. 5. Northeast Italian Late Glacial sites: anatomical representation. Data and explanation of anatomical groups and normalised frequencies (CNISP values) in table 3.

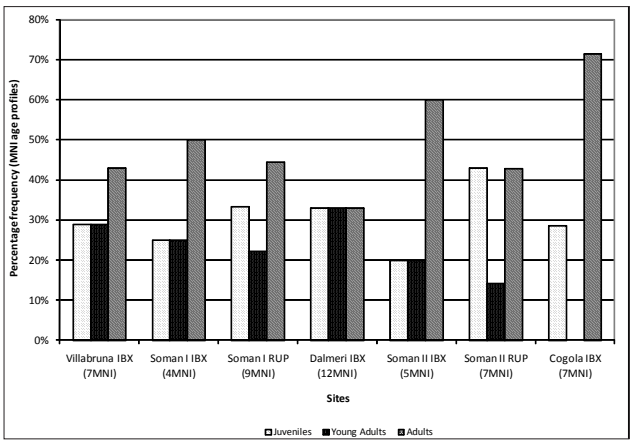


Fig. 6. Northeast Italian Late Glacial sites: age profiles. Data listed in table 3.

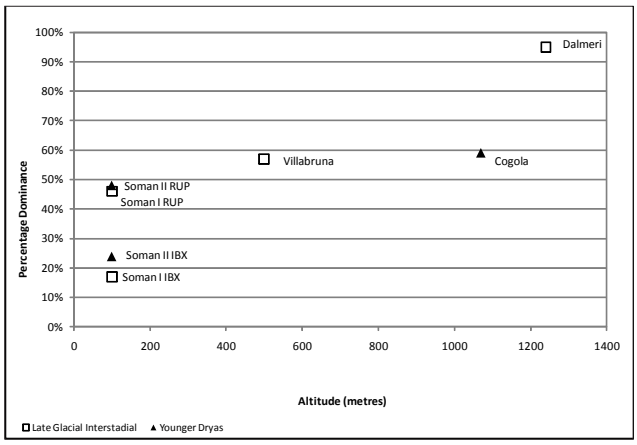


Fig. 7. Northeast Italian Late Glacial sites: site altitude and ibex frequency in relation to period of occupation.

The role of each site, either primary or secondary, is not necessarily related to prey species dominance. Stronger presence of the main prey does not imply that the site functioned as a short-term hunting camp. Riparo Dalmeri provides a good illustration. A strictly logistic use of the site,

| | Villabruna IBEX | | | Soman I IBEX | | | Soman I RUPICAPRA | | | Dalmeri IBEX | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Anatomical groups[1]** | **NISP** | **CNISP[3]** | **CNISP%** | **NISP** | **CNISP** | **CNISP%** | **NISP** | **CNISP** | **CNISP%** | **NISP** | **CNISP** | **CNISP%** |
| Teeth | 50 | 22 | 55% | 17 | 8 | 52% | 52 | 23 | 68% | 111 | 49 | 40% |
| Upper Limbs | 40 | 40 | 100% | 12 | 12 | 83% | 27 | 27 | 79% | 96 | 96 | 78% |
| Lower Limbs & Extremities | 21 | 11 | 28% | 29 | 15 | 100% | 68 | 34 | 100% | 245 | 123 | 100% |
| **Total NISP** | **111** | | | **58** | | | **147** | | | **452** | | |
| **Age Classes2** | **MNI** | | | **MNI** | | | **MNI** | | | **MNI** | | |
| Juveniles | 29% | | | 14% | | | 33% | | | 33% | | |
| Young Adults | 29% | | | 14% | | | 25% | | | 33% | | |
| Adults | 43% | | | 71% | | | 42% | | | 33% | | |
| **Total MNI** | **7** | | | **7** | | | **12** | | | **12** | | |

| | Soman II IBEX | | | Soman II RUPICAPRA | | | Cogola IBEX | | |
|---|---|---|---|---|---|---|---|---|---|
| **Anatomical groups** | **NISP** | **CNISP** | **CNISP%** | **NISP** | **CNISP** | **CNISP%** | **NISP** | **CNISP** | **CNISP%** |
| Teeth | 22 | 10 | 58% | 48 | 21 | 100% | 26 | 12 | 70% |
| Upper Limbs | 17 | 17 | 100% | 19 | 19 | 89% | 13 | 13 | 79% |
| Lower Limbs & Extremities | 17 | 9 | 50% | 42 | 21 | 98% | 33 | 17 | 100% |
| **Total NISP** | **56** | | | **109** | | | **72** | | |
| **Age Classes** | **MNI** | | | **MNI** | | | **MNI** | | |
| Juveniles | 14% | | | 33% | | | 29% | | |
| Young Adults | 14% | | | 25% | | | 0% | | |
| Adults | 71% | | | 42% | | | 71% | | |
| **Total MNI** | **7** | | | **12** | | | **7** | | |

Table 3: Northeast Italian Late Glacial sites: anatomical and age profile data (figures 5-6). Data for all sites from Phoca-Cosmetatou 2005a, except for La Cogola (Fiore and Tagliacozzo 2004)

1. Anatomical groups based on Gamble 1997 and Phoca-Cosmetatou 2004: Teeth: upper and lower teeth; Upper Limbs: scapula, humerus, radius, ulna, pelvis, femur, tibia; Lower Limbs and Extremities: metacarpal, metatarsal, calcaneus, astragalus, phalanges
2. Age profiles, except for La Cogola, are constructed on combined tooth wear and bone fusion data (see text and Phoca-Cosmetatou 2005a for definition of age groups)
3. CNISP: Corrected Number of Identified SPecimens: NISP values have been corrected so as to account for the differential representation of elements in the skeleton: the correction factors are derived by dividing the number of elements in each anatomical group to those of the smallest group (upper limbs). Percentages are normalised, as CNISP is a similar variable to MNI (Minimum Number of Individuals). For further details see Gamble 1997 and Phoca-Cosmetatou 2004

as suggested by the faunal remains (assemblage strongly dominated by one prey species, low utility elements, predominance of younger animals), has to be reconsidered: based on evidence from stone tools, human remains and artistic objects, the multitude of social, even symbolic, activities that have been argued to have taken place possibly involved the whole human group rather than a specialist hunting force (Dalmeri *et al.* 2006; Dalmeri, Neri 2008). This example highlights the different character of a site's occupation in relation to more strictly food procurement and social activities (see also Phoca-Cosmetatou 2009 for discussion).

The role of each site is not related to the date of occupation (Fig. 8). There is no noticeable change in the character of on-site food procurement activities, and thus in the role of the sites in the settlement system, between the two climatic periods of the Late Glacial Interstadial and the Younger Dryas. There is no increase in primary use of sites during the Younger Dryas. There is consistency in wild caprid processing activities at Soman in both phases, suggesting no direct climate link. La Cogola has a high frequency of adults, in contrast to the pattern suggested by the body parts, hence the dual designation; though that might be more of a methodological discrepancy between the methods used in the study of La Cogola age profiles (Fiore, Tagliacozzo 2006) compared to those for the other assemblages (Phoca-Cosmetatou 2005a). The differences between the sites could not be attributed to taphonomic factors as shown, though concerns are posed due to small assemblage sizes. Similar insights into the changing use of settlement patterns have been provided by the study of open air sites in the same region of Northeast Italy: the comparison of tool frequency and tool use at Val Lastari and Bus de la Lum has suggested that a similar range of activities was taking place at each site across the two climatic phases, but the length and intensity of site occupation might have been shorter at Bus de la Lum, occupied during the Younger Dryas (Peresani *et al.* 1999-2000).

Hence, despite the changing climatic conditions people were redundant in their behaviour at particular sites or, conversely, the environmental changes did not greatly affect resource availability, as seems the case at Soman. Although most sites in the pre-alpine region were only occupied seasonally during the summer and early autumn, a residential-style mobility and a settling into the landscape, at least for part of the year, is proposed for the occupation of the region during the Late Glacial Interstadial. This interpretation is further supported by the various lines of evidence from Riparo Dalmeri. The lack of change in on-site food procurement activities between the Late Glacial Interstadial and the Younger Dryas, and the absence of demonstrable decrease in site numbers during the Younger

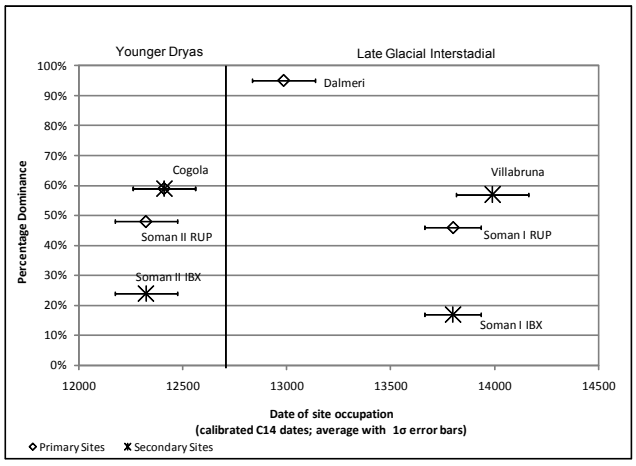


Fig. 8. Northeast Italian Late Glacial sites: site function in relation to ibex frequency and date of occupation ($^{14}$C dates).

Dryas suggests a similar use of the region in both periods, with a similar range of activities taking place. However, the abandonment of many of the previously occupied sites and the use of new localities together with indications of shorter visits during the colder phase of the Late Glacial suggest a shift towards increased mobility, shorter-term use of the newly occupied sites and a more ephemeral use of the region (Angelucci, Bassetti 2009; Peresani *et al.* 1999-2000; Peresani *et al*. 2010).

## Conclusion: the Late Glacial occupation of Northeast Italy

With the warming of the climate and the melting of the glaciers during the Late Glacial, people moved into the pre-alpine region of Northeast Italy. Given the mountain location of the sites and the reduced biodiversity available, which has resulted in an archaeological signature of ibex-hunting sites occupied during the warmer months of the year, a logistic, short-term occupation of the region might have been expected. However, assemblages with higher wild-caprid frequencies were not necessarily a result of primary hunting and processing activities. Apart from Dalmeri, the other sites (Villabruna, Soman, La Cogola) had relatively low frequencies (<60%) of the main prey species. Both primary and secondary processing activities were identified among these assemblages. Dalmeri, the only site with a strongly single species dominated assemblage (95%) which displayed features of primary food processing, was nonetheless the locus of a variety of social activities. The multitude of economic, social and symbolic activities taking place suggested that people settled into the landscape. In other cases economic activities on the sites were interpreted primarily as a result of processing and consumption rather than of the first stages of butchery (La Cogola, Villabruna, Soman ibex assemblage).

The above suggests that there was structured variability in mobility and settlement patterns during the Late Glacial in the pre-alpine region of Northeast Italy. There is some redundancy in on-site activities as seen, for example, in the similarity of economic activities taking place at Soman in both chronological phases. The whole region was only occupied during the warmer months of the year. However, all sites, with the exception of Soman, were occupied for a short length of time, for only part of the Late Glacial Interstadial or the Younger Dryas. New localities were occupied during the Younger Dryas, even if a similar range of activities was taking place. This situation hints to a "window of opportunity" (Bailey 1997) becoming available that enabled occupation of specific localities. The variability in subsistence activities was not related to site location or to the dominance of the main species. These latter features support an idea of an unstructured use of the landscape, related to the temporal and spatial unpredictability of resources. In conclusion, the settling into the landscape for part of the year resulted in redundancy in activities at particular locations, and in an unstructured use of the region as a whole, what was termed structured variability.

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