

Riparo Dalmeri: a high-altitude late glacial site in the venetian pre-alps. Palaeoecological and palaeoclimatological data from the micromammal remains

GIORGIO BARTOLOMEI

ABSTRACT - The present study points out the environmental and climatic conditions of the mountain zone of the pre-Alps of the Veneto and Friuli regions during the Alleröd oscillation on the basis of the micromammal associations.

Key words: Mountain environment, Paleoecology-paleoclimatology, Alleröd, Riparo Dalmeri, Micromammals
Parole chiave: Ambiente montano; Paleoecologia-paleoclimatologia, Alleröd, Riparo Dalmeri, Micromammiferi

Giorgio Bartolomei - Dipartimento di Studi Storici, Università di Venezia, C. Del Piovan, S. Marco 2546, I-30124 Venezia

The Riparo Dalmeri (Dalmeri rock-shelter) is located along the northern edge on the Asiago (or Sette Comuni) plateau at an altitude of 1240m. It lies in a crionival, narrow valley that leads to the Valsugana. It opens at some 100 metres from the wide karsic plain of Malga Marcesina between 1300-1370m of altitude. The surrounding mountains range between 1500 and 1800 metres. On the northern side, some 1000 metres from the rockshelter, begins the slope of the Valsugana with subvertical sides, 800-900 metres deep. At the foot of the slope lies the wide, alluvional valley bottom of the River Brenta at some 250 metres. The valley bottom is rich in waters fed by several karstic springs with wide, marshy areas.

The excavations at Riparo Dalmeri, directed by Dr.G.Dalmeri, have revealed a recent Epigravettian anthropogenic layer (units 14 and 16), whose maximum thickness is of 40cm. The encampment has been dated to 11260 \pm 100, 10800 \pm 100 and 11000 \pm 115 BP (DALMERI & LANZINGER, 1991; CASSOLI *et al.*, 1995; BASSETTI & DALMERI, 1995). From this layer, some 100 micromammal remains have been collected, representing the hunting activity of the birds of prey that inhabited the shelter.

Even though the sample is representative for only one climatic phase and not for a sequence, nevertheless it allows some useful climatological and ecological consid-

erations on the Last Glacial mountain environment, more precisely on the Alleröd oscillation.

The frequency percentages of the anthropogenic layer are given in Tab.1. The finds from the layers above are too poor to be taken into consideration.

The fossorial species dominate among the micromammals (48.6%), a half of which is represented by *Microtus arvalis* and the remaining by *Microtus nivalis* and *Microtus (Pitymys) multiplex*. *Clethrionomys glareolus* is some 1/4 of the whole complex, while significant is the percentage of *Apodemus sylvaticus* (14.3%). The arboreal species are extremely rare, represented by one specimen of *Dryomys nitedula* and by one Squirrel.

Clethrionomys is typical of the forest and shrub alpine environments with latifoliae and conifers, with slightly humid undergrowth. It occurs on soils covered with shrubs and thick herbs of the alpine open pastures where it can be abundant.

Apodemus is characteristic of the forest environments with undergrowth, of the shrubs and the shrubby pastures. It is absent in the microthermal conifer woods (in the West it is not present above 62° of latitude and 60°-65° in Asia); as well as in the upper alpine pastures, its spread is delimited by the continental steppe.

The Insectivora are badly represented (9.6%)

with a small-sized *Talpa europaea*, *Sorex araneus* and rare *Sorex alpinus*.

It is interesting to note the absence of *Arvicola*.

These micromammals represent the hunting environments of the birds of prey in a radius of 1.0-1.5Kms, that is the mountain environments located between 1000 and 1800 metres. The valley bottom of Valsugana seems to be excluded (altitudes between 250 and 300 metres). It lies at some 2.3Kms, with a gradient of 1000 metres.

In a paleoecological reconstruction these finds make us think of a karstic plain between 1200 and 1300 metres of altitude with an open, semiarid forest cover with conifers and shrub, non microtermic, with humid clearances, probably located in the wide karstic depressions, partly waterproofed by eolic deposits. The slopes of the surrounding mountains (1400-1800m) are covered with detritic, crioclastic belts, partly stabilized by shrubs and ipsofil herbs of open pasture alpine type.

Tab.1 includes a more detailed analysis of the anthropogenic horizon, subdivided into two units, a lower and an upper one, in order to observe the existence of an ecologic-climatic differentiation, even though on a lower number of specimens, per unit. As one can see, even though the sample is small, the essential differences are scarce; the percentages of *Clethrionomys glareolus* and of *Apodemus sylvaticus* are practically identical. The differences between the Insectivora is of little significance.

The only differences in the upper units are the slight decrease of *Pitymys* and the presence of the *Arboricola*. This might be due to the small number of finds but might also indicate a slightly more forested or shrubby environment. To conclude, there are no sensible palaeoecological differences between the lower and the upper part of anthropogenic horizon. This might indicate a slightly short period of sedimentation.

A contemporaneous deposit with micromammals, located eastwards in the Prealpi Carniche, is that of Grotte Verdi di Pradis (Clausetto, Pordenone) along the left side of the Torrente Meduna Valley, on a partly karstic upland. The hunting region of the birds of prey that inhabited these caves is between 600 and 700 metres of altitude, that is the lower mountain belt. This area is at a lower altitude than that of Riparo Dalmeri, but with heavier rains representing some 1900-2000 mm per year against 1200-1300mm of the Marcesina.

Three radiocarbon dates have been obtained from this deposit: 11770 \pm 260 (layer 2/1G), 11250 \pm 310 (layer 1A+1B1) and 10970 \pm 290 BP (layer 1/1G) (BARTOLOMEI *et al.*, 1977; BARTOLOMEI & TONON, 1997)

which allow comparisons between the two sites.

At Pradis, the layers beneath the C14 dated ones are characterized by 95-97% of fossorial species; 50% of these are represented by *Microtus arvalis* and subsequently by *M. agrestis*. The remainings are almost exclusively represented by *Microtus nivalis*; *Microtus (Pitymys) multiplex* is represented by about 1%.

The exotic species also occur even though with very low percentage (*Microtus gregalis*, *Sicista* sp. and *Microtus ratticeps*), the first two from the Asian steppe, the third from the boreal, marshy environments.

Apodemus is absent, while *Clethrionomys glareolus* is extremely rare, as are the Insectivora.

These layers have been attributed to the medium-old Dryas, with typical glacial characters of a mountain continental steppe. A climatic amelioration can be noticed in the layers above, dated with C14 method. The fossorial species decrease, representing 81% of the assemblage, the exotic ones disappear and the percentage of *Clethrionomys glareolus* markedly increases to 13%, *Apodemus sylvaticus* rare disappears and *Sorex alpinus* slightly increases.

The Arboreal species are not represented.

This amelioration is caused by a slight increase of humidity and temperature which increased the extension of the high alpine pasture at the expense of the steppe at the lower limit of conifers.

Both the occupation layer of Riparo Dalmeri and the three dated layers of Grotte di Pradis are to be attributed to the Alleröd oscillation.

This climatic amelioration is conventionally attributed between 11700 and 10800 BP, according to the radiocarbon chronology, and to 11930-10860 BP on the basis of dendrochronology (KAISER, in press).

According to these dates, the Riparo Dalmeri was inhabited towards the end of the Alleröd, while the three layers of the Grotte Verdi of Pradis cover the entire oscillation.

If we take into consideration the altitudinal differences of two sites, we can point out the altimetric extension of the more steppe lower belt in respect of that overhanging of condensation. The phenomenon is perhaps more emphasized in the eastern pre-alpine belt, due to a higher continental influence.

Another indirect datum we have obtained from Riparo Dalmeri is that the snow-limit, that in Sette Comuni Upland is of 1450m during the second Pleniglacial (TREVISAN, 1939), during the Alleröd was raised to some 2100-2300m that indicates that no snow-fields still existed on the upland in that period.

SUMMARY - The present study points out the environmental and climatic conditions of the mountain zone of the pre-Alps of the Veneto and Friuli regions during the Allerød oscillation on the basis of the micromammal associations. In the area surrounding the Dalmeri rockshelter (Marcesina), in the Northernmost part of the Sette Comuni Upland (Vicenza), at an altitude of 1200-1400 metres, is documented an arboreal, semi-arid environment with a sparse conifer vegetation, not microtermic, with wet grasslands in the doline. The surrounding steeper slopes, up to 1500-1600 metres, were covered by detritic fans partly stabilized by ipsofile shrub and grass cover of alpine upland type. In the contemporaneous deposit of the Grotte Verdi di Pradis (Clausetto, Pordenone), in the Carnic Prealps, at 600-700 metres, the micromammal association shows, a more arid and cold steppic grassland environment at the lower limit of conifers.

RIASSUNTO - Sulla base dello studio dei micromammiferi si evidenziano gli ambienti e il clima nella fascia montana delle Prealpi Venete e Friulane durante l'oscillazione di Allerød. Nell'area circostante il Riparo Dalmeri, situato all'estremo settentrionale dell'Altipiano dei Sette Comuni (Marcesina, Vicenza), alla quota di 1200-1400m l'ambiente era semiarido, caratterizzato da un ricoprimento boschivo a conifere piuttosto rado, non microtermico, e da radure prative umide nelle doline, un manto vegetale di tipo prateria alpina ricopriva e stabilizzava parzialmente invece le fasce detritiche dei versanti circostanti più erti (1500-1600m di quota). Nelle Prealpi Carniche, i micromammiferi dei depositi coevi delle Grotte Verdi di Pradis (Clausetto, Pordenone) evidenziano invece, a quote inferiori (600-700m), ambienti più aridi e freddi, di tipo steppa o prateria, al limite inferiore della fascia delle conifere.

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Tab. 1

Micromammals (anthropic stratum) 11000±/-115 BP			
SPECIES	%	(upper part) %	(lower part) %
1-Talpa europaea	4.1	6.2	2.0
2-Sorex araneus	4.1	4.2	4.0
3-Sorex alpinus	1.0	2.1	/
S 1-3	9.2	12.5	6.0
4-Dryomys nitedula	1.0	2.1	/
5-Sciurus vulgaris	1.0	2.1	/
S 4-5	2.0	4.2	/
6-Apodemus sylvaticus	11.2	10.4	12.0
7-Clethrionomys glareolus	26.5	25.0	28.0
S 4-7	39.7	39.6	40.0
8-Microtus arvalis	24.8	24.0	25.4
9-Microtus nivalis	13.8	14.4	12.7
10-M.(Pitymys) multiplex	12.4	9.5	15.9
S 8-10	51.0	47.9	51.0
Totale Micromammals n°	98	48	50

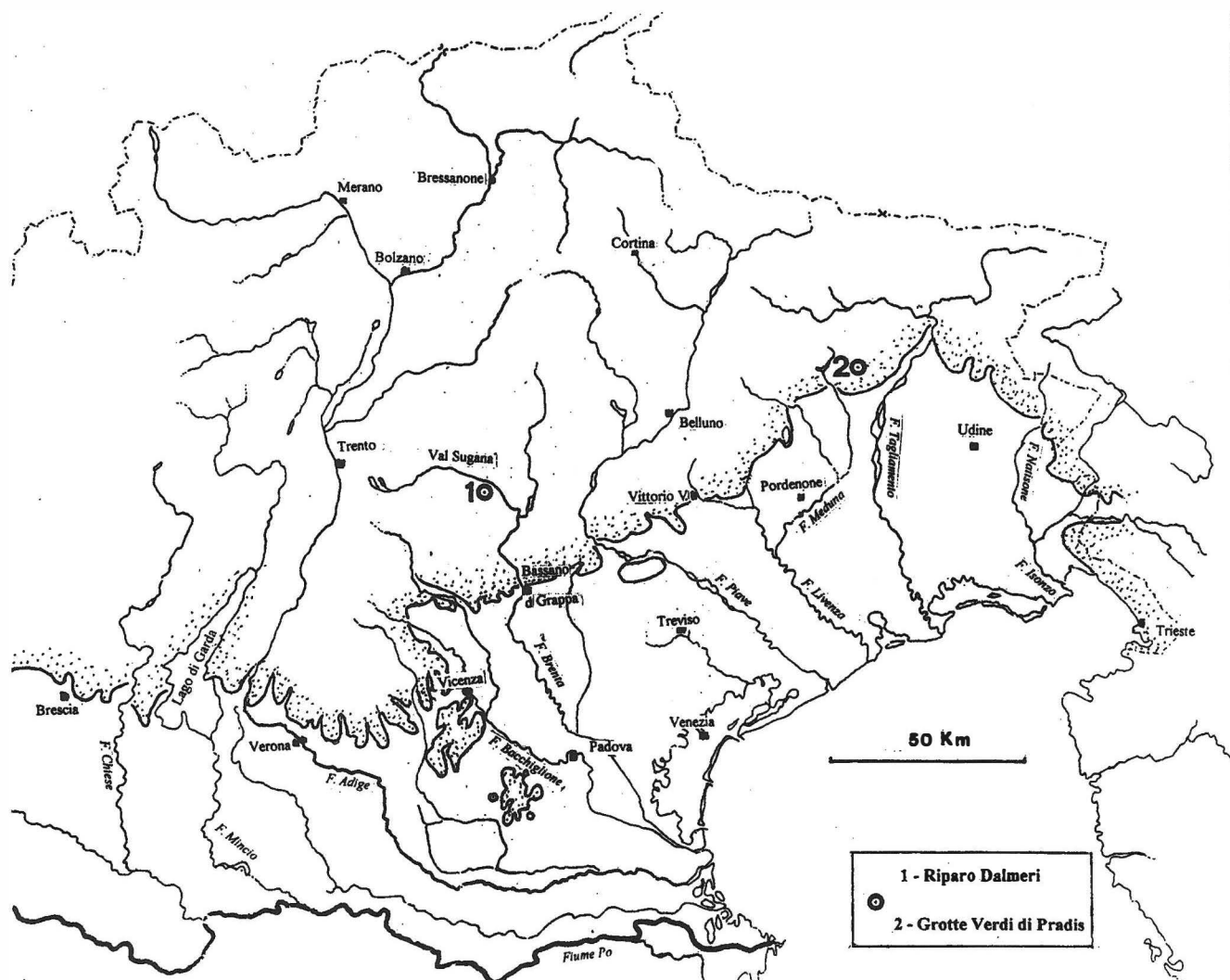


Fig. 1 - Riparo Dalmeri and Grotte Verdi di Pradis

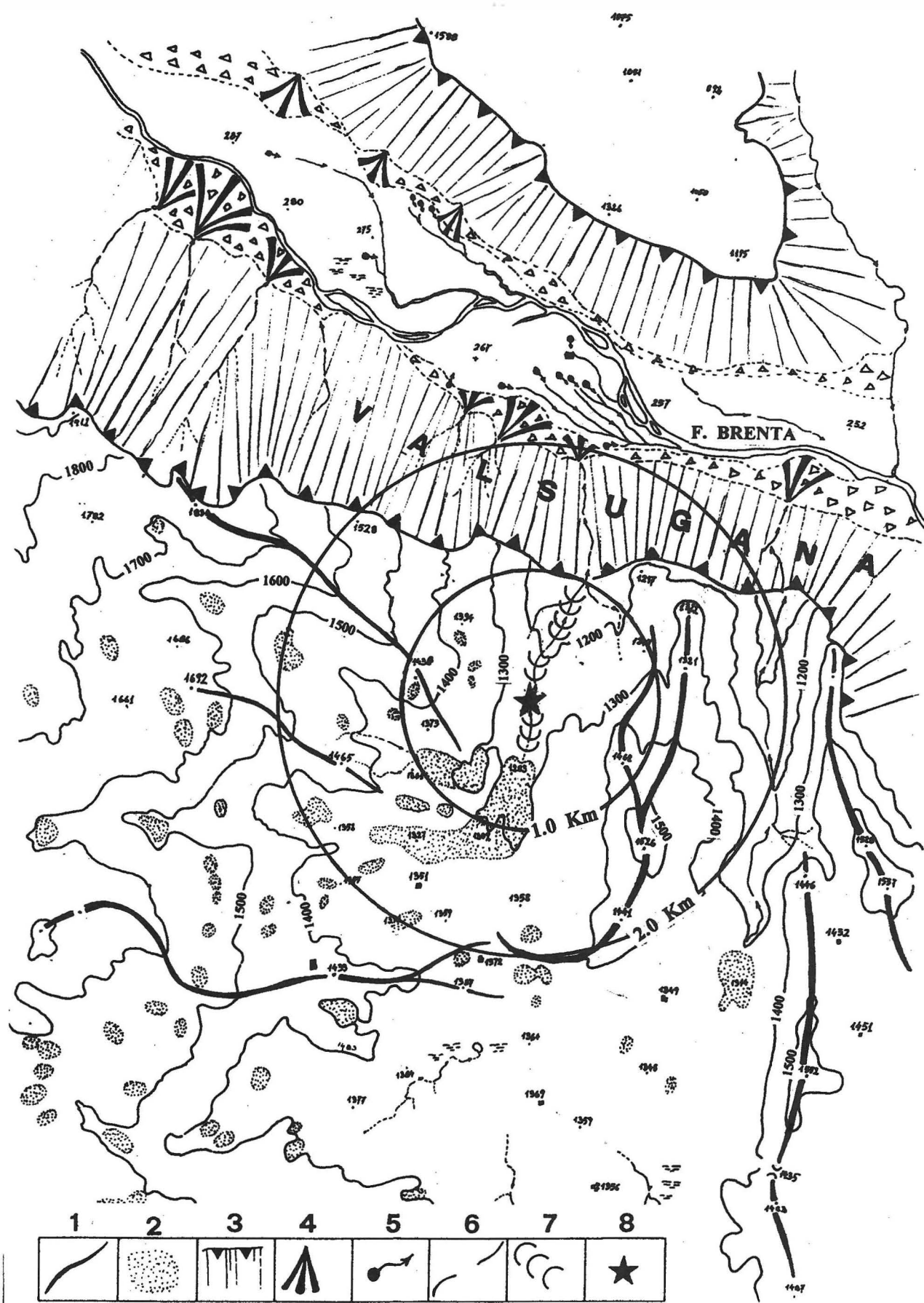


Fig. 2 - Geomorphological map: 1) watershed; 2) wide karst morphology; 3) edge of Valsugana; 4) talus cone and talus deposit; 5) spring; 6) contour interval; 7) periglacial small valley; 8) Riparo Dalmeri