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## Prehistoric environments and sites in the Eastern Alps during the Late Glacial and Postglacial

### ABSTRACT

CATTANI L., 1993 - Prehistoric environments and sites in the Eastern Alps during the Late Glacial and Postglacial. [Ambiente e siti preistorici nelle Alpi orientali durante il Tardiglaciale ed il Postglaciale]. *Preistoria Alpina*, 28: 61-70.

A synthesis of the results of pollen analyses carried out on deposits from some Palaeolithic (Aurignacian and Epigravettian) and Mesolithic sites in the eastern Alps are presented. Apart from the usual description of the floristic environment, the article attempts to highlight the problems related to the preservation of pollen in high altitude mountain sites and the palaeoecological interpretation of pollen spectra which have sometimes been very heavily influenced by anthropogenic activity.

**Parole chiave:** Archeopalinologia, Tardiglaciale, Postglaciale, Alpi orientali, Italia.

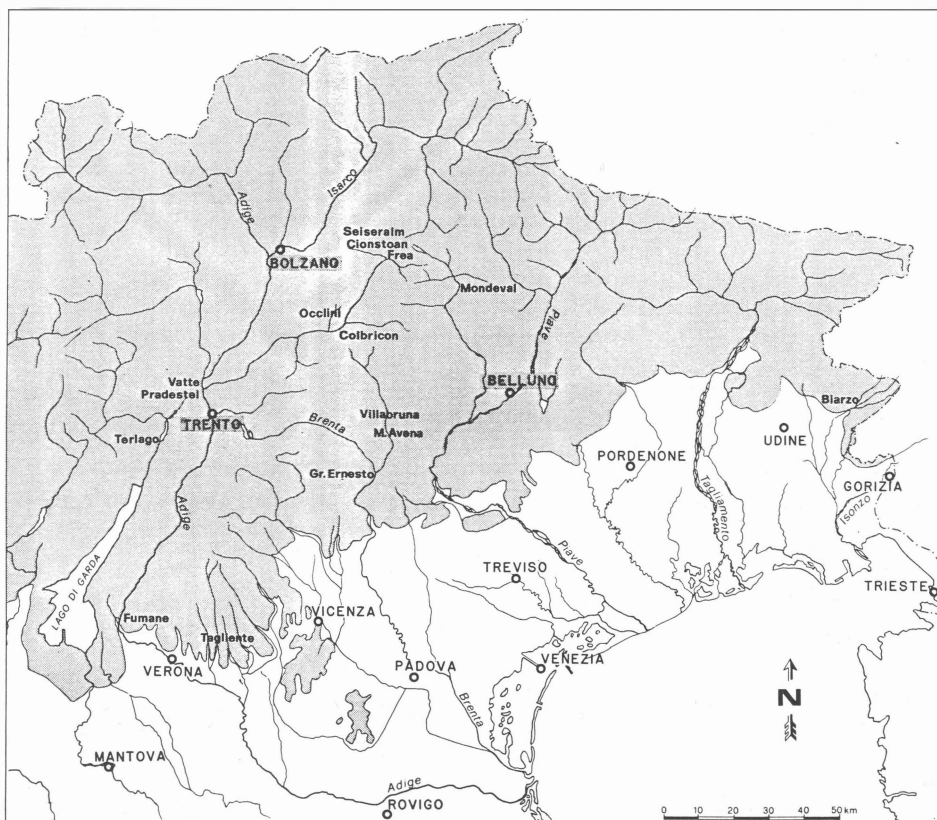
**Key words:** Archaeopalinology, Late Glacial, Postglacial, Eastern Alps, Italy.

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To consider the Late Glacial as the starting point for the history of the vegetation which follows here was not so much a choice but rather a necessity which was imposed by the absence of pollen data for older mountain sites in the eastern Alps. The deposits at Monte Avena, Riparo Fumane, and level 25 at Riparo Tagliente, in fact, have furnished no pollen documentation about the environment for the Aurignacian period.

The deposits of various mountain sites of Mesolithic age, situated in the Dolomites at altitudes comprised between 1800 and 2200 metres (BROGLIO, 1990, 1990a), have also been studied without success, such as Cresta di Siusi, Passo Occlini and Plan de Frea (fig. 1). As the chemistry of the soil is the only factor responsible for the preservation of organic matter, it was therefore obvious to expect a total absence of pollen content in the sediments of open sites which have produced only lithic artefacts. Unfortunately this is a very frequent situation in the Dolomites mountain zone, the area of our research, although it is however rich in peaty-lacustrine sediments which have preserved the pollen rain from the late Würm deglaciation onwards.

There are two exceptions to this: the Mesolithic sites of Mondeval de Sora, at 2150 metres altitude in the Val Fiorentina (Selva di Cadore, Belluno), at which charcoal and



*Fig. 1* - Distribuzione geografica dei siti esaminati.  
Location map of the examined sites.

bones have been perfectly preserved; and Colbricon near Passo Rolle (Trento), where the human occupation level has been protected by a thick layer of peat.

The Epigravettian series from Riparo Tagliente has furnished us with the only pollen diagram referable to the Late Glacial (BARTOLOMEI *et alii*, 1982; CATTANI, 1990; CATTANI & RENAULT-MISKOVSKY, 1989). The sediments of the upper stratigraphic unit, which has been dated by the radiocarbon method to the Late Glacial, are almost exclusively of anthropogenic origin (debitage from flint working, bones, ash and charcoal). In the areas which have been excavated so far it was impossible to find sediments for pollen analysis; it was therefore necessary to collect the anthropogenic debris and to wash it with distilled water in order to obtain a sample of earth to analyse. The high degree of anthropogenic activity has certainly had a large influence on the reliability of the pollen spectra, but despite this the climatic improvement of the Alleröd is clearly identifiable and in the pollen spectra the *Cichorioideae* are not over represented as normally happens in prehistoric sites in the Mediterranean basin which date from the Gravettian period onwards.

The lower part of the series (levels 16-15), which is attributable to a phase of the Dryas, is characterised by an open environment in which a herbaceous vegetation is

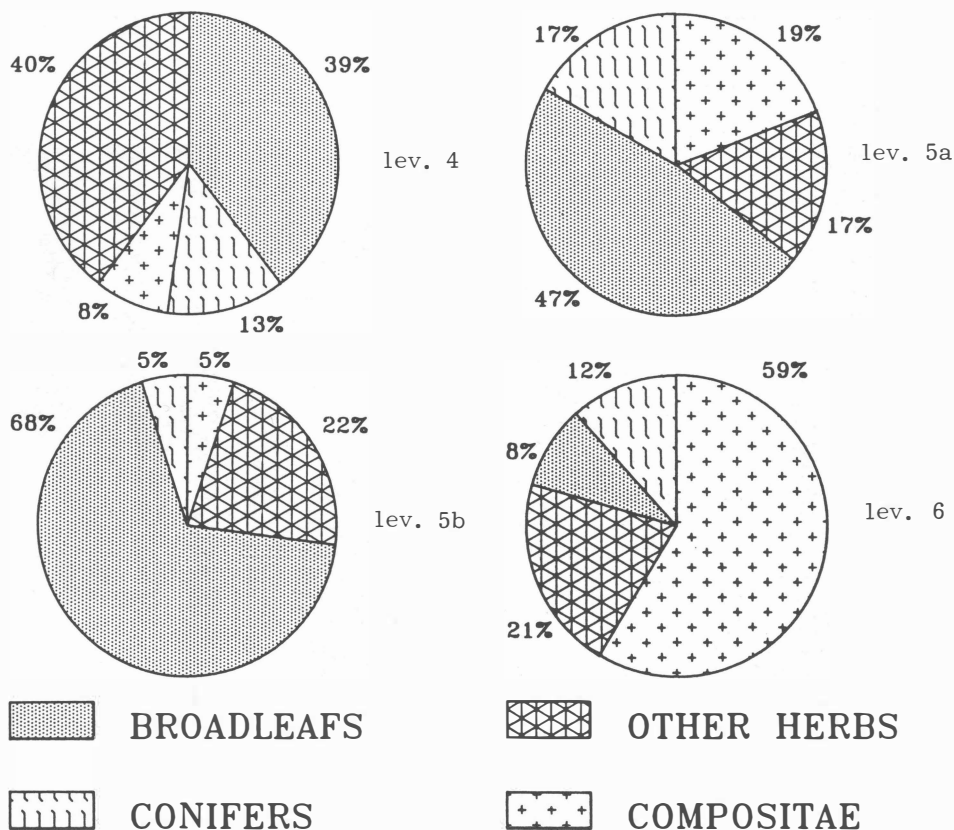


Fig. 2 - Riparo di Biarzo: spettri pollinici dei livelli paleolitici e mesolitici.  
Riparo di Biarzo: pollen spectra of the palaeolithic and mesolithic levels.

dominant, while juniper and Scotch-dwarf pine seem to play a colonizing role. A process of climatic amelioration, which starts in level 14 and peaks in levels 10 and 9, marks the Alleröd oscillation. The floristic situation in fact changes in level 14 and then remains nearly unchanged until the top of the series. The frequency of trees increases (A.P. = 50% circa); juniper disappears while pine increases, and hazel-nut and elements of mixed oak wood appear. The grassland wooded with pine and mixed oak wood marks the beginning of the expansion of the woodland. In levels 9-5 the rapid flexing of the pine curve and the contemporaneous increase in the curves of hazel-nut, linden and grasses seems to indicate a new expansion of open environments, although the percentage of the other herbaceous plants does not change significantly. *Betula*, *Salix* and *Alnus* denote the availability of surface water in the valley, and a river was in fact very close.

The impossibility of scanning better the classic pollen zones for the Late Glacial in this series of deposits is attributed to anthropogenic factors. If, however, we take into consideration the pollen sequences from non-anthropogenic deposits (lacustrine, alluvial, etc.) in various geographic areas to the south of the Alps, we do not observe substantial modifications in the floristic environment, modifications which allow us to iden-

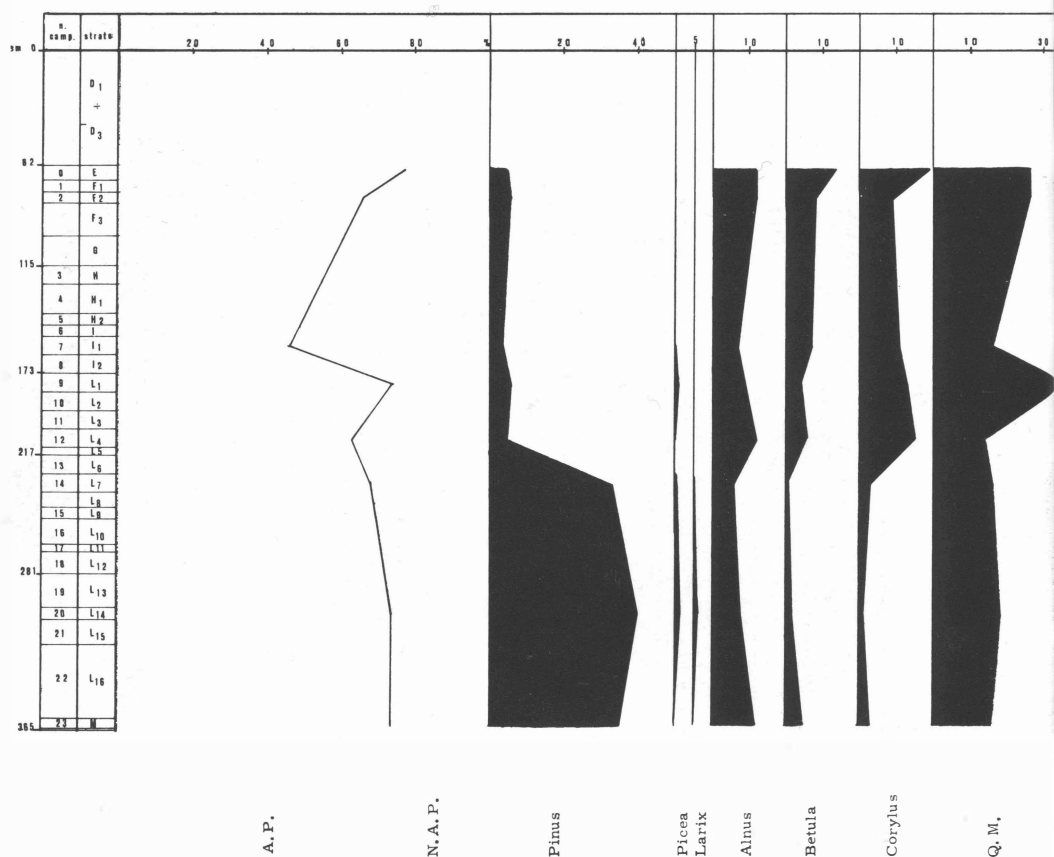
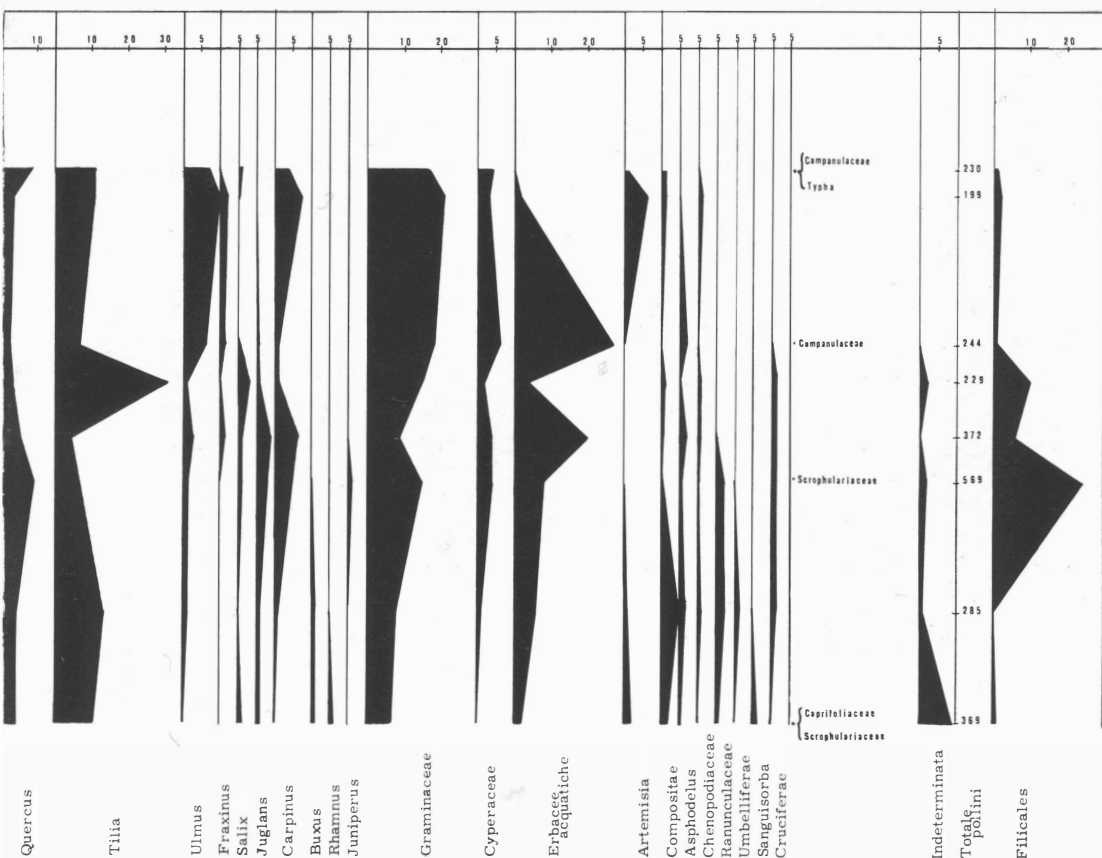


Fig. 3 - Riparo di Pradestel: diagramma pollinico.  
Riparo di Pradestel: pollen diagram

tify the pollen zones of the north European sequences in the absence of radiometric dates. In the diagrams established, for example, for the plain near Verona (ACCORSI *et alii*, 1984), for the region of Lake Garda (BERTOLDI, 1968) and for various lakes and swamps in Haute-Provence (DE BEAULIEU & REILLE, 1983), no clear variations are observed in the afforestation taxa such as to define the Bölling temperate oscillation, marked in particular by the radiocarbon dates. In contrast, the Alleröd pollen zone is always very evident in these diagrams, marked by the reappearance of elements of mixed oak wood and grassland wooded with dwarf pine.

Unfortunately, we have no pollen data for the series from Riparo Villabruna (fig. 1) where the Late Glacial has in fact been well dated. It is a sterile breccia deposit in which the only organic material is charcoal resulting from anthropogenic activities.

In the Friuli Pre-Alps, along the left bank of the river Natisone and at 150 metres altitude, is Riparo Biarzo (fig. 1) which has furnished us with evidence of the final Epigravettian, Sauveterrian, ancient and recent Neolithic cultures (BRESSAN *et alii*, 1982; BRESSAN and GUERRESCHI, 1984; CATTANI, 1985). The deposits, which are very rich in traces of anthropogenic activity, reach up to circa one metre in thickness, and have been



preserved only over a small area (fig. 2). At the base of the series the pollen spectrum of level 6, which is of an alluvial nature and culturally sterile, indicates a steppe continental environment with a predominance of *Compositae* (both *Liguliflorae* and *Tubuliflorae*) and *Graminaceae*, chronologically attributable to a phase of the Dryas (middle Dryas ?). The scarce arboreal component is constituted by *Pinus sylvestris-mugo*, *Picea*, *Corylus*, *Tilia*, *Carpinus* and *Ulmus*. This episode is followed by a phase of renewal of the woodland, referable to the Alleröd oscillation (level 5); the vegetation is enriched by pine, hazel-nut, linden, hornbeam, birch and alder. A climatic variation, due to the establishment of more temperate and humid conditions which were favourable to the *Abies-Picea* association, is documented in the following stratigraphic unit (level 4), coeval with the Sauveterrian culture. *Fagus* appears for the first time.

In this site the Late Glacial-Postglacial transition is absent; after the Alleröd the oldest climatic phase present is the Boreal. The environmental variations which mark the beginning of the Holocene are in fact illustrated by the pollen diagram from the rockshelter of Pradestel (fig. 3). This is a Mesolithic site located along the right side of the Valle d'Adige a few kilometres to the north of Trento (BROGLIO, 1984; CATTANI, 1977). The oldest part of the deposit (levels M-L6), dated between 9500 and 8500 BP, is characterised by an environment wooded with Scotch pine and some broadleaves. With the fall of the pine curve in level L4, an arboreal association constituted almost exclusively by thermophilous broadleaves appears. This is followed by the development of mixed oak wood and hazel-nut, a development which becomes more marked in the upper levels of the series (levels F-E). The climate, at first arid and quite cold, then became temperate and more humid. While level L4 marks the transition between the Boreal and

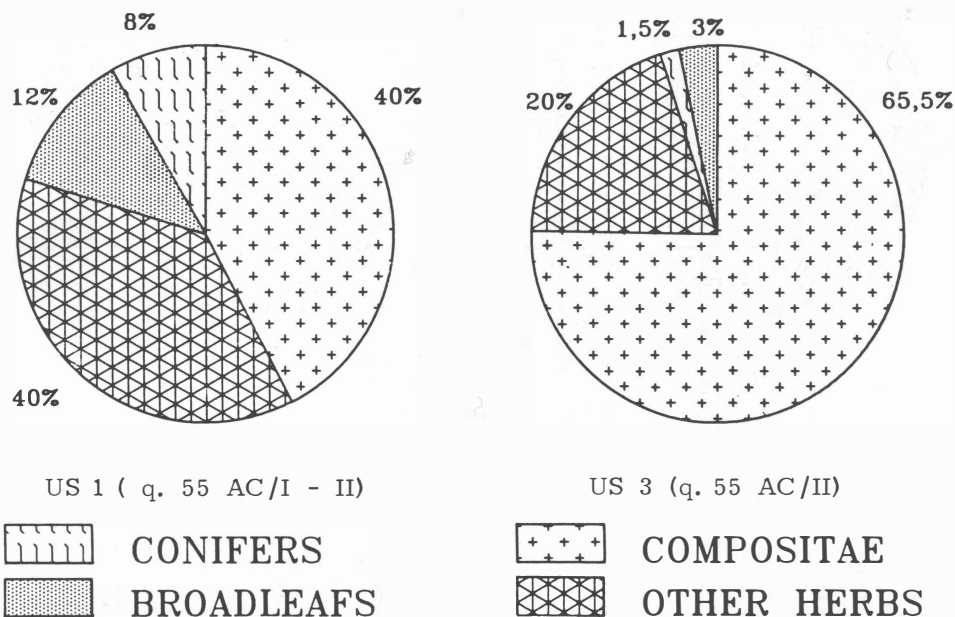


Fig. 4 - Grotta di Ernesto: spettri pollinici.  
Grotta di Ernesto: pollen spectra.

the Preboreal, level E could correspond to the beginning of a more humid climatic phase attributable to the Atlantic.

A pollen spectrum obtained from a silty level (level 8) in the nearby rockshelter of Vatte di Zambana and referable to the end of the Boreal on the basis of the radiocarbon dates, confirms the presence of an environment wooded with mixed oak wood, corresponding to that described for level F of Pradestel.

At Grotta di Ernesto (BAGOLINI & DALMERI, 1985), which opens on the northern edge of the Altopiano dei Sette Comuni (fig. 1), two pollen spectra (fig. 4) denote a steppe environment dominated by *Cichorioideae* in the human occupation level, while wooded grassland prevailed during the formation of the surface stalagmitic crust. In the first spectrum the percentage of arboreal elements is very low and includes only *Corylus*, *Tilia* and *Pinus sylvestris*; in the second the conifers (8%) are represented by *Abies*, *Picea* and *Pinus*, while among the broadleaves *Corylus* and *Tilia* are particularly frequent, even if all the elements of the mixed oak wood are already present.

A series of radiocarbon dates places the human occupation level between 9000 and 8000 BP, and the stalagmite which covers this paleosurface between 7000 and 6000 BP (unpublished data); the two pollen spectra seem to be older. Even if one considers the very high percentage of *Compositae Liguliflorae* to be an effect of anthropogenic activity, the environment must have been rich with these plants; we cannot, in fact, use the selective preservation of pollen grains to justify such overrepresentation, since all the

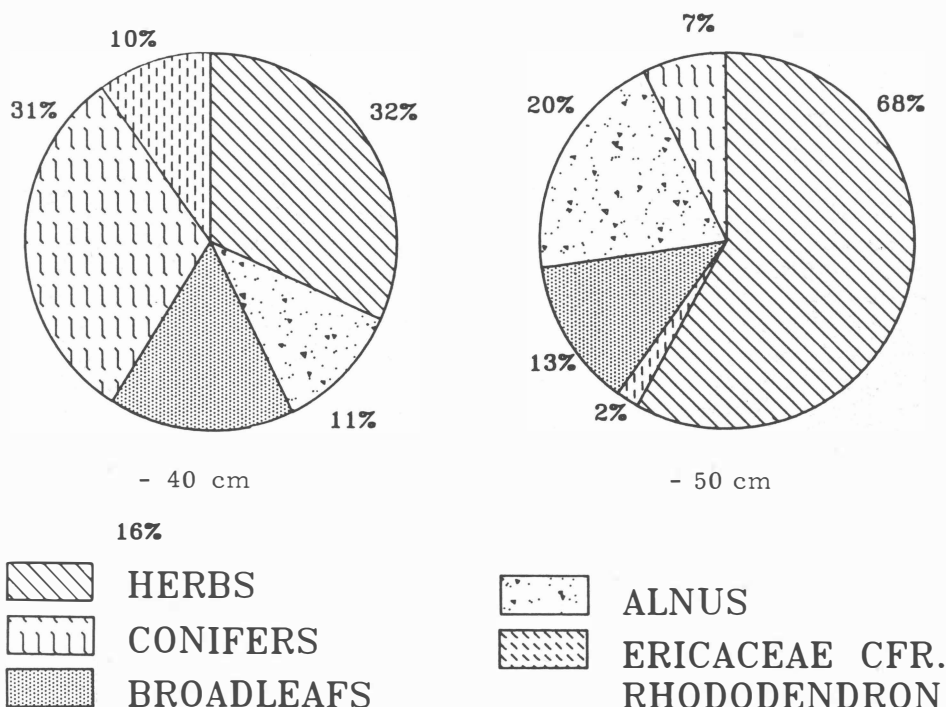


Fig. 5 - Colbricon: spettri pollinici dei livelli mesolitici.  
Colbricon: pollen spectrum of the mesolithic levels.

pollen is well preserved. The pollen spectrum in question, in our view, could refer to the recent Dryas, while the montane wooded grassland contemporaneous with the stalagmitic crust could be of Preboreal age.

Two pollen profiles support this idea. In the pollen sequence from the Sommersüss peat-bog, at 870 metres altitude and north of Bressanone (SEIWALD, 1980), the predominance of *Pinus* begins at 9135 BP and continues for a good part of the Boreal, while the diffusion of *Picea* begins at the end of the Boreal; the mixed oak wood is already present (5%).

In the profile from «Forcellona» (KRAL, 1980), a site at 1330 metres altitude on the north-east side of the Altopiano dei Sette Comuni, the lacustrine sediments at the base of the series, which are dated to the Preboreal, have given a high percentage of arboreal elements (85%). One also observes a clear dominance of pine and a discrete presence of mixed oak wood. The expansion of *Picea* is here dated to 8900 BP.

Rising in altitude there are the two Mesolithic sites of Colbricon near Passo Rolle (Trento) and Mondeval de Sora near Selva di Cadore (Belluno) (fig. 1).

The pollen analysis of site 3 at Colbricon (fig. 5), at 1980 metres altitude, denotes the existence of a montane grassland wooded with *Picea*, *Pinus sylvestris* and *Pinus cembra* (CATTANI, 1983). The scarce density of woodland also allowed pollen transport from the vegetational zones of lower altitudes, which are here represented by linden, hazel-nut, elm, beech and birch. The herbaceous vegetation of Alpine grassland is associated with shrubs such as alder and rhododendron, the latter being more abundant in the upper level examined (-40 cm).

At Mondeval de Sora (GUERRESCHI, 1990; ALCIATI *et alii*, see page 351) the pollen spectrum of the level with the burial also denotes a montane grassland rich with *Compositae* (42% *Cichorioideae*). The arboreal taxa present here are: *Picea*, *Pinus sylvestris-mugo*, *Alnus*, *Carpinus* and *Corylus* (fig. 6).

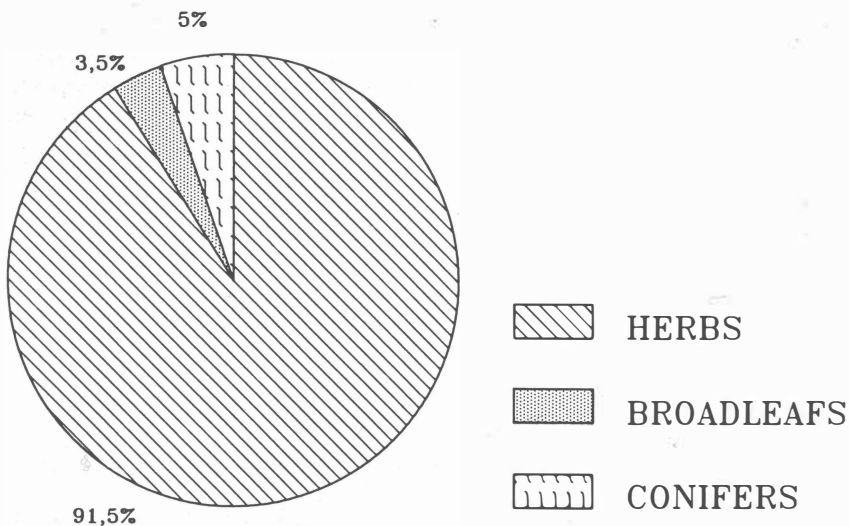


Fig. 6 - Mondeval de Sora: spettro pollinico del livello della sepoltura.  
Mondeval de Sora: pollen spectrum of the burial level.



## Conclusions

In conclusion, the principal observations which one can extract from these isolated and fragmentary pollen spectra defined for these principal late Palaeolithic and Mesolithic sites of the Alpine and Pre-Alpine area are as follows:

- The Late Glacial pollen zone which is best identifiable is the Alleröd temperate oscillation which follows the end of the domination of continental steppe environments; the diffusion of hazel-nut, a heliophilous plant, unequivocally marks its beginning. We note in the pollen diagrams of the cave and rockshelter sites in north-east Italy that linden is also an excellent indicator of this climatic amelioration, as is the mixed oak wood which appears first.
- The reforestation with Scotch pine during the Preboreal, which is well marked in the diagram from Pradestel, and the following diffusion of mixed oak wood even at mid altitudes, documents the climatic amelioration of the Boreal.
- The Sauveterrian Alpine sites are characterised by montane grassland environments.
- Despite the sometimes excessive presence of *Compositae Liguliflorae*, which alters the validity of the frequencies of the other taxa, the pollen spectra can be compared and correlated with the continuous sequences of Late Glacial and Holocene age which are especially numerous and detailed for the Trentino and Alto-Adige area.

## RIASSUNTO

Lo studio archeopalinologico, qui sinteticamente presentato, di vari siti paleolitici (aurignaziani ed epigravettiani) e mesolitici, distribuiti nella fascia alpina e in quella prealpina dell'area geografica veneto - tridentina, evidenzia per prima cosa la frammentarietà dei dati. Gli insuccessi ottenuti per i siti montani, i cui sedimenti hanno restituito solo materiale litico, sono infatti numerosi e non consentono di definire un quadro floristico generale. In tali casi è indispensabile ricorrere, non solo come supporto, alle sequenze polliniche continue che sono fortunatamente numerose per l'area in questione.

Gli spettri pollinici ottenuti per il Tardiglaciale documentano bene, nonostante l'antropizzazione dei sedimenti, l'oscillazione temperata di Alleröd con la diffusione del nocciolo e del tiglio, che è l'elemento del Querceto misto che nei depositi di grotta è meglio rappresentato.

Il diagramma pollinico di Pradestel documenta invece la reforestazione in atto nel Preboreale, con boschi a pino silvestre, e la successiva diffusione del Querceto misto durante il Boreale.

I siti alpini di età sauveterriana denotano infine ambienti a prateria montana.

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