

THE MIDDLE AND UPPER PALAEOLITHIC OF SWITZERLAND (ISOTOPIC STAGES 2 & 3) : CHRONOLOGY, CULTURES AND ENVIRONMENT

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ABSTRACT

Because of the mountain-mass and the climatic changes in Switzerland, the prehistoric population had to withdraw from most of the territory during glacial episodes. As the climate improved, new groups came again to settle on virgin lands. More than elsewhere, Swiss prehistory is dependent on the fluctuations of ice-retreat. The chronostratigraphy of OIS 3 and 2 to this day is fairly well known in the Jura and the Swiss Plateau thanks to the numerous studies of geologists and palynologists, but the archaeological sites, not plentiful and often ill-dated, allow but a partial reconstruction of a settlement dynamic.

The first period of Palaeolithic settlement supported by evidence occurs in the Late Middle Palaeolithic during the Interstadials of Dürnten and Hengelo in the Middle Würm (OIS 3). The last Neanderthal groups are still present around 29'000 BP, during the Interstadial previous to the beginning of the Last Pleniglacial. It ensues that they have been contemporary with the first groups of Cro-Magnons present in the South of Germany. The land is then forsaken from 28'000 to 18'000 BP during new ice-phases.

The Upper Palaeolithic migratory move on territories freed by ice-retreat starts around 18'000 BP from French Old Magdalenian cultural centers. The first stage during the Oldest Dryas (Dryas I, 18'000-13'500 BP) only appears in two sites in the Birse valley (North-West of Switzerland). The transition Oldest Dryas/Bölling (13'500-12'600 BP) corresponds to a first extension of an Old Upper Magdalenian as far as the regions of Lake Constance and Lake Neuchâtel. During the Bölling Interstadial (12'600-12'000 BP), the Swiss Plateau and the foot of the Jura are massively colonized by classical Upper Magdalenian groups. The end of Magdalenian times is characterized by shoulder-points and broken-backed points cultures. During the Bölling, the so-called "cold fauna" and its related Reindeer disappear together with the Magdalenian. The transition Bölling/Alleröd seems to be a colder short episode (Dryas II or Older Dryas) which does not seem to affect the vegetation consequentially. During the warm stage of reforestation of the Alleröd (12'000-10'700 BP), as well as the cold period of the Younger Dryas (Dryas III, 10'700-10'000 BP), Late Palaeolithic hunters go on spreading settling on higher altitudes in the Jura and in the Foreland.

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The attempt to set the Swiss Palaeolithic settlement dynamic during OIS 3 and OIS 2 is still but an approach. However, because of its mountain-mass, because of its geographic position right in the middle of Europe and at the cross-roads of varied cultural influences, Switzerland offers quite an interesting and promising territory for the study of modes and factors in the establishment of patterns of settlement dynamic on new lands after ice-retreat.

RESUME

Périodiquement, en raison du caractère montagneux de la Suisse et des changements climatiques, les populations préhistoriques ont dû abandonner la majeure partie du territoire durant les périodes glaciaires. Lors du réchauffement suivant, de nouveaux groupes sont revenus coloniser un territoire vierge. Plus qu'ailleurs, la préhistoire helvétique est conditionnée par l'alternance des glaciations. La chronostratigraphie des stades 3 et 2 est aujourd'hui assez bien connue au niveau du Jura et du Moyen Pays (Mittelland ou "Plateau suisse"), grâce aux nombreux travaux des géologues et des palynologues, mais les gisements assez peu nombreux et souvent mal datés ne permettent qu'une reconstitution partielle de la dynamique de peuplement.

La première période de peuplement paléolithique bien attestée correspond au Paléolithique moyen final durant les épisodes interstadias Dürnten et Hengelo du Würm moyen (Stade isotopique 3). Les derniers Néandertaliens sont encore présents vers 29'000 BP, lors de l'interstade précédant le début du dernier Pléniglaciaire. Il en résulte qu'ils ont été les contemporains des premiers Cro-Magnons attestés dans le sud de l'Allemagne. Le pays est ensuite déserté de 28'000 à 18'000 BP pendant les phases glaciaires.

La reconquête des territoires libérés par les glaces débute vers 18'000 B.P. à partir des foyers culturels magdaléniens anciens français. La première phase durant le Dryas I ancien (18.000-13.500 BP) n'est attestée que par deux sites dans la vallée de la Birse (NW de la Suisse). La transition DryasI/Bölling (13'500-12'600 BP) correspond à une première extension d'un Magdalénien supérieur ancien jusque dans les régions des lacs de Constance et de Neuchâtel. Durant l'interstade de Bölling proprement dit (12'600-12'000 BP), on assiste à une colonisation généralisée du Moyen Pays et du pied du Jura par des groupes magdaléniens supérieurs classiques. La fin de l'occupation magdalénienne correspond à des faciès particuliers caractérisés par l'apparition de pointes à cran et de pointes à dos anguleux. Avec le Bölling disparaissent le Magdalénien et les faunes froides marquées par le Renne. La transition Bölling/Alleröd semble n'être qu'un court épisode plus froid dont l'effet ne s'est pas traduit au niveau de la végétation. Aussi bien pendant la phase forestière de l'Alleröd (12'000-10'700 BP) que pendant la phase froide du Dryas récent (10'700-10'000 BP) des groupes de chasseurs épipaléolithiques poursuivent la conquête de territoires de plus en plus élevés dans le Jura et au pied des Alpes.

L'esquisse de la dynamique du peuplement paléolithique helvétique pendant les stades isotopiques 3 et 2 est encore très incomplète. Cependant, la Suisse, en raison de son relief montagneux et de sa position géographique au coeur de l'Europe et au carrefour d'influences culturelles variées constitue un secteur particulièrement intéressant et prometteur pour l'étude des mécanismes et facteurs de peuplement de nouveaux territoires après les phases glaciaires.

1. INTRODUCTION

The first period of wide-spread Swiss prehistoric settlement well supported by the evidence, occurred mainly during the mild climatic stages of the Middle Würmian complex, namely at the beginning of the isotopic stage 3 (OIS 3). The particular location of Switzerland right in the middle of Europe as well as its mighty mountain mass offers quite an interesting pattern for prehistoric settling in high-altitude territories and the study of migration of the ethnic groups whether related to the Rhenish and Danubian Lands, to the French area (Saone-Rhone axis) or related to the Adriatic Mediterranean world by the plain of River Po. Swiss prehistory is absolutely depending on variations of the climate during the last glaciation.

Today, it is still difficult to establish a complete and detailed chronology for the periods previous to the Late Glacial. As regards OIS 3, chronology is essentially based upon the morainic sequences of the Swiss Plateau, in particular on the mighty stratigraphies of the Zurich Oberland (Schlächter 1986, 1989, Schlächter et al. 1987) and of the Bernese Oberland (Wegmüller 1991, 1996). In the Eighties, Max Welten had set forth a palynologic chronology founded on diagrams issued from the Vosges mountains and from the Alpine Foreland which he compared with the classical profiles of the reference sites Amersfoort and Odderade (Welten 1982, 1988). This chronological frame, still correct, in the main, has been lately more accurately defined in recent studies (Ammann 1993).

2. CHRONOLOGY AND ENVIRONMENTAL DATA (FIG. 1)

The Swiss Würmian chronology inferred from the study of the major lakes and glacial stratigraphies of the Foreland on the data line of the latest works of geologists (Schlächter 1995, Schlächter & Wohlfarth 1993) and palynologists (Ammann 1993, Burga & Perret 1998) has been synthesised in figure 1.

The Middle Würm (OIS 3) is far less well known than the Late Würm (OIS 2). This long period (isotopic stage 3) is characterised by quite an important glacial retreat. At Gossau, at least two major interstadials can be observed. They begin around 55'000 and 40'000 BP. We name them Dürnten and Hengelo (Le Tensorer 1998, p. 85). A cold period (Turicum 4) takes place between these interstadials. Then, occurs a mightier glacial stage during which the Swiss Plateau remains free from ice but still under periglacial conditions without vegetation (Turicum 5, permafrost on the Plateau, 33'000-29'500 BP) before ending in a weaker third interstadial (Denekamp, around 29'500-28'000 BP). The Middle Würm in

Switzerland corresponds to the first major period of Mousterian settlements in the Jura and even in the Alps as high as 1500 m or more. The Late Würm (around 28'000 to 10'000 BP, OIS 2) can be divided into two periods :

- The Upper Würmian Pleniglacial stage, which can be subdivided into two main glacial advances, occurring after 28'100 BP and between 23'000 and 18'000 BP.

- The Late Glacial general deglaciation (18'000-10'000).

The Upper Pleniglacial corresponds to the latest main glacier advance whose major extension is located on the Swiss Plateau after 28'100 BP (Killwangen maximum) but whose oldest period seems to develop later around 20'000 BP, showing then a weaker extension of the glaciers due to a drier period. During these times, even though the areas were free from ice in the north-west of Switzerland they seem to have been completely forsaken by men and animals.

The Late Glacial chronology can be approached on different levels, particularly in studying the phases of retreat of the main glaciers and the evolution of the landscape, as well as in defining the different vegetation stages due to the colonisation of the soil by the plants as they relate to the climatic changes. Another approach would consist in studying the variations of the level of the great lakes. Whatever approach we choose, the great time units which are thus brought out arise from the same event : The coming out of a great climate instability which results in a general warming up interrupted at intervals by colder periods. This deglaciation starts around 18'000 BP and ends about 9'500 BC. The Late Glacial shows different steps of rapid warming up around 16'000, 14'500, 12'600 and 10'000 BP which all led to ice decay and the reduction of the great alpine glaciers to their present state (Schluchter & Wohlfarth 1993).

- First stage : Lower Late Glacial or Oldest Dryas (18'000-12'600 BP)

As we study the setting up of the present great lakes and the variations of their level we observe that the melting of glaciers had been well under way 18'000 BP years ago and that the lakes of Zurich and Lugano were completely free from ice way back in 15'000 BP. From that time on, we notice a slow retreat of glaciers in alpine valleys. As they are supplied with waters issued from ice-melting, in all the great lakes a rise of the water-level as well as a rapid deposit of detrital materiel is recorded. As glaciers retreat, bare soils appear and they are feebly colonized by a steppe embryonic vegetation. This tundra- type glacial landscape must have been monotonous and quite partitioned by large streams with manifold branches feeding lakes which were larger than nowadays. The soils almost bare or showing very little vegetation and liable to an intense splitting up due to the periglacial phenomena were submitted to a severe erosion which concurred to bring about a significant bulk of detrital sediments which gathered into fluvio-glacial deposits of gravels, sands or silts. In all outwash plains large seasonal deposits of loess in the Lake Constance can be observed all along this first period which ends around 14'500 BP.

From 14'500 BP on, a change in the lacustrine sedimentation which becomes finer and more organic is to be noted. It shows that vegetation has stronger hold on soils which it stabilizes and ensures from erosion while higher altitude lakes, recently freed from ice, still display detrital material sedimentation. The study of morainic deposits enable to define stages of glacial retreat more or less well-correlated between different valleys. In all great lakes, pollens which were not present in older levels, are now abundant and enable a more detailed reconstruction of the paleovegetation. On the Swiss Plateau, macrofossil finds point out to different phases (local PAZ). They all correspond mainly to an *Artemisia*-Steppe, heliophilous and gramineous plants. Towards the end of this period, between 13'500 and 12'600 BP, *Betula nana* start to grow and spread followed by *Juniperus* and *Salix*. This change in vegetation is foreboding quite a milder period, the interstadial "Bölling/Alleröd" complex. It is during this transition stage that the major phase of Magdalenian settlement will develop in Switzerland.

- Second stage : Middle Late Glacial or Interstadial Bölling/Alleröd complex (12'600-10'600 BP)

The next phase showing a climatic improvement leads to an important and rapid change from a steppe into an arboreal vegetation. The beginning of the Bölling interstadial is well characterized by a rapid development of juniper and arboreal birch. These modifications of the climate and vegetation appear clearly in the lacustrine sedimentation. In fact, up to 2000 m above sea-level, deposits of clay beds and lacustrine chalk layers as well as peat strata can be observed. As gyttja occurs in these horizons it points out to a complete vegetation growth over the slopes of the lakes, to the stabilization of the vegetation and to very quiet conditions of sedimentation. This phase, called at time "Tardi-Würm Interstadial" takes place around 12'600 BP. In terms of sedimentology, the gyttja level occurs during the Bölling and the Alleröd. Between these two interstadials a thin layer of silt could correlate with a short cold period ("Dryas II", older Dryas). The "Bölling/Alleröd" period was a continuous complex whose warmest episode occurred during the Alleröd. This is the reason why most of the searchers think that the older Dryas never took place as a real glacial stage during the Late Würm. And yet, the study of the oscillations of oxygen isotope ratios in the Swiss lake sediments show for this period a feeble variation which can be ascribed to a fluctuation of the temperature. The Dryas II, would be then a short phase covering only around 100 years and which would have been too short to allow a significant change of vegetation related to this climatic deterioration (Burga 1988). Before this episode, the reindeer disappear from Switzerland while forest species such as red deer, roe deer and wild boar develop (Rentzel et al. 1999). Around 12'000 BP *Pinus sylvestris* grows rapidly. It is the beginning of the Alleröd. This stage appears mainly as a phase during which forest gains over the landscape. The limit Bölling/Alleröd is, most of all, biostratigraphic. In the sediments of the Alleröd, a thin level of volcanic ashes originated from the volcano of lake Laacher in the Eiffel region of Germany can be observed most of the time. It is a most valuable chronostratigraphic pointer, as the eruption is dated 11'000 BP (Bogard 1983). About 200 years after the deposit of this ashes layer, the climate shows signs of degradation. The pine forest weakens and *Artemisia*, *Juniperus* and heliophilous plants gain over bare zones. Erosion phenomena begin again.

This cold period, Younger Dryas, represents the last glacial assault before the final warming up of the Holocene.

- Third stage : Upper Late Glacial or Younger Dryas (10'600-10'000 BP)

Sedimentologic evidences of the last Würmian deterioration of the climate can be found everywhere in Switzerland. In the Alps, the sediments seldom include horizons rich in organic matter and they show signs of erosion which, again, starts to affect bare soils. Hydrogen and Oxygen Isotope ratios in fossil ice point to a decrease of the average temperature of 5 to 7°C. This general fall in temperature brings about a new lowering of the water-level in the great Lakes. The soils start to be denuded again and periglacial activity resumes its work. The whole context paves the way for erosion phenomena giving birth to pebbles and sands deposits. We can assume that the upper timber-line falls by a few hundreds of meters while, in the plains, there is an increase of non- arboreal plants, particularly of gramineous plants and *Artemesia*. The ice-age, as well as the cultures of the Epipalaeolithic end with this last cold episode.

3. THE DIFFERENT TYPES OF SITES. THEIR DISTRIBUTION.

The enclosed table gives a general listing and major references alike.

3.1. Late Middle Palaeolithic. (Fig. 2)

As for the site types, the Mousterian sites can be subdivided into three main groups (Le Tensorer 1998) : open-air settlements, caves or rock-shelters and, at last, high-mountain sites in the caves of the Alpine Zone. The data for the different sites are of quite unequal value and dating remains a major problem. The Alpine sites were clearly non-existent during glacial advances as the glaciers were much too close. This is the reason why the first searchers were prone to think that these high-mountain sites belonged to the last Interglacial (Eemian). Most of Mousterian dwelling sites can be correlated with milder phases of the Mesowürmian complex as demonstrated by recent studies. Most of open-air sites have probably been wiped out by erosion. Consequently this site type is under-represented if we compare it with the better preserved cave dwellings. However, if we consider the distribution of Mousterian open-air sites, (they are numerous in France and Italy), we come to the conclusion that they are impressively becoming scarce as we get closer to mountainous areas, which is the case in Switzerland and Austria.

Neanderthal Men clearly chose plains and large valleys for their long lasting camp site while they most likely looked for caves or shelters for their halting-place when they ventured into the mountains. In Switzerland, Mousterian open-air sites are scarce and limited to the North of the Jura and to the Rhenish plain around Basle. They are always located on a low level and are, as yet, unknown in the Alpine zone. In general, open-air camp sites show a single archaeological layer and represent a single period of occupation. There are, however, a few exceptions, a few sites among them having been occupied more

than once in the course of Middle Palaeolithic, as illustrated in Pré Monsieur (Stahl-Gretsch, Detrey et al. 1999) where larger Mousterian debitage work-shops yielded over 100'000 artifacts. Dating all these open-air sites is difficult. The evidence of a geological context and of the fauna (when preserved) leads us to place these occupations during one or several interstadials of the Older Middle Würm before or after the first major Pleniglacial.

Rock shelters or caves sites are more numerous than open-air sites and are distributed on either side of the Jura at an average level ranging from 350 m to 700 m above sea-level, except for a few high-mountain cave sites such as Les Plaints (1120 m). They are concentrated in the river Birse area and, further away on the elevations over the region south from Neuchâtel where the famous cave of Cotencher still remains the major Mousterian Swiss site almost a century after the first excavations of Dubois and Stehlin in 1916. As fixed locations, contrary to open-air sites, cave sites have been repeatedly occupied as, most of the time, the entrance can be easily spotted at a glance and as they offer a stable dwelling at disposal when free from unwelcome guests. In fact, these caves are very often roomy places which were perfect shelters for the cave bear, the bones of which represent almost all the animal remains in prehistoric sediments. Man must have been cautious as he dared venture into these caves, possibly in the summer-time, when the dangerous animal was away. The remnants left over by the Mousterians are generally scarce but they nevertheless point out to varied activities.

On the periphery of the Alpine arc, a number of caves opening at utterly different levels from 600 to 2000 m or more above sea-level were dwelling sites in Middle Palaeolithic times. As already mentioned, they were used as dens by cave bears. Because of the intense action of frost within the layers in the sediments, the artifacts have been distorted. Consequently, they show abrupt pseudo-retouches and are completely weathered. This crushing has altered the original shape of the implements to such an extent that it is impossible to determine to which type they belong. It ensues that all the Alpine industries present a more or less similar facies. Therefore, many authors were led to consider this culture as being specific of Alpine territories and named it "Alpine Palaeolithic or Alpine Mousterian". At the present, they are considered as having been high-mountain hunting sites related to the Mousterian cultures of the plains (Le Tensorer 1987).

3.2. Upper and Late Palaeolithic.

On the distribution map of the Swiss Late Palaeolithic sites (fig.3) we note at once that the extent of the distribution is nearly limited to the Jurassic arc from Geneva of Schaffhouse. Only a few open-air sites have been discovered on the Plateau such as Moosbühl for example, the sites of the region of Olten and, lately, brought to the light at the foot of the Alps, the open-air settlements of Einsiedeln (Leuzinger-Piccand et al.1995) and sites in the region of Lucerne and Zug (Nielsen 1994, 1996). The distribution map is essentially depending upon the conditions of research in the given areas and offers but a glimpse of the actual state during the Magdalenian and the Late Palaeolithic. So far, we are aware of 100 Tardiglacial sites in Switzerland but they are of different significance from one site to the next in time as well as in space.

The first Magdalenian sites amount to two small cavities in the Birse river basin while the classical Upper Magdalenian extends over all regions from Schaffhouse to Geneva, and on the way around Olten and Moosbühl. These sites, to the number of 26 are somewhat well distributed between caves of small amplitude, rock shelters and open-air camp-sites.

The dwelling places of the shouldered and broken backed points Magdalenian, as well as a few sites of the end of the Ice-Age, for which we cannot establish for a fact to which type they belong, are preferentially located in small caves or on open-air sites. At last, the Azilians and other Epipalaeolithics chose more often open-air sites or rock shelters than caves for their dwelling-place.

If we bear in mind the small number of sites, these considerations are of poor statistic significance and yet, they seem to be in support of a trend. If we consider the altitudes and the site-types it is obvious that Man, in Tardiglacial times, occupied more and more varied territories, higher and higher up in course of time. A subdivision of the Tardiglacial sites which takes into account the abundance of archaeological artifacts, the extent of the activity area and the presence of hearths or other structures, leads to distinguish the large sites, usually considered as main dwelling sites, from minor camp-sites or occasional halting-places scattered at a more or less large distance around the major basic sites.

4. SETTLEMENT DYNAMIC OF THE MIDDLE AND LATE PALAEOLITHIC.

4.1. Middle Würm settlement (OIS 3)

As regards Middle Palaeolithic, we have to consider that Neanderthal Men of the Mediterranean type started to spread during the Old Würm. Coming up the Rhone Valley they very likely reached the Swiss Jura following a route along the foot of the mountain or using longitudinal depressions along the range. These populations might have settled in Cotencher for example (Adate et al. 1991) during an improvement of the Würm and during the first interstadials of the Middle Würm (beginning of OIS 3-Dürnten/Hengelo). They disappeared afterwards probably because they had been either extinct or made to leave as glacial conditions prevailed again. Then, a more robust type of Neanderthal Man took refuge in the mountains during the last Interstadial of the Middle Würm. Assuming that the hypothesis is correct, Neanderthal people were on the verge of their final extinction. We can surmise that they constituted a residual population on territories where the Cro-Magnons had not yet ventured. If the dating (around 29'000 BP) not only of Saint-Brais (Reusser 1967) but also of Gigny, layer VIII, in the French Jura (Campy et al. 1989), is correct, we can positively state that Neanderthal Man has been contemporary with the first modern Man and this, during several thousands of years.

4.2. Late Glacial settlement (OIS 2)

Settlements on territories freed after ice retreat started quite obviously from several regional places which Man had not entirely forsaken during the previous

cold period. On the whole, migration comes from West and South-West, in other words from well-known Magdalenian centers on the French territory. The migratory move of the first Magdalenians to Switzerland started from the Rhone/Saone axis but, as the huge Rhone glacier was barring the way into the country in the area of the Lake of Geneva, the approach to the land took place in the Swiss ice-free North-West region.

- First stage : oldest Dryas (18'000-13'500 BP)

As soon as 16'000 BP the ice decay had been significant enough to allow a general pioneer occupation on low territories. The Magdalenian appears first in the Birse valley in the Kastelhöhle. This pioneer incursion relates to the Old Magdalenian (Schweizer and al. 1959 ; Le Tensorer 1986a, 1998) as supported by the evidence of all analyses but it seems to be a side-phenomenon. After this first try, the following Magdalenian migrations are known for certain only towards the end of the oldest Dryas. It relates to the Old Upper Magdalenian (cf. French Upper Magdalenian IV.) in the region of Schaffhouse in the Kesslerloch cave (Höneisen et al. 1993). Between these two migratory moves a level, in the Birseck Ermitage cave, yields a Magdalenian assemblage with triangles (Leesch 1993) which could belong to the Middle Magdalenian (cf. French Magdalenian II-III).

- Second stage : transition between the Oldest Dryas and the Bölling (13'500-12'600 BP)

It is the first major step of the Magdalenian settlement in Switzerland (Le Tensorer 1990). From centers such as Schaffhouse and the Birse valley, sites become numerous and diversified. Man settles in smaller valleys and starts to choose his dwelling on higher altitudes (around 500m above sea-level). Hunting is varied and the sites specialized either in small game such as willow grouse (*Lagopus lagopus*), arctic hare (*Lepus timidus*) or arctic fox (*Alopex lagopus*) or in mountain species such as Alpine Ibex or in big game, large mammals such as reindeer or horse. This first stage of colonization is very likely linked with a warming up of the climate as the conditions tend to improve but the so-called " glacial fauna " has not disappeared yet.

- Third stage : the Bölling (12'600-12'000 BP)

The extension goes on and spreads both over the Plateau and to higher altitudes. As they come from the Savoy the Magdalenians settle in the region of Geneva reaching the farther end of the lake. Before the climatic optimum the reindeer disappears and, by way of consequence, the Magdalenian cultures are replaced by the Epipalaeolithic ones.

- Fourth stage : the Alleröd (12'000-10'700 BP)

During the warm phase of reforestation of the Alleröd, the new hunters belonging to Azilian groups are established along the Jura border, while, on the Plateau, other Epipalaeolithic cultures appear.

5. CONCLUSIONS

Considering that the evidence at our disposal is still unsatisfactory because it is too thin and partial at times, this attempt to set a settlement dynamic during OIS 3 and 2 in Switzerland represents a first approach.

New discoveries, excavations and datings are necessary to support a more detailed synthesis all the more since the country is worth it. Switzerland represents in fact quite an exceptional territory if we want to understand pioneer phases of settlements. As the topography of the mountain-mass allows glaciers to develop, the fluctuations of the ice-masses induce a dynamic of people in motion coming or going in turns on virgin lands freed by ice retreat and because of its geographic location on the other hand, it stands in the middle of the European cultural differences.

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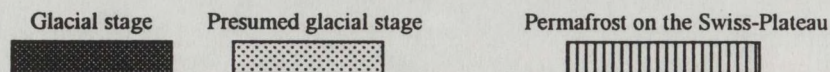
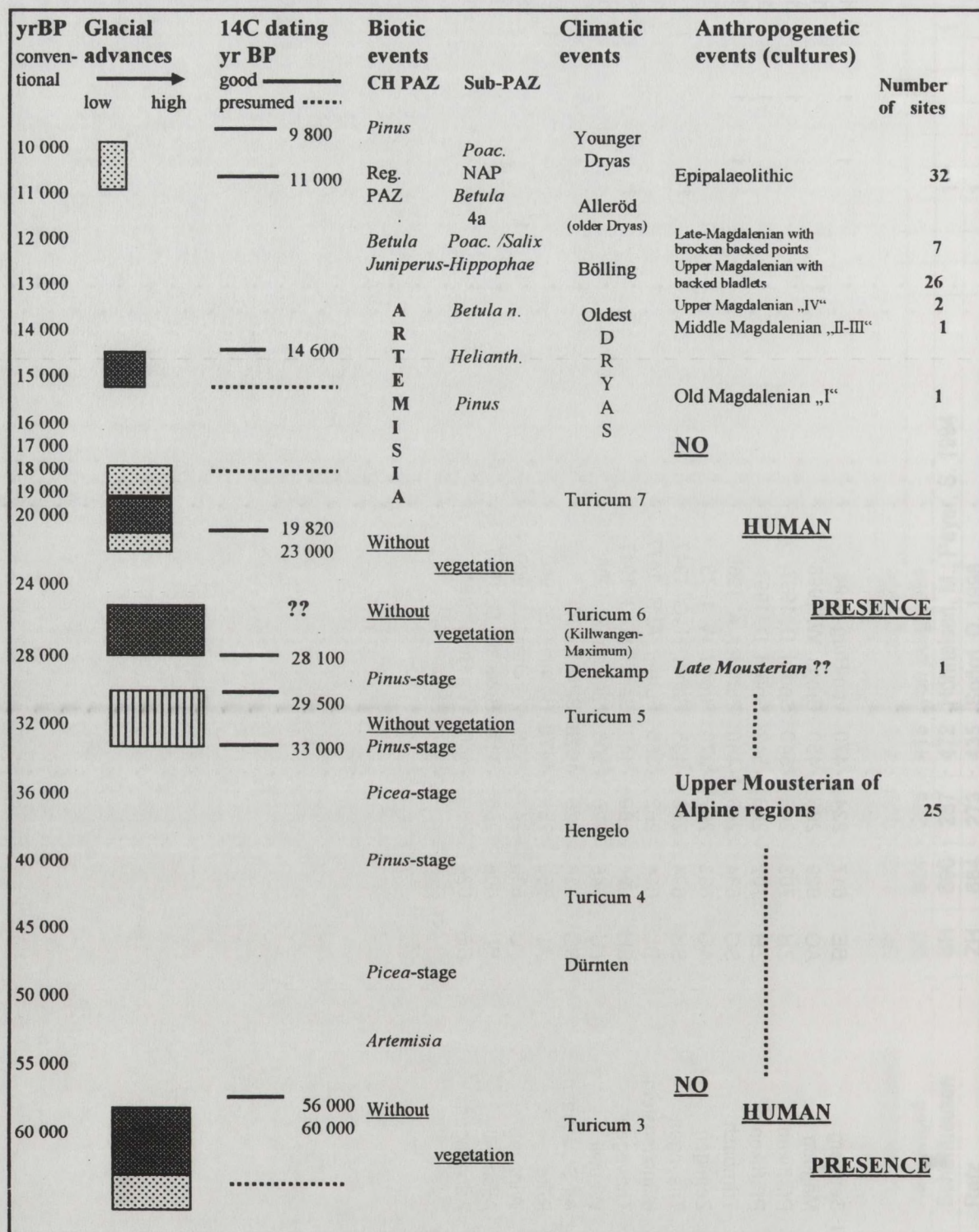
locality	municipality	canton	X-coord.	Y-coord.	altitude	references	Middle Palaeolithic	Middle Palaeolithic ?	indetermin. Upper Pal	Magdalenian	Magdalenian ?	Epipalaeolithic	Epipalaeolithic ?	shelter / cave	open-air site	
							number of sites :	19	3	5	39	8	35	18	42	71
Aarerainterrasse E	Attiswil	BE	614	232	460	von Burg 1994							1		1	
Abri de la Cure	Baulmes	VD	530	183	693	Egloff, M. 1967						1		1		
Abri Freymond	Mont-la-Ville	VD	519	167	1088	Pignat, G.; Winiger, A. 1997						1		1		
Acker Abegg	Wetzikon	ZH	702	243	539	Spörri, D. 1997						1		1		
Altwasser Höhle	Rüte	AI	751	236	1409	Jagher, R. et al. 1997						1		1		
Au Pâquier	Lentigny	FR	568	178	830	Schwab, H. 1984						1		1		
Balm bei Günsberg	Günsberg	SO	609	234	700	unpublished						1		1		
Bâme de Courtemaîche	Courtemaîche	JU	571	257	403	Bigler, P. 1989		1						1		
Bichon	La Chaux-de-Fonds	NE	555	222	845	Morel, P. 1993						1		1		
Bienenberg	Liestal	BL	620	261	430	Sedlmeier, J. 1998						1		1		
Birseck-Ermitage	Arlesheim	BL	614	260	357	Sarasin, F. 1918				1		1		1		
Bönistein	Zeinigen	AG	634	265	540	unpublished						1		1		
Bruderholz / Gundeldingen	Basel	BS	612	265	300	Sarasin, F. 1918				1				1		
Brügglihöhle	Nenzlingen	BL	609	255	365	Bandi, H.-G. et al. 1953				1				1		
Brüttelen-Eichmatte	Brüttelen	BE	579	209	440	Nielsen 1991							1	1		
Burgäschisee-Südwest	Burgäsch	SO	617	224	466	von Burg 1994							1	1		
Bustelbach-Neumatt	Stein	AG	639	266	300	Le Tensorer, J.-M. 1986	1							1		
Büttenloch	Ettingen	BL	608	259	365	Sedlmeier, J. 1989				1				1		
Chälen	Gempen	SO	617	257	725	Sedlmeier, J. 1999	1							1		
Champréveyres	Hauterive	NE	564	206	428	Leesch, D. 1997				1		1		1		
Chateau d'Oex	Chateau d'Oex	VD	579	151	1170	Crotti, P.; Pignat, G. 1995						1		1		
Chesselgraben	Erschwil	SO	608	248	454	Spycher, H.; Sedlmeier, J. 1985				1				1		
Chilchlihöhle	Erlenbach	BE	605	171	1810	Andrist & Flückiger 1964			1					1		
Cotencer	Rocheft	NE	552	202	650	Dubois, A.; Stehlin, H.G. 1933	1							1		
Dachsenbühlälchen	Schaffhausen	SH	691	287	475	Bandi, H.-G. 1947					1			1		
Ermitage	Rheinfelden	AG	627	266	302	Sedlmeier, J. 1989				1				1		

Table of the Middle, Upper and Late Palaeolithic sites in Switzerland (established by R. Jagher).

Erlachrundi 7-9	Gampelen	BE	572	206	435	Nielsen, E. 1991			1		1
Fürsteiner, Grabung 1943/44	Seeberg	BE	617	224	467	von Burg 1994		1	1		1
Fürsteiner, Seeberg VI	Seeberg	BE	617	224	467	von Burg, A. 1994			1		1
Furtacker	Wetzikon	ZH	702	243	537	Spörri, D. 1997			1		1
Gere	Egolzwil	LU	643	227	501	Bill, J. 1990			1		1
Glattacker	Schwerzenbach	ZH	692	248	436	Spörri, D. 1997			1		1
Grindel 7 (Stättler Allmend)	Cham	ZG	678	227	420	Nielsen, E. 1996		1	1		1
Gsang	Schaffhausen	SH	691	287	490	Bandi, H.-G. 1947		1			1
Gummen	Aarwangen	BE	624	233	420	von Burg 1994				1	1
Hard I	Olten	SO	636	245	445	Zürcher, A. 1969		1			1
Hard II	Olten	SO	636	245	435	Zürcher, A. 1969		1			1
Heidenküche	Himmelried	SO	610	253	375	Sarasin, F. 1918		1		1	1
Hintere Burg	Burgäsch	SO	618	224	467	von Burg 1994		1	1		1
Höhle Thierstein	Büsserach	SO	608	248	450	Sarasin, 1918		1			1
Hollenberg-Höhle 3	Arlesheim	BL	614	260	450	Sedlmeier, J. 1982		1			1
In Langen Teilen	Hüttwilen-Nussbaumen	TG	705	275	437	Leuzinger, U. 1998				1	1
Inkwilersee	Bolken	SO	617	227	460	Sedlmeier, J. 1996		1			1
Junkholz	Bettingen	BS	617	268	464	Braun, I.; Jagher, R. 1999	1				1
Käsloch	Winznau	SO	637	246	420	Zürcher, A. 1969		1			1
Kastelhöhle	Himmelried	SO	610	253	397	Schweizer, T. et al. 1959	1	1			1
Kerzenstübli	Thayngen	SH	694	290	520	Bandi, H.-G. 1947			1		1
Kesslerloch	Thayngen	SH	694	289	433	Ammann, B. 1988		1			1
Kino Elite	Solothurn	SO	607	228	429	Sedlmeier, J. et al. 1997				1	1
Kleine Ganghöhle	Himmelried	SO	610	253	440	Sedlmeier, J. 1990		1			1
Kohlerhöhle	Brislach	BL	610	253	370	Lüdin, C. 1963		1			1
Köpfli	Winznau	SO	636	247	490	Zürcher, A. 1969		1			1
Lac de Lussy	Châtel-St-Denis	FR	559	156	830	Boisaubert, J.-L. & Mauvilly, M. 1999			1		1
Langrütli	Einsiedeln	SZ	702	223	889	Piccand-Leuzinger, C. et al. 1996.		1			1
Laufenburg (Epipal.)	Laufenburg	AG	647	267	320	unpublished				1	1
Lausen	Lausen	BL	624	258	345	Leuthardt, F. 1911			1		1
Les Brennets	La Chaux-de-Fonds	NE	554	221	700	Gigon, R. 1976				1	1
Les Plaints	Couvet	NE	538	200	1120	Gigon, R. 1976	1				1
Liesberg -Höhle	Liesberg	BL	600	249	390	Sarasin, F. 1918		1			1
Löwenburg -Ziegelacker	Pleigne	JU	591	254	550	Jagher-Mundwiler, E. & N. 1977				1	1
Löwenburg-Maisfeld	Pleigne	JU	591	254	570	unpublished	1				1
Löwenburg-Neumühlefeld III	Pleigne	JU	592	254	550	Jagher-Mundwiler, E. & N. 1977	1		1		1

Löwenburg-Niederfeld II	Pleigne	JU	591	254	535	Jagher, E.; Jagher, R. 1989			1		1
Messikomereiche	Seegräben	ZH	701	244	539	Spörri, D. 1997			1		1
Mettmenhaslersee	Niederhasli	ZH	679	259	425	Spörri, D. 1997			1		1
Monruz	Neuchâtel	s	564	206	428	Affolter, J. et al. 1994		1	1		1
Moos/Seemoos Seeberg III	Seeberg	BE	617	224	470	von Burg 1994			1		1
Moos/Seemoos Seeberg V	Seeberg	BE	617	224	470	von Burg 1994			1		1
Moosbühl I	Mosseedorf	BE	604	207	527	Piccand, C. 1994		1			1
Moosbühl II	Mosseedorf	BE	604	207	528	Bandi, H.-G. 1947		1			1
Moosmatten	Aeschi	SO	617	225	470	von Burg 1994		1	1		1
Mühleloch	Starrkirch-Wil	SO	637	243	500	Zürcher, A. 1969		1			1
Neue Höhle	Thayngen	SH	694	289	440	Bandi, H.-G. 1947		1			1
Neu-Mühle	Roggenburg	BL	592	254	515	Bandi, H.-G. 1968			1		1
Noir-Bois (JP)	Alle	JU	576	252	448	Othenin-Girard, B.; Stahl-Gretsch, I. 1992			1		1
Noir-Bois (MP)	Alle	JU	576	252	448	Othenin-Girard, B.; Stahl-Gretsch, I. 1992	1				1
obere Höhle	Liesberg	BL	600	250	415	Schaub, S.; Jagher, A. 1945	1				1
Pré Monsieur	Alle	JU	575	252	439	Othenin-Girard, B.; Stahl-Gretsch, I. 1992	1				1
R1	Roggenburg	BL	592	254	535	unpublished			1		1
Rehagstrasse	Basel	BS	611	265	330	Schmid, E. 1970	1				1
Reiden-Stumpen	Reiden	LU	641	234	512	Nielsen, E. 1994		1			1
Risliisberghöhle	Oensingen	SO	620	239	488	Barr, J. H. 1975		1			1
Robenhausen-Kiesgrube	Wetzikon	ZH	702	243	539	Spörri, D. 1997			1		1
Roggenburg-Mühle	Roggenburg	BL	592	254	500	unpublished	1				1
Rosenhalde	Schaffhausen	SH	690	287	525	Bandi, H.-G. 1947		1			1
Rüteliacher	Höchstetten	BE	614	222	470	von Burg 1994		1			1
Rütihard	Muttenz	BL	614	264	350	Sedlmeier, J. 1982		1			1
Saint Brais I & II	Saint Brais	JU	578	240	960	Koby, F.-E. 1956	1	1			1
Sälihöhle Oben	Olten	SO	636	243	450	Zürcher, A. 1969			1		1
Schalberghöhle	Aesch	BL	610	257	425	Vogt, E. 1936	1				1
Schalchewärch	Bannwil	BE	621	231	440	von Burg 1994				1	1
Schnurenloch	Oberwil	BE	601	169	1230	SPM I, 271	1				1
Schötz 1 / Fischerhäusern	Schötz	LU	643	225	499	Nielsen, E. 1997			1		1
Schötz 16/25	Wauwil	LU	645	225	502	Nielsen, E. 1991		1	1		1
Schürfeld	Schwarzhäusern	BE	625	233	415	von Burg 1994			1		1
Schürhof / Zelig III/IV	Aarwangen	BE	624	233	415	von Burg 1994				1	1
Schweizersbild	Schaffhausen	SH	690	287	472	Höhneisen, M.; Peyer, S. 1994		1			1
Solgen-Im Grauen	Rafz	ZH	684	273	435	Spörri, D. 1998		1			1

Stockrüti / Erlenhof-Seeberg II	Seeberg	BE	617	224	470	von Burg 1994			1	1	1
Strick	Magden	AG	629	265	450	Brogli, W. 1998	1				1
Strübel-Südwest	Pfäffikon	ZH	703	245	540	Spörri, D. 1997				1	1
südliches Birkenwäldchen	Pfäffikon	ZH	702	246	542	Spörri, D. 1997				1	1
Trimbach	Trimbach	SO	634	246	440	Zürcher, A. 1969			1	1	1
Uf Wigg	Zeinigen	AG	633	267	370	Brogli, W. 1975		1			1
Untere Bsetzi	Thayngen	SH	694	288	435	Bandi, H.-G. 1947			1		1
unterer Steinbruch	Münchenstein	BL	614	262	355	Furger, A. R. 1977	1				1
Vorder Eichen	Thayngen	SH	694	289	440	Bandi, H.-G. 1947			1		1
Wauwil-Obermoos	Wauwil	LU	645	226	506	Nielsen, E. 1996				1	1
Wildenmannlisloch	Alt St. Johann	SG	738	226	1628	SPM I, 276	1				1
Wildkirchli	Rüte	AI	750	239	1470	Bächler, E. 1940	1				1
Wilmatt	Winznau	SO	636	247	525	Zürcher, A. 1969		1			1
Ziegelei	Allschwil	BL	608	266	312	Bosinski, G. 1967	1				1
Zopfen, Hügel 4	Aarwangen	BE	624	230	460	von Burg 1994				1	1



Chronological table of events during the isotopic stages 2 & 3 in Switzerland

Fig. 1 : Chronostratigraphy of isotopic stages 2 and 3 in Switzerland. (Glacial advances and dating after Chr. Schlüchter 1995, Biotic events after B. Ammann 1993)

Middle Palaeolithic

● Open-air sites

- 1 Pré-Monsieur/Alle JU
- 2 Noir-Bois/Alle JU
- 3 Löwenburg JU, U. Roggenburg, Mühle BL
- 4 Allschwil BL (Rosenberg)
- 5 Allschwil Ziegelei BL
- 6 Basel-Rehhagstrasse BS
- 7 Münchenstein BL
- 8 Magden AG
- 9 Stein AG
- 10 Riehen Ausserberg BS
- 11 Oeflingen (D)
- 12 Murg (D)

■ Caves and rock-shelters

- 12a Schalbergfelsen BL
- 13 Kastelhöhle SO
- 14 Abri Liesberg BL
- 15 Saint-Brais JU
- 16 Cotencher NE
- 17 Les Plaints NE
- 18 Schnurenloch BE
- 19 Chichlihöhle BE
- 20 Wildkirchli AI
- 21 Wildmannlisloch SG
- 22 Drachenloch SG
- 23 Monfenera (I)
- 24 Bucca del Piombo (I)

Ice extent of the glaciation
of the Swiss Alps

- Last glacial maximum
 Most Extensive Glaciation
 (OIS 12 ?)

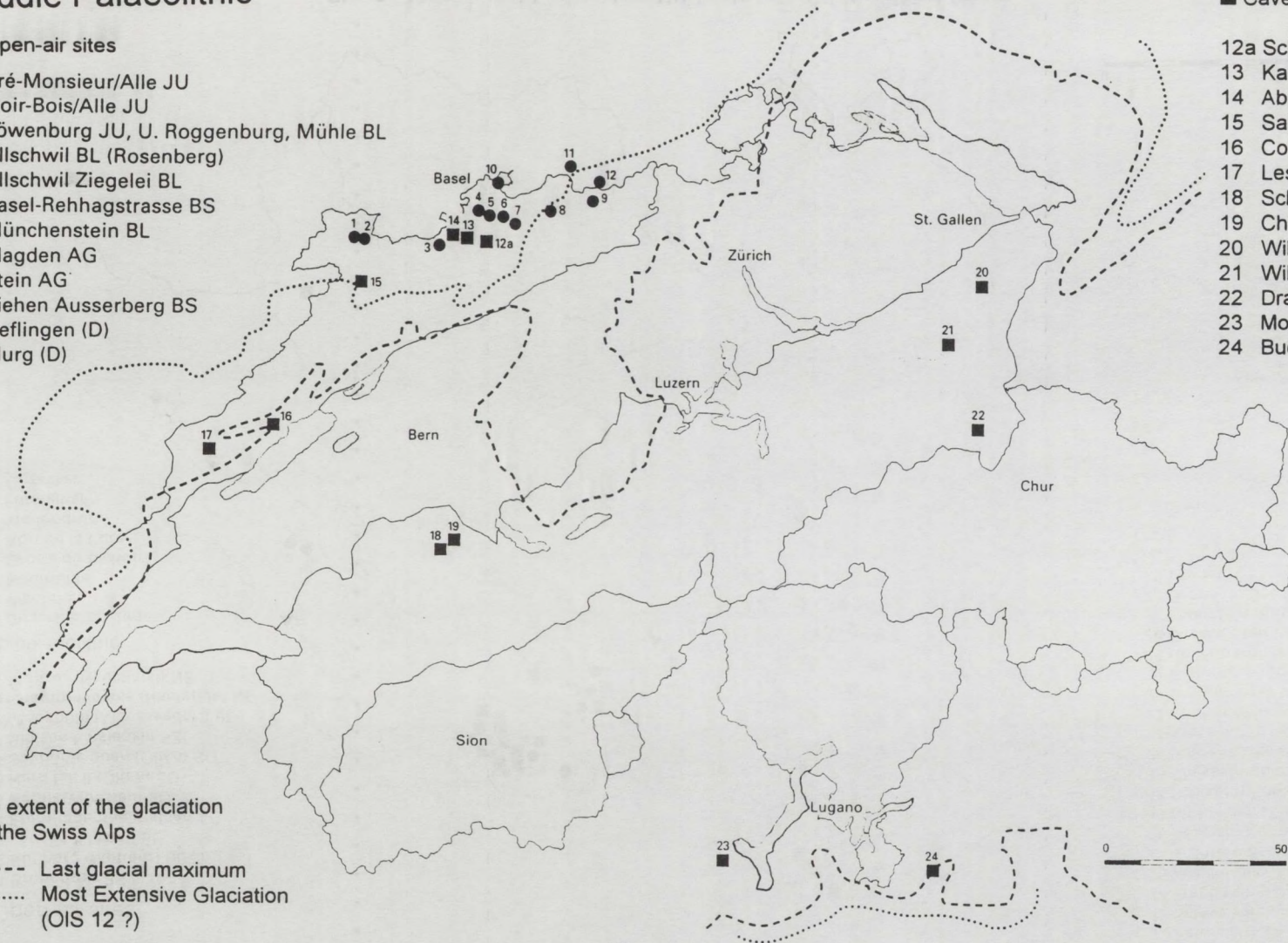


Fig. 2 : Middle palaeolithic sites in Switzerland (map established by R. Jagher)

Magdalenian and Epipalaeolithic

● Open-air sites

- 1 Bruderholz BS
- 2 Rütihard (Muttentz) BL
- 3 Lausen (Liestal) BL
- 4 Eremitage Rheinfelden AG
- 5 Köpfli (Winznau) SO
- 6 Hard I u. II (Olten) SO
- 7 Sälihöhle oben (Olten) SO
- 8 Sihlsee-Einsiedeln SZ
- 9 Moosbühl (Moosseedorf) BE
- 10 Champpréveyres (Hauterive) NE
- 11 Monruz (Neuchâtel) NE

▲ Epipalaeolithic

- 26 Birseck-Eremitage
- 30 Wachtfels
- 31 Neumühle
- 32 Grotte du Bichon
- 33 Abri de la Cure
- 34 Mollendruz
- 35 Fürsteiner
- 36 Furtacker

■ Caves and rock-shelters

- 12 Petersfeld (D)
- 13 Schweizersbild SH
- 14 Freudenthal SH
- 15 Kesslerloch (Thayngen) SH
+ Untere Bsetzi und Vorder Eichen
- 16 Käsloch (Winznau) SO
- 17 Mühleloch (Starrkirch) SO
- 18 Rislisberghöhle (Oensingen) SO
- 19 Chesselgraben (Erschwil) SO
- 20 Heidenküche (Himmelried) SO
- 21 Kastelhöhle (Himmelried) SO
- 22 Kohlerhöhle (Brislach) BL
- 23 Brugglihöhle (Nenzlingen) BL
- 24 Büttenloch (Ettingen) BL
- 25 Hollenberghöhle (Arlesheim) BL
- 26 Birseck-Eremitage (Arlesheim) BL
- 27 Thierstein (Büsserach) SO
- 28 Grotte du Scé (Villeneuve) VD
- 29 Veyrier (GE u. F)

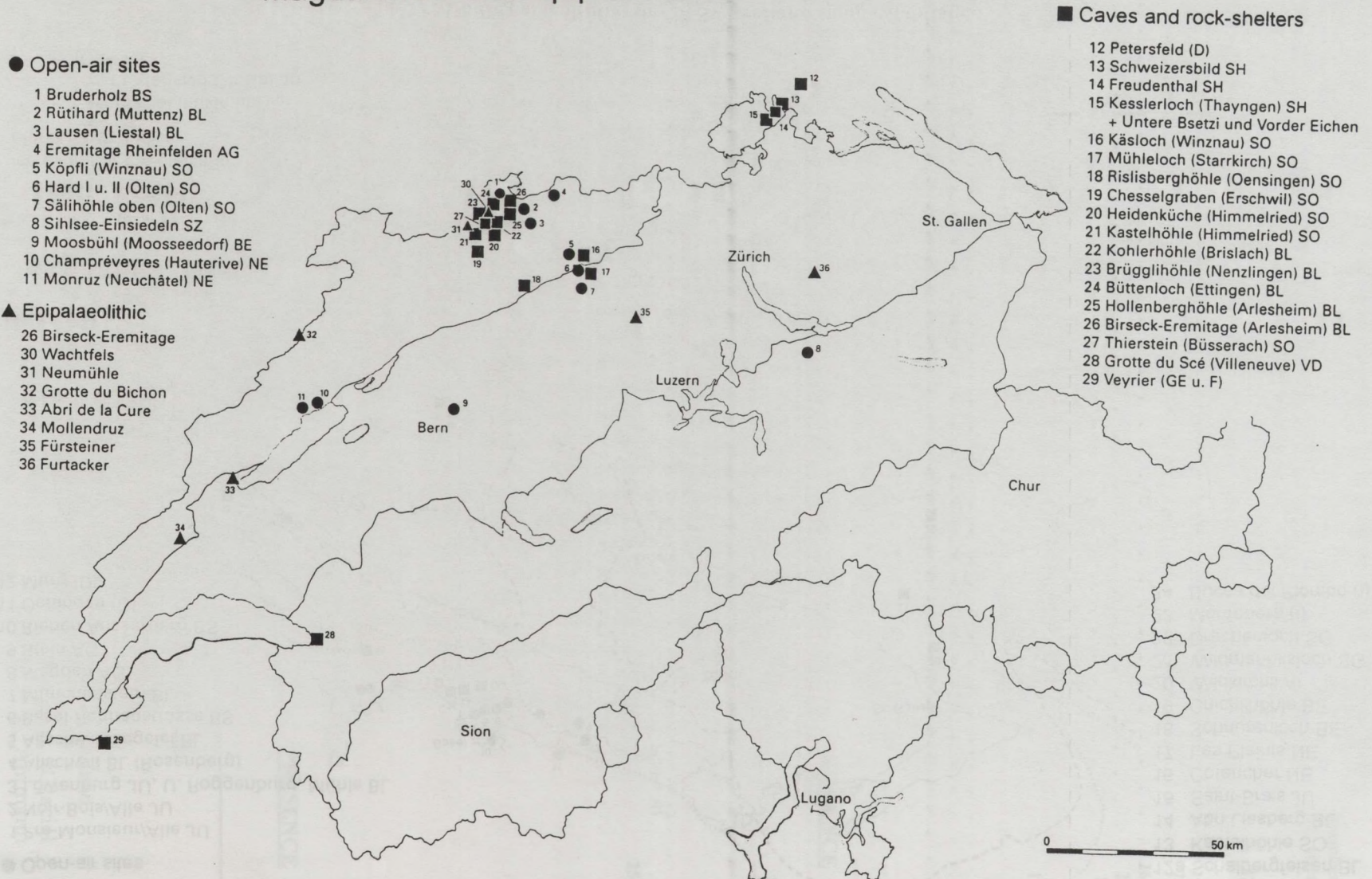


Fig. 3 : Upper and Late palaeolithic sites in Switzerland (map established by R. Jagher)