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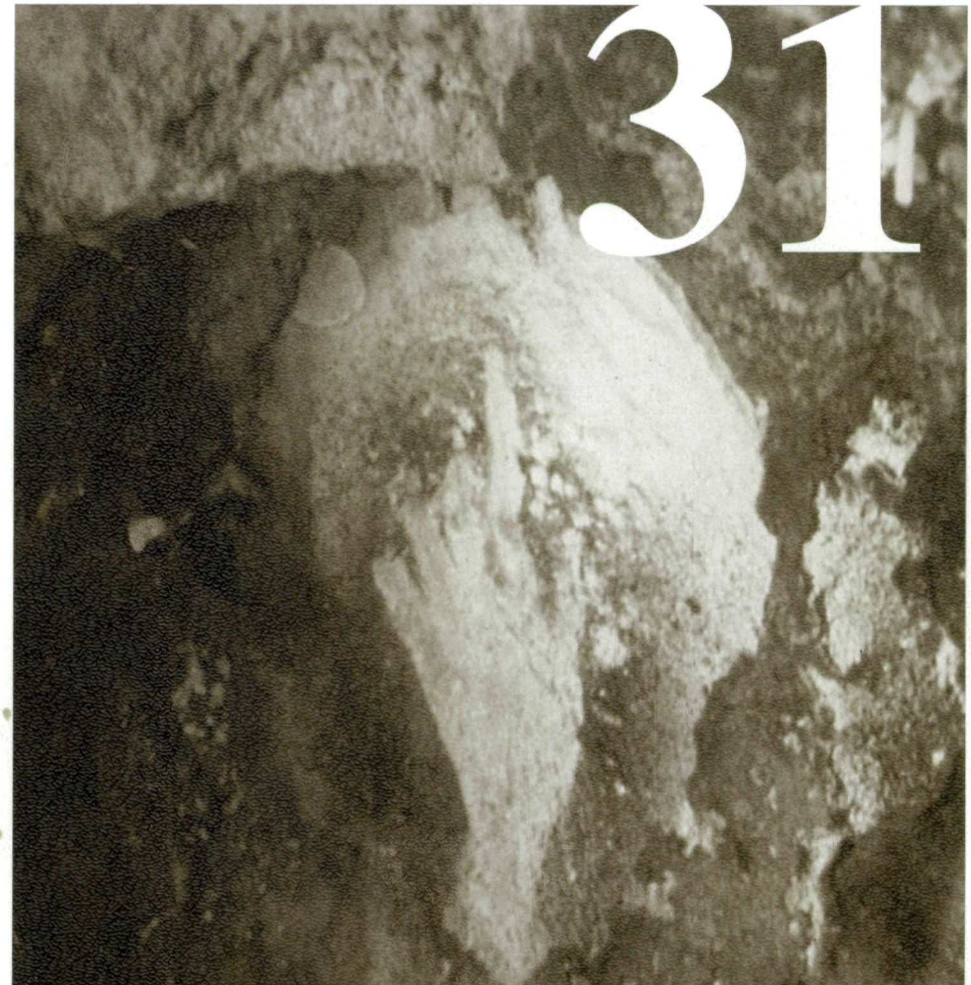

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HUNTERS OF THE GOLDEN AGE

THE MID UPPER PALAEOLITHIC OF EURASIA 30,000 – 20,000 BP

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This volume is dedicated to the memory of Joachim Hahn

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Joachim Hahn

19 The Gravettian in Southwest Germany – environment and economy

Sediments, flora and faunas are analysed for the Gravettian within the chronological frameworks. The sediments point to a cold and humid climate, as manifest in frost cracked debris and mud flows. The karst dynamics apparently worked on a small scale. Pollen in mineral sediments cannot be directly compared to the limnic deposits because they constitute a different environment as to the selection of species and the preservation. In caves, they represent the local vegetation near the entrance, with a marked difference to nearby waterlogged sediments, as shown by the Weinberghöhlen diagrams. An open vegetation with few trees is indicated. The faunal remains, partly due to animal activity, are varied without a specialisation on one species. The few individuals per species point to an encounter hunt.
AMS dates place most of the gravettian levels near 28,000 bp, in its early phase. The worsening climatic conditions culminating in the glacial maximum nearly 10,000 years later, are not yet evident in the floral and faunal assemblages.

1. Introduction

Generally, the Gravettian is assumed to have developed during the climatic deterioration of the late Pleniglacial. This may have influenced the economy (Hahn 1987), and initiated a widened social network (Gamble 1982).

In Southwest Germany the Gravettian (Fig. 1) is mainly known from cave sites situated in the Swabian Jura (Scheer 1993) with two exceptions: the open air site of Steinacker near Müllheim in the Upper Rhine valley (Pasda 1995) and the open air site of Salching (Weissmüller and Bausch 1986), both with Font Robert points. Detailed studies of the Gravettian are still in preparation.

The climatic and ecological data result mainly from cave sites with their special formation and post-depositional characteristics.

The analysis of the environment is mainly based on modern analogies, with the actual ecological requirements and behaviour applied to the past. In order to monitor the data from archaeological sites, information from neighbouring sedimentary natural contexts are considered too. This small regional analysis is placed into a wider context where possible.

2. The sedimentary context

Sedimentological analyses have been obtained from Geissenklösterle (Laville and Hahn 1981), Hohle Fels

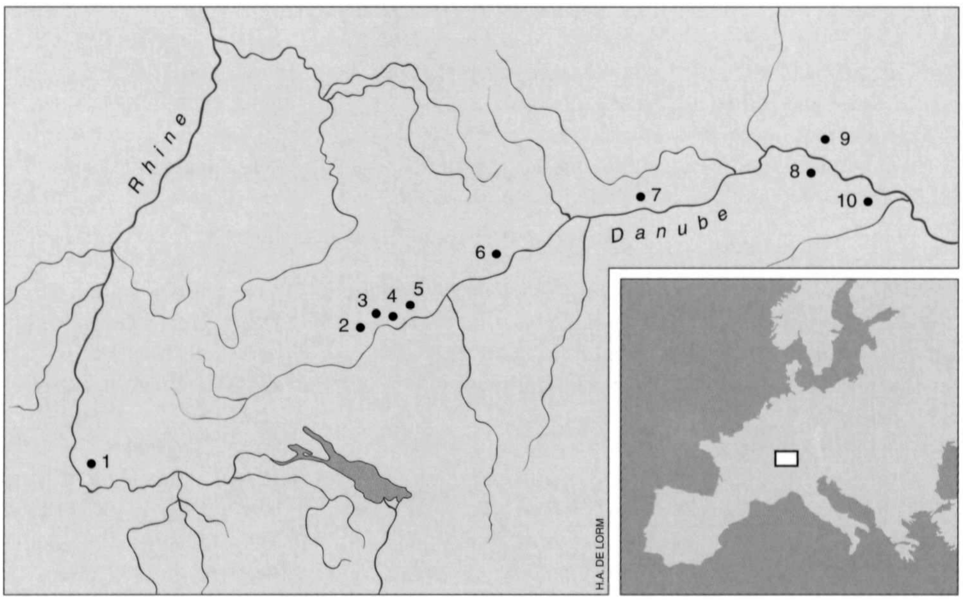

Fig. 1. Gravettian sites in Southern Germany: 1 Steinacker-Müllheim, 2 Hohle Fels, 3 Sirgenstein, 4 Geissenklösterle, 5 Brillenhöhle, 6 Bockstein-Törle IV-VI, 7 Weinberghöhle, 8 Abri im Dorf, 9 Mittlere Klause, 10 Salching.

(Campen 1990) and, in a preliminary form, from Brillenhöhle (Riek 1973). At the latter site, the gravettian sediments indicate, with a high loess component and the many thermal fractures, a rather dry and cold climate for level VII. Level VI with more clay and rounded limestone indicates more humid climatic conditions.

At Geissenklösterle sediments of the major gravettian 7/It level have been subjected to a *lessivage* (Laville and Hahn 1981), forming a dry *éboulis* which has been interpreted as an interstadial, the 'Tursac' oscillation. This succeeded a cold and humid climatic phase. On top, a level with a fine matrix (GH6) contained burnt limestone fragments from the hearth below, arranged in a polygonal pattern. The brownish highest levels with crushed artefacts and bones were attributed to a post-depositional movement of these objects from the gravettian levels below. Campen's (1990) analysis confirmed Laville's interpretation of the Geissenklösterle sediments.

A similar situation occurred at Hohle Fels (Fig. 2). The fine matrix, rich in silt and clays, originates from decomposed rocks and from the karst system. Level 3c/IIc in the interior of the cave entrance tunnel is sectioned by aligned oblique stone slabs, probably not a polygonal frost-crack pattern but the lateral deposition of a mud flow. Differently sized patches are represented by bone ash, bones and artefacts, possibly a nearly *in situ* living floor. Stones polished by repeated rubbing by bears, some with engravings, have been frost fractured like many limestone fragments. The sediments (Campen 1990) suggest a change from a cool humid to a cold and dry climate. The lower levels are in an open matrix with two ash layers showing a strong slope to the valley.

The Gravettian in both caves is associated with a cold and humid climate with intensive frost fracture. At Geissenklösterle the climate of level It is assumed to be cold and humid, with few karst pebbles. At Hohle Fels in level IIc there are many karst pebbles; the climate is considered as cold and dry.

At Hohle Fels, the climatic oscillation is not marked. The two sequences are not identical, though the refittings by Scheer (1986) suggest at least a partial contemporaneity, as do the AMS dates.

The gravettian level at Salching (Weissmüller and Bausch 1986: 241) is situated above a fossil soil correlated with the 'Denekamp' interstadial. This should correspond to the Stillfried B interstadial. At Müllheim, the gravettian level near the surface is situated in a decalcified loess.

3. ^{14}C-chronology

Although there are ^{14}C-dates for four major sites, only a few conventional radiocarbon dates on collagen were obtained. Charcoal from the Weinberghöhlen Gravettian gave an age of 28,265 ± 325 bp (GrN 6059). Brillenhöhle VII provided a

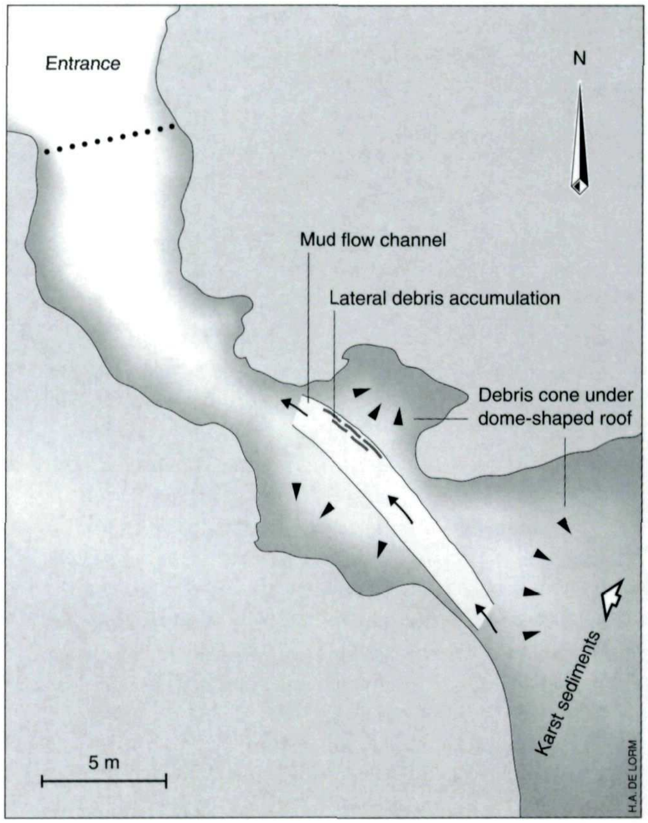

Fig. 2. Hohle Fels – schematic representation of site formation

burnt bone date in excess of 25,000 bp, and Hohle Fels IIb and Geissenklösterle Ia are dated to about 23,000 bp. For Hohle Fels, residue of burnt bone gave an abnormal date of 30 kyr. With the AMS method sufficient sample material became available, and a number of new dates could be processed. Geissenklösterle It with five dates ranging between 26,540 and 29,200 bp and Is with one date of 28,050 bp are earlier than expected (Hahn 1995). The geological horizons 5a to 5d with gravettian finds are dated between 16,940 and 30,950 bp. Except for the 16 kyr date, which is possibly contaminated, this level is only slightly younger than the other gravettian levels below it.

At Hohle Fels IIc, the Gravettian has an age of 29,000 bp, based on two dates on a decorated antler adze. A cave bear bone gave a date of only 26,000 bp. The Gravettian is thus significantly earlier than assumed. According to the AMS dates from the early gravettian levels dated at 27,000-26,000 bp, in Hohle Fels and Geissenklösterle there is a more than 10,000 yr hiatus in sedimentation, since the magdalenian levels dated at 13,000 bp (Hohle Fels) overlay them directly. The Glacial Maximum apparently is not represented in these stratigraphies. The only other sequence, Bockstein-Törle

Table 1. Chronoscheme for the Early and Mid Upper Palaeolithic.

	AURIGNACIAN			GRAVETTIAN	
Phase	Early	Middle	Late	Early	Late
^{14}C	37-34,000	34-32,000	32-30,000	29-26,000	22-20,000
Ach valley	GK III	GK II,		BH VII,	
		BH XIV,		GK I,	
		HF III-IV		HF IIc,	
				Mül,	
				Sal	
Lone valley		Vog V	Vog IV,		BT IV-VI
			HS IV,		
			BT VII		

BH = Brillenhöhle, BT = Bockstein-Törle, GK = Geissenklösterle, HF = Hohle Fels
HS = Hohlenstein-Stadel, Mül = Mülheim, Sal = Salching, Vog = Vogelherd.

(Hahn 1977; Otte 1980) yielded two conventional ^{14}C-dates between 20,000 and 22,000 bp. The corresponding industries, levels VI to IV, are supposedly Gravettian; Otte (1980) thinks it is Epi-Aurignacian because of the presence of flat-faced burins. I claim that the blade technology, a single backed piece (no water sieving was done at the time of the excavations), dihedral burins, Bassaler-like burins, a longitudinal stone retoucher and stone pendants, one deeply notched, place it more appropriately in the Gravettian. These assemblages, occurring in a yellow loess-like sediment may be the late phase of the Gravettian. New dates on the site and its sediments may help to clarify this problem.

Stratigraphies, AMS dates and typology can be compiled to provide a chronoscheme for the Early and Mid Upper Palaeolithic (Table 1) in Southwest Germany.

The early Gravettian is characterized by *fléchettes*, and by shouldered points (Hohle Fels) or tanged Font Robert points (Geissenklösterle), Brillenhöhle VII and Weinberghöhlen C have none. The later Gravettian contains flat-faced burins.

4. Pollen analysis

The criteria for a palaeoecological and climatic interpretation of pollen in an inorganic sediment have been summarised by Sanchez Goni (1994: 380). Her deconstruction of the current palynological chronosystem for the Pleniglacial (25,000-15,000 bp) applies as well to the South German sites.

In South Germany, the first analysis of the pollen of cave sediments has been performed for the Weinberghöhlen (Brande 1975). Here the correlation of limnic open air and inorganic cave deposits has been attempted.

Pollen analysis is restricted to two sites from the Swabian Jura, Geissenklösterle and Hohle Fels, and one site from the Franconian Jura, Weinberghöhlen (Fig. 3). The pollen diagram is situated below the gravettian level, but in the same sedimentary unit. A comparison with reference sites, especially from bogs, is difficult.

Our research has indicated:

a) a cyclic sedimentation which consists of deposition, and a sedimentation 'stop', followed by erosion;
b) the pollen deposition occurs by the wind, by older sediments of the karst system, by animals and/or by men;
c) a taphonomic disturbance by differential preservation and by percolation of recent pollen;
d) bioturbation (e.g., by earthworms) is common, and more in humid Hohle Fels than Geissenklösterle. This may have resulted in a mixing of the sediments, creating an apparently homogeneous pollen composition. Differential pollen preservation may also stem from this bioturbation.

At Geissenklösterle the pollen frequency and preservation is somewhat better with the exception of the upper Late Glacial/Holocene levels.

The rare tree pollen (AP) from willow, spruce and birch do not conform to the pattern for an interstadial oscillation (max. 5% instead of the necessary 20%) in Geissenklösterle (Wille 1978). The highest percentage (5%) occurs in the levels 10-13 at the top of the aurignacian sequence. Herbaceous and grass pollen (NAP) dominate. The gravettian level IIc (Fig. 3) is characterised by a higher percentage of umbelliferae pollen. At the same time, the liguliflorae are more frequent which may point to a poor preservation. The ecological interpretation for the Gravettian indicates a more humid climate than during the early Aurignacian which is less rigorous. The middle Aurignacian has a more dry-cold climate; the lower Aurignacian is less cold and dry. Finally, the Late Glacial is characterised by more cruciferae, which suggests bad preservation.

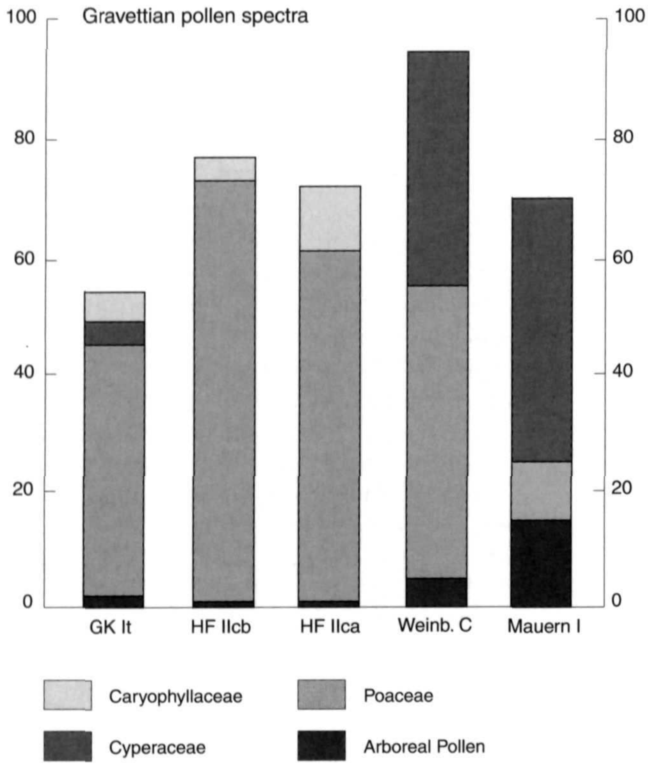

Fig. 3. Simplified pollen diagram of the gravettian levels from Hohle Fels (HF), Geissenklösterle (GK), Weinberghöhlen (Weinb. C) and Mauern I.

The pollen profile from Hohle Fels is represented by two samples from level IIc (Fig. 3). Pollen preservation is generally medium to poor. Pollen frequency, however, ranges between 68 and 850. Due to the rarity of tree pollen, these are supposed to belong to a similar pollen vegetation scheme and preservation spectrum. The analysis of level IIc by B. Albrecht indicated pollen from three different periods: pre-Quaternary, and altered and unaltered Quaternary ones, differing in patination and taxa. In the Late Quaternary, the rare arboreal pollen (AP) such as pine are represented by fragments, and the dominance of grasses, cichoridaeae, points to a differential preservation of the more resistent taxa. The histogram is subdivided into an upper part with many cichoridae and tree pollen, probably due to increased destruction and contamination, and a central part with many grasses and more asteraceae. The lower part with more cichoridae points again to poor preservation.

A zonation and a comparison to reference pollen stratigraphies is not possible. Despite evidence for poor preservation, the low frequency of tree pollen can be considered as real, even if minuscule wood fragments and charcoals are present in all samples. The presence of wood may be suggested from the charcoal fragments in all levels. As these occur also in archaeologically poor or in sterile levels, it is more appropriate to see them as a result of the bioturbation processes.

Through time, there is no change of composition and taxa, except for the upper Late Glacial levels. The pollen sequences cannot be compared due to the different sample treatment, differing percentages and location.

The rare charcoals from the ashy levels III and IV at Hohle Fels consist of birch and willow, both of the dwarf type (research by W. Schoch).

The only pollen diagram from the Ach Valley area came from the Schmiech lake. An open landscape without trees is suggested by the pollen (Grüger 1995). The absence of ^{14}C-dates does not permit a direct comparison. In contrast to the Ach Valley cave samples cyperaceae (sedges) reach the same values as in the Bavarian sites.

Pollen sections were analysed from the Weinberghöhlen near Neuburg in Bavaria, two in the cave itself and several from the valley below (Brande 1975). Both cave sections are roughly comparable, with Gramineae dominant and equal percentages of Cyperaceae, but with varying frequencies of AP. The AP consist of pine, birch, spruce and willow with a percentage below 20%. The pollen sequence from the valley below is characterised by more AP, more Cyperaceae, *Artemisia*, and less Gramineae. Different local plant communities and differential conditions of preservation do not allow a direct comparison.

The pollen composition of these sequences corresponds more to a grassland vegetation (in this case of a slope) vegetation with many Gramineae and herbs than to a tundra with few grasses (Birks 1973). The pollen from these and other caves (Sanchez Goni 1994) cannot establish the existence of an interstadial like Tursac or Arcy.

An important conclusion that can be drawn from the palaeoecological data is that the climate in the Gravettian was generally more humid than during the Aurignacian. Due to the nature of the sediments, it is not possible to correlate open air to cave sediments, even if the horizontal distance is minimal, as the example from the Weinberghöhlen indicates.

5. Fauna

Faunal analyses have been conducted for Geissenklösterle and Brillenhöhle. For Hohle Fels and Bockstein-Törle only partial, preliminary studies are available. Generally, the macromammals indicate a gradual change from more temperate to cool to cold conditions. This is visible in the increasing rarity of red deer and red fox, and also by mammoth and ibex (Table 2).

The minimum numbers are low, usually 1-2 individuals. This may indicate no specialisation on a certain species, but also reflects the nature of caves. Cut marks on cave bear bones also indicate the hunting of this species. The majority of the bones and teeth belong to animals which had lost their milk teeth or died naturally in the caves. The high number of carnivores is also due to the nature of the sites. At Weinberghöhlen, the minimum number of mammoths (6) is higher than in the other assemblages, but cave bear is rarer.

Cut marks and butchering traces are rare. Often both young and adult mammoths, horses and reindeer, occur. For mammoth, this may indicate a preference for the hunting of inexperienced young animals.

The Geissenklösterle analysis demonstrated a dominance of cave bear, part of which has been hunted. Mammoth is represented by ribs of an adult individual. An indication of seasonality is given by a horse foetus, pointing to winter, and by fish remains (Torke 1981) pointing to spring. This fauna has been attributed to spring and autumn occupations.

The temporal proximity of the three assemblages in the Ach Valley as evidenced from the refitting of lithics (Scheer 1986) should apply also to the fauna. At Brillenhöhle, with an apparent mix of magdalenian and gravettian artefacts, the re-analysis of the stratigraphy by refitting (Lauxmann and Scheer 1986) makes an evaluation of this faunal record difficult.

Ecological and climatic inferences may be made from fish, birds and microfauna. Water sieving has only been undertaken at Geissenklösterle and Hohle Fels. The analysis of birds is not complete, and of the microfauna only a sample (Münzel *et al.* 1995) has been studied. At Geissenklösterle the dominance of the collared lemming over the microtines of the *Microtus arvalis/agrestis* group are noteworthy. Ecologically, both are attributed to an open landscape. The *Microtus oeconomus* of humid areas is rare, in contrast to the birds. At Hohle Fels IIb species preferring humid environments are equally rare, but the microtines dominate the lemmings (Markert 1995). Generally, from the lower level there is an increase from cold to more humid forms. The microfauna of the Weinberghöhle (von Koenigswald 1974) is similar, but has less collared lemming. Some levels have more *Microtus oeconomus*, some have none. The small numbers do not permit an analysis.

At Brillenhöhle (Boessneck and Van Den Driesch 1973), birds come mainly from marshy or water areas, like the nearby Schmiechener See, with fewer indicators of an open tundra-like landscape, as typified by ptarmigans. Woodland species are not represented. Hohle Fels and Geissenklösterle have numerous fish remains, salmonids (*Hucho hucho, Thymallus thymallus* and *Lota lota*) which point to an oxygen-rich, but not too cold water.

The only natural fauna from the Kemathenhöhle in Bavaria (von Koenigswald 1978), dated at 30,000 bp, contains red deer, horse, ibex and more reindeer in the mammalian fauna. Fox and hare are well represented. As far as the small assemblage is relevant, the animal species seem not to be really different from faunas where humans played a role.

Table 2. MNI of the hunted fauna.

	BH	GK	HF	WH
Lepus sp.	22	8	5	9
Canis lupus	1	2		1
Alopex lagopus	5	(13)	2	3
Vulpes vulpes	8	(13)		2
Ursus spelaeus	27	69	7	6
Crocuta spelaea	1			3
Mammuthus primigenius	2	1	2	6
Equus sp.	3	2		3
Coelodonta antiquitatis	1	1		1
Capra ibex	4	1		
Rupicapra rupicapra	2	1		
Rangifer tarandus	6	1	1	2
Bos/Bison	2	1?		1

BH = Brillenhöhle, GK = Geissenklösterle, HF = Hohle Fels, WH = Weinberghöhle.

6. Discussion

The major problem is that there are no clear palaeoenvironmental data: there is only a tendency of a climatic change from the Aurignacian to the Gravettian. Floral remains from cave sequences are determined by taphomomy, like preservation and bioturbation. Even under favourable conditions, only the local vegetation is represented. Flotation of burnt material has just started to yield some macro plant remains.

With respect to fauna, the apparent use of bones as fuel may distort the representation of faunal skeletal elements, and species. It is assumed for Hohle Fels that some large pieces of burnt and unburnt bone may belong to mammoth (or rhinoceros?). Apart from this, mammoth is only represented by ivory fragments. Differing data collections, e.g. water sieving at Geissenklösterle and Hohle Fels and the preliminary nature of the faunal analysis for Hohle Fels, render final conclusions impossible.

Microfauna analysis of the Kemathenhöhle (von Koenigswald 1978) in Bavaria indicates a climatic amelioration between 33 and 24 kyr, i.e., during the Gravettian, with an increase in the climatically indifferent species.

However, thick levels and small absolute numbers make any specific attribution impossible. Comparison with the Geissenklösterle and Hohle Fels gravettian and aurignacian microfaunas is not possible. Regional differences between the Ach Valley and the Weinberghöhlen cannot be established. While hunting is very probable, the use of plant food remains unknown.

7. Conclusion

Climatically, the Gravettian is attributed to a cold to cool, dry and also humid climate. Frost fracture is frequent, karst elements like karst pebbles vary numerically from site to site. The layer at Salching, located above a fossil soil, may be attributed to a cold, dry climatic phase. The pollen sequences are rather similar with many Gramineae, and few tree pollen. They represent more a local flora from near the site, highly influenced by differential preservation. The microfauna indicates a change from cold to more cool and humid conditions.

Raw material use has changed. Whereas the aurignacian groups obtained the raw material locally, and only a small amount from the southern lowlands, the latter material was widely used in the Gravettian, even if the local materials remained the major lithic resource. An overexploitation or an environmental geomorphological change as indicated by a different slope of the gravettian and aurignacian levels at Hohle Fels may be responsible for this phenomenon.

According to the AMS dates, the Gravettian follows the late Aurignacian rather directly at Vogelherd IV, Hohlenstein-Stadel IV, Bockstein-Törle VII and Hohlenstein-Bärenhöhle II. There may have been an overlap, but the early Gravettian occurs only in the Ach Valley where no late Aurignacian has been identified. In the Lone Valley there is no early Gravettian. It is assumed that this is a bias due to the small sample of sites and levels.

As far as pollen and faunas are representative, the ecological change between 40,000 and 20,000 bp was minimal and cannot be used as an argument for the adaptation to a changed environment.

The economy is based on a variety of animals, the Gravettians of the sites considered apparently were generalised hunters who also practised some fishing. The amount and kind of plant food has not yet been ascertained.

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