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7 The earliest occupation of Europe: Western Central Europe[1]

Isolated finds from the Kärlich pit indicate a late Early Pleistocene occupation. Excavated assemblages are known from the middle part of the Middle Pleistocene onwards, at Kärlich G and Miesenheim. The Mauer mandible roughly dates to that period too. Interglacial occupation is attested, while finds from Kärlich H (OIS 12) point to occupation of cold steppic environments.

1. Geographical and geological background

1.1. Geographical overview

Western Central Europe lies between the Alps and the North Sea (Fig. 1). The largest, most westerly part of the region is drained by the Rhine and its tributaries. To the southeast the region includes the upper drainage basin of the Danube, while to the northeast the Weser with its tributaries the Fulda and the Werra form the most important river system.

In the southwest of the region is the Upper Rhine graben, a region of flat land up to 50 km wide. The central part of the region – north of the rivers Main and Nahe – is formed by the Rhenish Slate Massif. The Rhine, together with its tributaries Lahn and Moselle, subdivide the massif into four regions, the Hunsrück and Taunus to the south and the Eifel and Westerwald to the north. The central Rhine region (Rhenish Shield) is undergoing a process of slow uplift, which has caused increased downcutting by rivers in relatively narrow valleys. At the centre of this region lies the Neuwied Basin, an area of lowland measuring some 20 × 30 km, which formed as a result of a lower rate of tectonic uplift at this point.

The northern part of the region is formed by the central part of the North European Plain, the flatlands of which are only interrupted by the northern upland extension of the Teutoburger Forest and the Wiehengebirge. The Plain extends southwards into the Upland Zone, in the form of the Lower Rhineland Kölner Bucht. In contrast to the Rhenish Shield, where processes of uplift operate, the Lower Rhineland is a region of tectonic subsidence. This has led to the deposition of large quantities of sediments, in particular of deep gravel beds laid down by the Rhine and the Meuse. In the northern Lower Rhineland the Pleistocene deposits reach thicknesses of as much as 1,000 m.

1.2. Volcanism

Tertiary volcanoes are found in the Hegau region to the west of Lake Constance, and in particular in the Hessian depression, with the large volcanic Vogelsberg massif, and in the Westerwald, where they include the Siebengebirge formation near Bonn. The Pleistocene saw the formation of the West and East Eifel volcanic fields (Frechen 1976; Schmincke, Lorenz and Seck 1983; Meyer 1986). In the West Eifel, close to Daun, are located some 200 volcanoes. The East Eifel volcanic field, between the rivers Brohl and Moselle, contains some 100 volcanoes (Schmincke 1988). Major explosive volcanic eruptions occurred in this region some 400,000 years ago (Rieden caldera), again at ca. 200,000 (Wehr caldera) and finally at 11,000 BC cal. (Laacher See caldera) (P. van den Bogaard and Schmincke 1990; Street, Baales and Weninger 1994). These explosive eruptions covered large areas of the Central Rhineland with pumice, as is particularly clear in the case of the youngest, Laacher See eruption. These volcanic deposits are of major importance to the prehistory of the region, serving both as chronological marker horizons (P. van den Bogaard and Schmincke 1988) and as cover and protection to archaeological sites. The formation of the numerous scoria cones of the West and East Eifel was a much less dramatic process and the tephra deposits of these volcanoes are normally of only local significance. Nevertheless, the lava flows and, in particular, the craters of these volcanoes and the favourable settlement locations which they offered, are also important for prehistoric research.

1.3. Glaciation

The ice of the inland glaciation advanced at least twice across the northern Lowland Zone as far as the boundary of the Upland Zone (Fig. 1; Woldstedt 1955). The ice advance forced the Rhine into a more westerly drainage system. At the same time, the energy of the Rhine drainage system and the continual erosion of the glacier front prevented a more south-westerly ice advance (Thome 1958). The location of the different glacier fronts is particularly well preserved in the western Lower Rhineland in the form of series of moraines. In the south of the region under consideration,

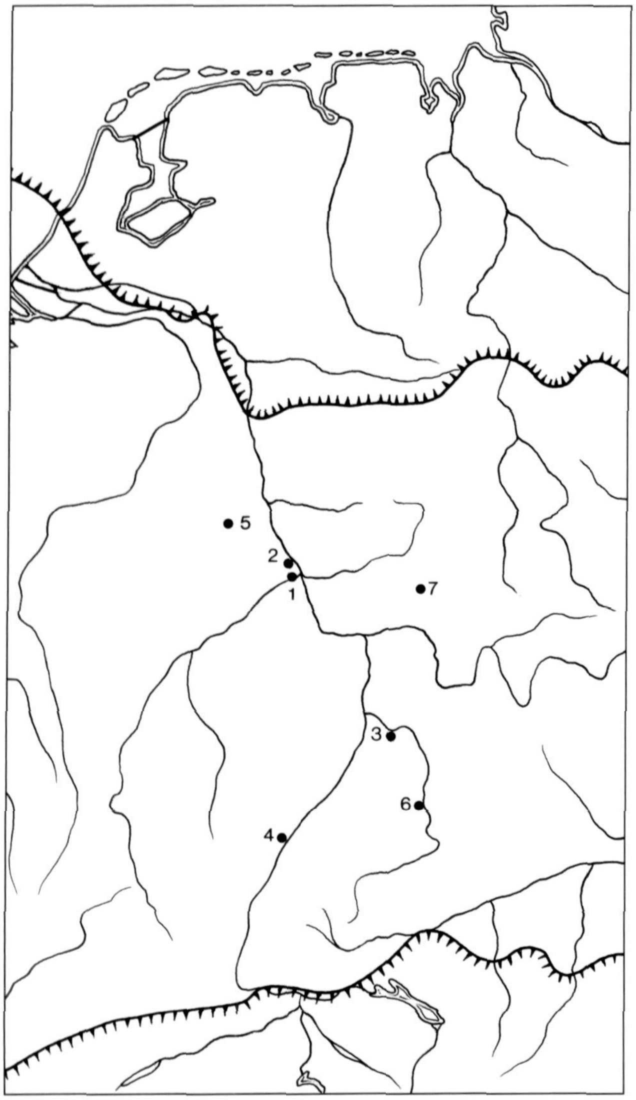

Fig. 1. Lower Palaeolithic sites in western Central Europe and extent of the Pleistocene glacial maximum.
1. Kärlich; 2. Miesenheim; 3. Mauer; 4. Achenheim; 5. Kartstein travertine; 6. Bönnigheim; 7. Münzenberg region.

the alpine glaciers also advanced far out into the foothills (Penck and Brückner 1901-09). In addition, in some colder phases, the Upland Zone above *c.* 900 m OD was also glaciated. The Black Forest and the Vosges, in particular, had an ice-cap at these periods. In glaciated regions older sites have normally been destroyed by the advance of glaciers up to several 100 m thick. It is therefore particularly important that a major part of western Central Europe lies between the alpine glaciers and the northern inland ice, and was never subject to glaciation.

1.4. River terraces

In the present context only the river terraces of the Central and Lower Rhine are of importance. In the Rhineland, terrace formation was heavily influenced by tectonic activity. In the Central Rhineland region of tectonic uplift, the different terraces are particularly clearly defined. The High Terrace lies here at 300 m OD, 200 m above the level of the Rhine today. The Middle Terraces are also very high, between 100 m and 200 m OD, i.e. 40-140 m above the present river level (Kaiser 1961). By contrast, terrace formation in the Lower Rhineland has been influenced by tectonic subsidence so that the individual terrace formations are here stacked above each other (Brunnacker, Boenigk *et al.* 1978; Brunnacker, Farrokh and Sidiropoulas 1982; Brunnacker and Boenigk 1983; Klostermann 1992).

1.5. Loess

Loess deposits, important both for Pleistocene stratigraphy and for the survival of archaeological sites, are well represented in western Central Europe and reach depths of up to 30 m. Typical loess regions are the Upper Rhine Valley, the Rhine-Hessian Plateau and the Rheingau, the Neckarland, Franconia and the Wetterau and the Hessian Depression. In the Central Rhineland, loess is found in the river valleys and in the Neuwied Basin. In the Lower Rhineland, loess characterizes the southern part of the Kölner Bucht and forms a broad belt along the northern edge of the Upland Zone.

2. Chronological framework

2.1. Subdivision of the Pleistocene

The northern and alpine moraine sequences and the Pleistocene subdivisions based upon them represent only one aspect of Pleistocene phenomena. For this reason the framework of this paper is based upon features recognized in the periglacial area, in particular the river terraces and loess deposits. Further building blocks are provided by biostratigraphy, tephra layers and absolute dating methods. In addition, deep sea isotope curves are examined for the purpose of supra-regional comparison.

Initial and Early Pleistocene deposits are particularly well represented in the Lower Rhine Basin, where they are accessible in large open cast lignite mines (Boenigk, Kowalczyk and Brunnacker 1972; Boenigk 1978). The subdivision of the Middle and Late Pleistocene is, by contrast, well preserved in the Central Rhineland volcanic region.

Only the period from the end of the Early Pleistocene until the late Middle Pleistocene is relevant for the Lower Palaeolithic of our region. This period is well represented by the superficial deposits of the Kärlich clay pit, close to

Koblenz; for this reason the stratigraphic sequence of this site will serve here as a reference section (Brunnacker, Streit and Schirmer 1969; Brunnacker, Heller and Lozek 1971; Chr. van den Bogaard, P. van den Bogaard and Schmincke 1989; Bosinski 1992).

2.2. The Kärlich profile

The base of the Pleistocene sequence at Kärlich is formed by High Terrace gravels deposited by the Rhine and the Moselle (Fig. 2). The underlying Rhine facies gravels are grey, the upper, Moselle gravels are coloured red by the

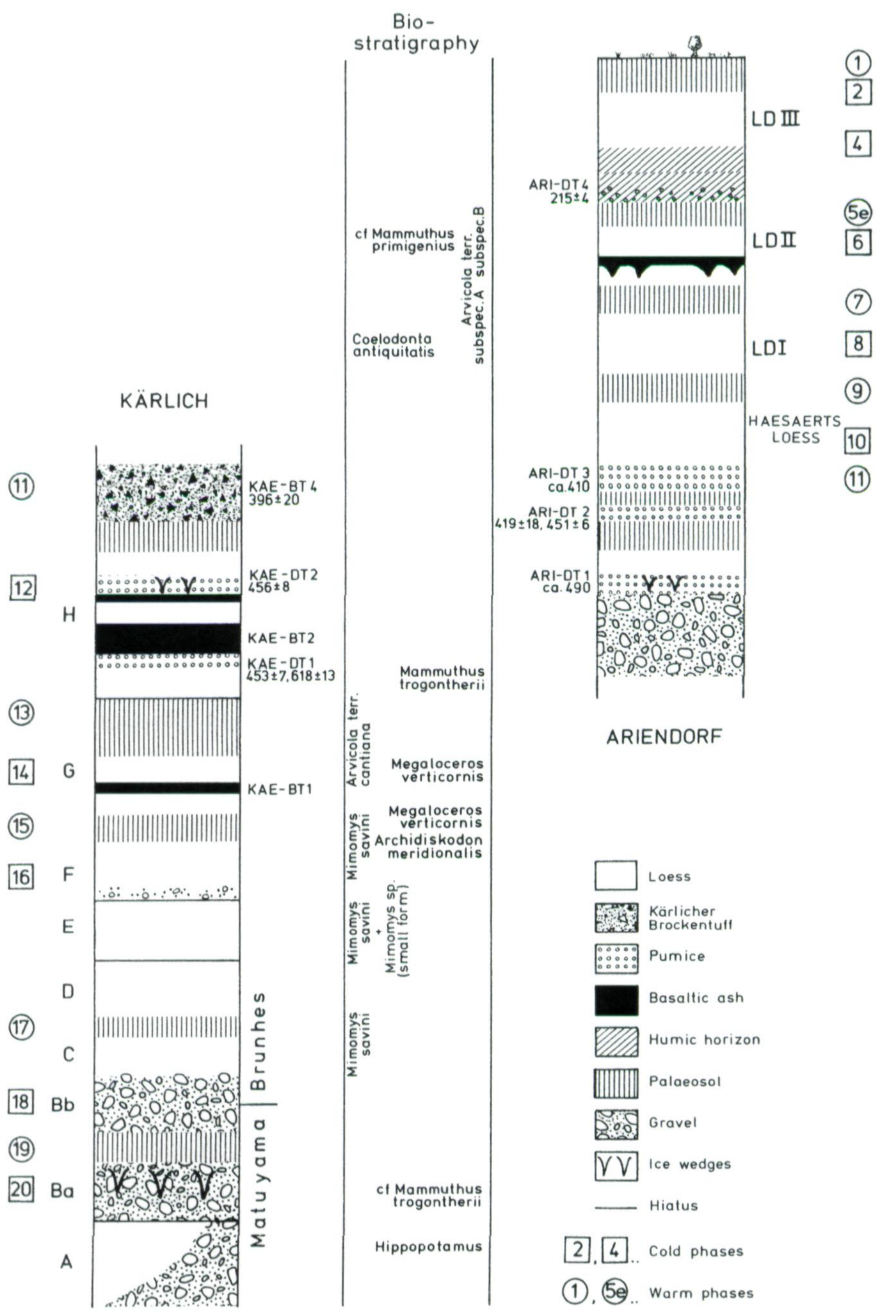

Fig. 2. Subdivision of the Pleistocene in the Central Rhineland based on the sections at Kärlich and Ariendorf.

inclusion of New Red Sandstone found in the region drained by this river. Between the two gravel facies is an illuviated sand layer. The magnetic field is reversed in this layer, but normal in layers above the overlying Moselle gravels, placing the Matuyama-Brunhes boundary in the level of the Moselle gravel facies (Boenigk, Heye *et al.* 1974; Brunnacker, Boenigk *et al.* 1976). This marks the boundary of the Early and Middle Pleistocene at 780 Kyr BP and falls within Oxygen Isotope Stage (OIS) 19. Tilted sediments (Layer A) were preserved only locally below the High Terrace sequence. They consist of normally magnetized gravel, sand and loess deposits which possibly date to the Jaramillo Event at 900 Kyr BP (OIS 23). An important piece of biostratigraphic evidence is the presence in these layers of *Hippopotamus*, which also first appears at other Central European localities dated to the Jaramillo Event (Kahlke 1985; in press).

The "mixed gravels" at the top of the Rhine gravel facies (Kärlich Ba) are affected by ice wedge pseudomorphs and cryoturbation features. This is the oldest evidence in the Central Rhineland for a pronounced cold phase with periglacial phenomena, dating to the end of the Early Pleistocene and equivalent to OIS 20. The High Terrace gravels (Kärlich B) are followed by a flood loam (Layer C) and then by loess deposits. The top of Layer C is marked by a weak soil formation. Stratigraphically important is the presence in Layer C of *Mimomys savini* (Van Kolfschoten, Roth and Turner 1990; Van Kolfschoten and Turner, in press). The overlying Loess D is poorly defined and not associated with a soil formation; faunal remains are very rare.

Above this follows a banded colluvial deposit, Layer E. Layers D and E are separated by a clear boundary, which suggests that erosional processes were active and represents a possible hiatus in the sequence. Layer E contains numerous molluscan remains characteristic of cold stage environmental conditions. The base of the stratigraphically higher Loess F shows evidence of redeposition. In particular, small, reddish-brown quartz pebbles within the layer have been derived from Tertiary "Kieseloolith" terraces. Loess F is usually pale yellow in colour and the top shows a clear soil development. Past authors have described a basaltic ash within Loess F as the oldest volcanic layer present in the Kärlich sequence, however, this tephra was not located by our recent investigations.

Loess F contains rich faunal remains (Van Kolfschoten, Roth and Turner 1990; Turner 1990, 1991; Van Kolfschoten and Turner, in press). Interesting in the macrofauna is the presence of *Megaloceros verticornis* and the identification of elephant molars as *Archidiskodon meridionalis*. The presence in the microfauna of *Mimomys savini* is important. Loess F is the youngest layer in which *Mimomys savini* occurs; in layers above this, the species *Arvicola terrestris cantiana* occurs. This biostratigraphic boundary, which characterizes the end of the Biharian (Maul 1990), marks the end of the earlier part of the Middle Pleistocene (Van Kolfschoten 1990a).

A stratigraphically important change in the spectrum of heavy minerals is recognizable in Layer F. Deeper layers are dominated by the heavy minerals zircon, rutile and green hornblende, which are derived from the Rhine gravels; the overlying layer contains spectra of volcanic origin dominated by brown hornblende (Zipter 1991). Loess F is correlated with OIS 16, its soil development with OIS 15. The upper part of the following Loess G is characterized by a pronounced soil development – a major marker horizon in the Kärlich section. The lower part of the loess contains a heavily weathered basaltic tephra (Kae-BT1) originating from a volcano of unknown age and location (Chr. van den Bogaard, P. van den Bogaard and Schmincke 1989). Kärlich G contains a rich microfauna. Stratigraphically important is the presence of *Arvicola terrestris cantiana*, a species characteristic of the central part of the Middle Pleistocene. The macrofauna contains rhinoceros (*Dicerorhinus* sp.) and *Megaloceros verticornis* (Van Kolfschoten, Roth and Turner 1990).

Whereas the volcanic heavy mineral spectrum of Layer G is dominated by brown hornblende, the overlying Layer H has a spectrum of volcanic heavy minerals dominated by pyroxene (Zipter 1991). This change in the heavy mineral spectra is stratigraphically important and allows, for example, the site of Miesenheim I to be dated to between Kärlich G and H (see below). The soil development of Kärlich G is correlated with OIS 13. Loess H contains two volcanic deposits (Fig. 3). In particular, the pumice (Kae-DT1) and overlying basaltic tephra (Kae-BT2) at the base of Layer H form an important marker horizon, which is also found overlying the Miesenheim I archaeological site. Mineralogical analysis shows that the tephra Kae-DT1 originates from an eruption centre of still unknown location. Absolute dating (40Ar/39Ar single crystal laser dating) gives a *maximum* age for this tephra of 618 Kyr BP (P. van den Bogaard, Hall *et al.* 1987; Chr. van den Bogaard, P. van den Bogaard and Schmincke 1989). On the evidence of the Kärlich section and the biostratigraphic record at other sites this maximum age appears to be some 100,000 years too old and a conventional date (40Ar/39Ar step-heating) of 453 ± 7 Kyr BP appears more probable (Lippolt *et al.* 1986; Vollbrecht 1992). Slightly higher in Kärlich Layer H a pumice layer (Kae-DT2) of up to 1 m in depth lies immediately above a thin basaltic tephra. The top of the pumice layer is interrupted by ice wedge pseudomorphs. Tephra Kae-DT2 is mineralogically similar to the Kae-DT1 tephra described above and has been dated by the 40Ar/

Fig. 3. Volcanic ash in Kärlich Level H. with their *maximum* age based on 40Ar/39Ar single crystal laser dating (see text).

39Ar single crystal laser method to 456 ± 8 Kyr BP. Kärlich H is capped by a soil containing shells of temperate molluscan species (Remy 1959; Van Kolfschoten, Roth and Turner 1990; Roth, in press a) and the impressions of leaves (identified is a species of maple) and seeds of *Celtis* (Lozek 1971). The rich molluscan fauna is characteristic of an interglacial phase with slightly more continental conditions than at the present day (Roth, in press a). This soil is sealed by the "Kärlich Brockentuff" (Kae-BT4). This is a poorly sorted deposit derived from an eruption in the immediate vicinity of the site, which at this point broke through both the underlying Devonian bedrock and also Tertiary clay layers and Pleistocene Upper Terrace gravels. Blocks of all these materials form the tuff ring of the "Kärlich Brockentuff", which has been dated by the 40Ar/39Ar single crystal laser method to 396 ± 20 Kyr BP. The mineralogical composition of the tephra shows that it derives from the Rieden eruptional phase. The eruption of the Kärlich Brockentuff occurred towards the middle of an interglacial which might be equated with OIS 11. The first part of this interglacial is represented by the soil formed upon Kärlich Layer H. Deposits from the second half of this interglacial are preserved in the southeast of the Kärlich clay pit in a depression formed subsequently to (and probably as a result of) the eruption of the Brockentuff. These sediments contain the archaeological site Kärlich-Seeufer (see below). With the exception of this depression, in which younger deposits are preserved, the Brockentuff represents the summit of the sequence at Kärlich. Above the primary Brockentuff deposit are found only thin deposits of Last Glacial loess and Laacher See pumice.

2.3. The Ariendorf profile

Important for the younger part of the Middle Pleistocene is the site of Ariendorf (Brunnacker, Löhr *et al.* 1975; Haesaerts 1990; Bosinski 1992). At the Ariendorf gravel quarry the Devonian slate bedrock is overlain by a 30 m deposit of Rhine Middle Terrace gravels (Leubsdorf Terrace), followed by a sequence of loess deposits and palaeosols (Fig. 2). The upper part of the fluviatile sequence contains a heavily weathered and cryoturbated pumice deposit (Ari-DT1), which is dated to *c.* 490 Kyr BP and is possibly equivalent to the Kärlich pumice Kae-DT1. Higher in the sequence two further pumice layers cover a soil formation. The lower pumice deposit (Ari-DT2) has a maximum age (40Ar/39Ar single crystal laser dating) of 451 ± 6 Kyr BP. The upper tephra (Ari-DT3) is some 0.80 m thick and contains numerous impressions of leaves. It too was dated by the 40Ar/39Ar single crystal laser method to approximately 410 Kyr BP (P. van den Bogaard and Schmincke 1990) and, additionally, by conventional 40Ar/39Ar step-heating (the sample is almost certainly Ari-DT2) to 419 ± 18 Kyr BP (Lippolt *et al.* 1986).

P. van den Bogaard and Schmincke (1990) point out that both the Ariendorf tephra Ari-DT2 and Ari-DT3 and the Kärlich Brockentuff (Kae-BT4) can be assigned mineralogically and chemically to the East Eifel Rieden eruptive phase. The volcanic deposits at both Kärlich and Ariendorf were erupted during an interglacial. These arguments – same eruptive phase, similar age, interglacial context – make it plausible to regard both the Kärlich Brockentuff (Kae-BT4) and the Ariendorf tephra layers Ari-DT2 / Ari-DT3 as deposits from the same interglacial, probably OIS 11. On this basis it is possible to synthesize the sections at Kärlich and at Ariendorf (Fig. 2). The four (?) Ariendorf loess beds thus correspond to the younger part of the Middle Pleistocene and the Late Pleistocene. The deepest loess ("Haesaerts loess"; Fig. 2) could belong to OIS 10, the soil on top of it to OIS 9. From this lower part of the Ariendorf sequence there are no archaeological finds. In the western part of Central Europe only artefacts from the Kartstein travertine (see below) could date to this final stage of the Lower Palaeolitic (OIS 9). Archaeological material from the base of the third Ariendorf loess bed (OIS 8) can already be assigned to the beginning of the Middle Palaeolithic.

3. Earliest traces of human occupation

The oldest evidence for human presence dates to the end of the Early Pleistocene and to the oldest (*Mimomys savini*-fauna) part of the Middle Pleistocene. The material consists exclusively of single, collected finds of lithic material without further contextual information.

3.1. Kärlich A

K. Würges found three quartzite pebble tools in the sandy loess-loam of Kärlich Layer A (Würges 1986; Vollbrecht 1992). All three artefacts are flaked on one surface only, i.e. choppers (Fig. 4). One specimen has subsequently split along a quartz vein. A tooth fragment of *Hippopotamus* comes from the same stratigraphical unit (Turner 1990; 1991). The finds could be contemporary with the Jaramillo-Event and correlated with OIS 23.

3.2. Kärlich Ba

At the base of the Rhine gravel sequence of the High Terrace (Ba) K. Würges discovered an artefact manufactured of trachytic tuff (Würges 1986; Vollbrecht 1992). The piece is a core showing several flake scars and can be assigned to a late phase of the Early Pleistocene. It is older than the pronounced cold phase (equated with OIS 20) shown by periglacial activity at the summit of the Rhine Gravel facies (Ba).

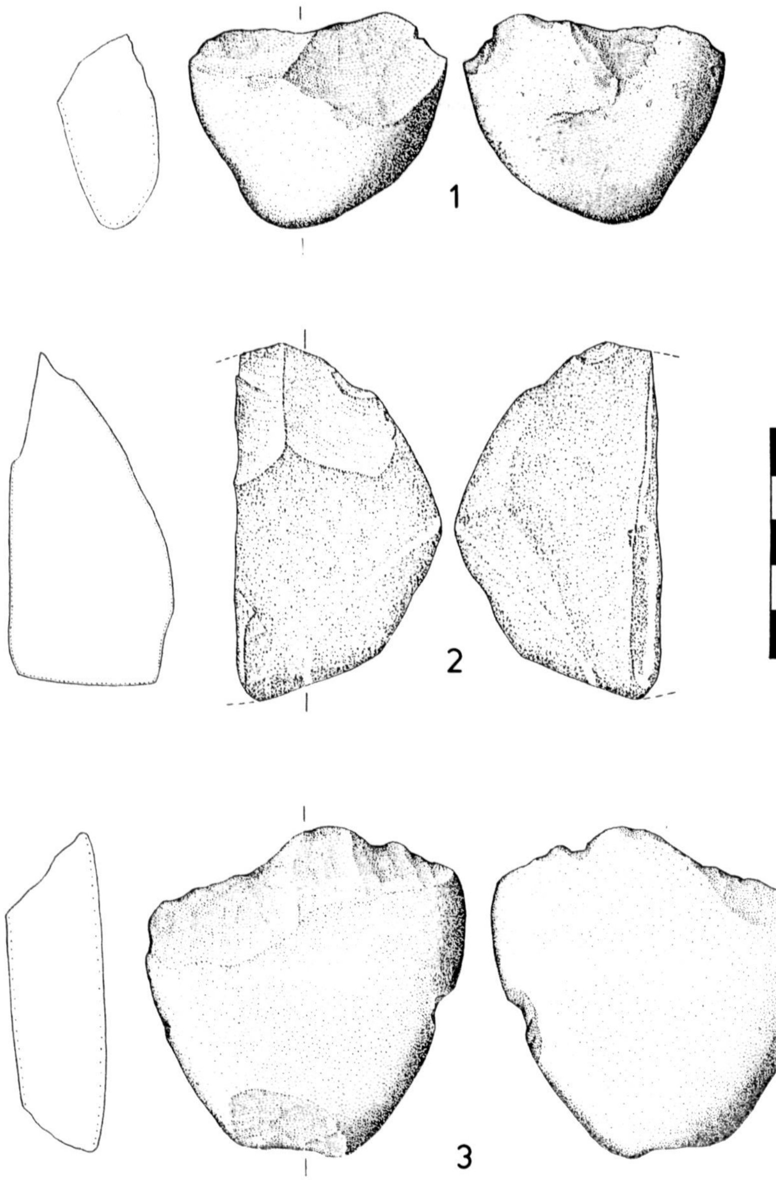

Fig. 4. Kärlich A. Pebble tools.
Scale in cm.
After Würges (1986) and Vollbrecht (1992).

A number of stones (artefacts?) found by K. Schmude in High Terrace gravels in the Lower Rhineland possibly belong to an equivalent period (Schmude 1992).

3.3. KÄRLICH BB

K. Würges collected eight artefacts of reddish-brown quartzite from the surface of the Moselle gravel facies (Würges 1986; Bosinski 1992; Vollbrecht 1992). The artefacts are slightly rolled and are derived from a locality further upstream. There are two cores, four flakes, a "pebble-scraper" and a pick-like tool (Fig. 5). Several bones and teeth of a deer (*Cervus* sp.) and a bovine (*Bos/Bison*) were found in a comparable stratigraphical position (Turner 1991). These finds are assigned to the initial phase of the Middle Pleistocene, soon after the Matuyama-Brunhes boundary which is located in the Moselle gravels (Bb).

Artefacts collected by L. Fiedler and A. von Berg from the surface of the High Terrace around Koblenz are possibly broadly contemporary (Berg and Fiedler 1983; 1987; Fiedler 1991). Among these quartz and quartzite artefacts are not only pebble tools, flakes and cores, but also bifaces.

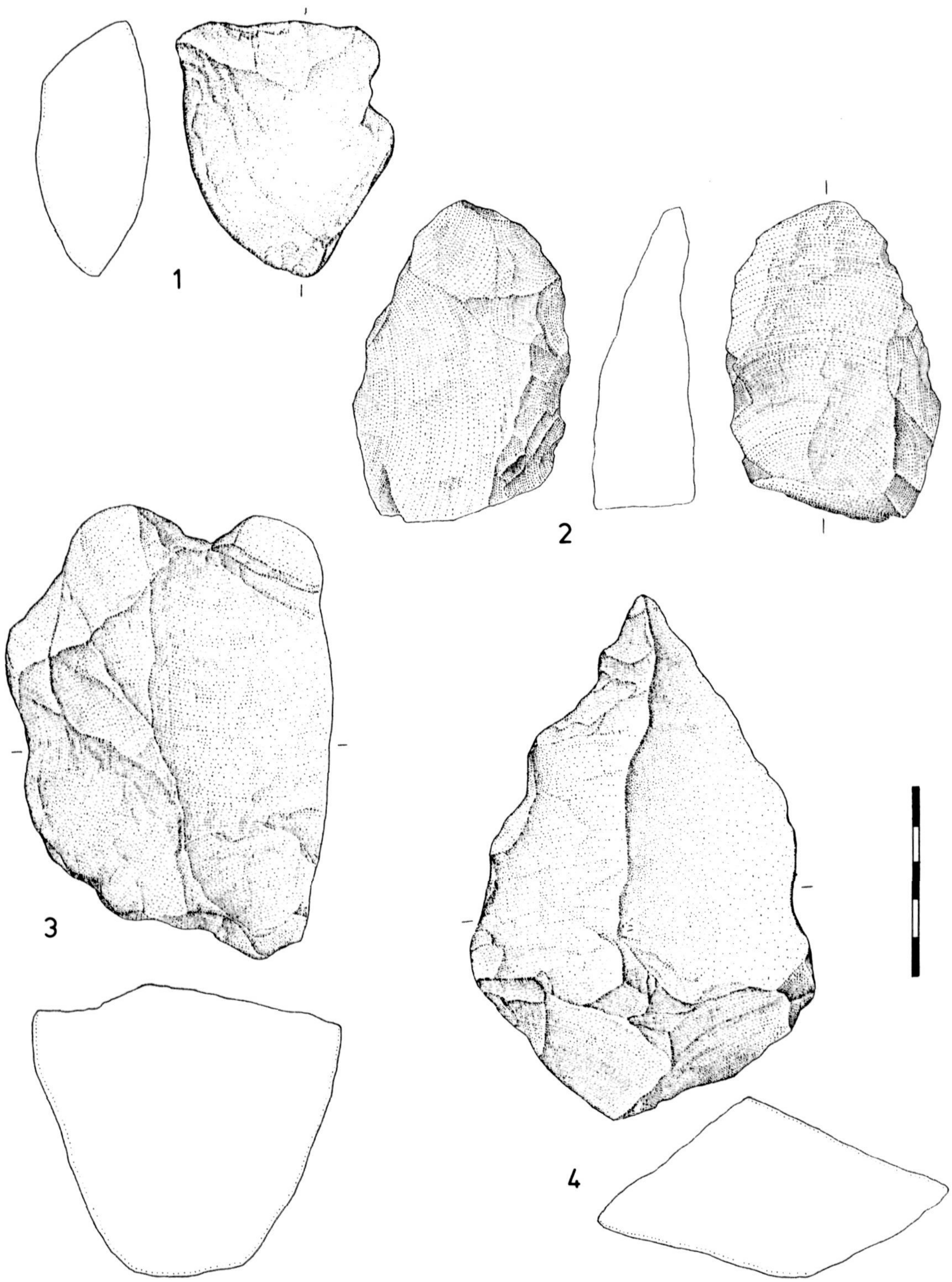

Fig. 5. Kärlich Bb. Pebble scraper (1), flake (2), core (3) and pick-like artefact of quartzite (4). Scale in cm. After Würges (1986) and Vollbrecht (1992).

4. Sites from the early Middle Pleistocene

This part of the Lower Palaeolithic is defined as comprising those finds dated to the first part of the *Arvicola terrestris cantiana* faunal stage, equivalent to OIS 14-12.

4.1. KÄRLICH G

Over a period of time 14 artefacts of quartz and quartzite have been found (mainly by K. Würges) in Kärlich layer G (Würges 1991; Vollbrecht 1992). The pieces comprise three cores, five flakes, one cleaver-like and two borer-like tools (Fig. 6). Numerous bones of large mammals were also found in layer G, including *Dicerorhinus* sp., *Equus* sp., *Alces* sp., *Dama* sp., *Megaloceros verticornis* and *Bos* or *Bison* (Turner 1991). The sediments of Layer G are correlated with OIS 14 and 13. Their heavy mineral spectrum is dominated by brown hornblende, so that artefacts from Kärlich G are older than those from Miesenheim I, where pyroxene already dominates in the profile.

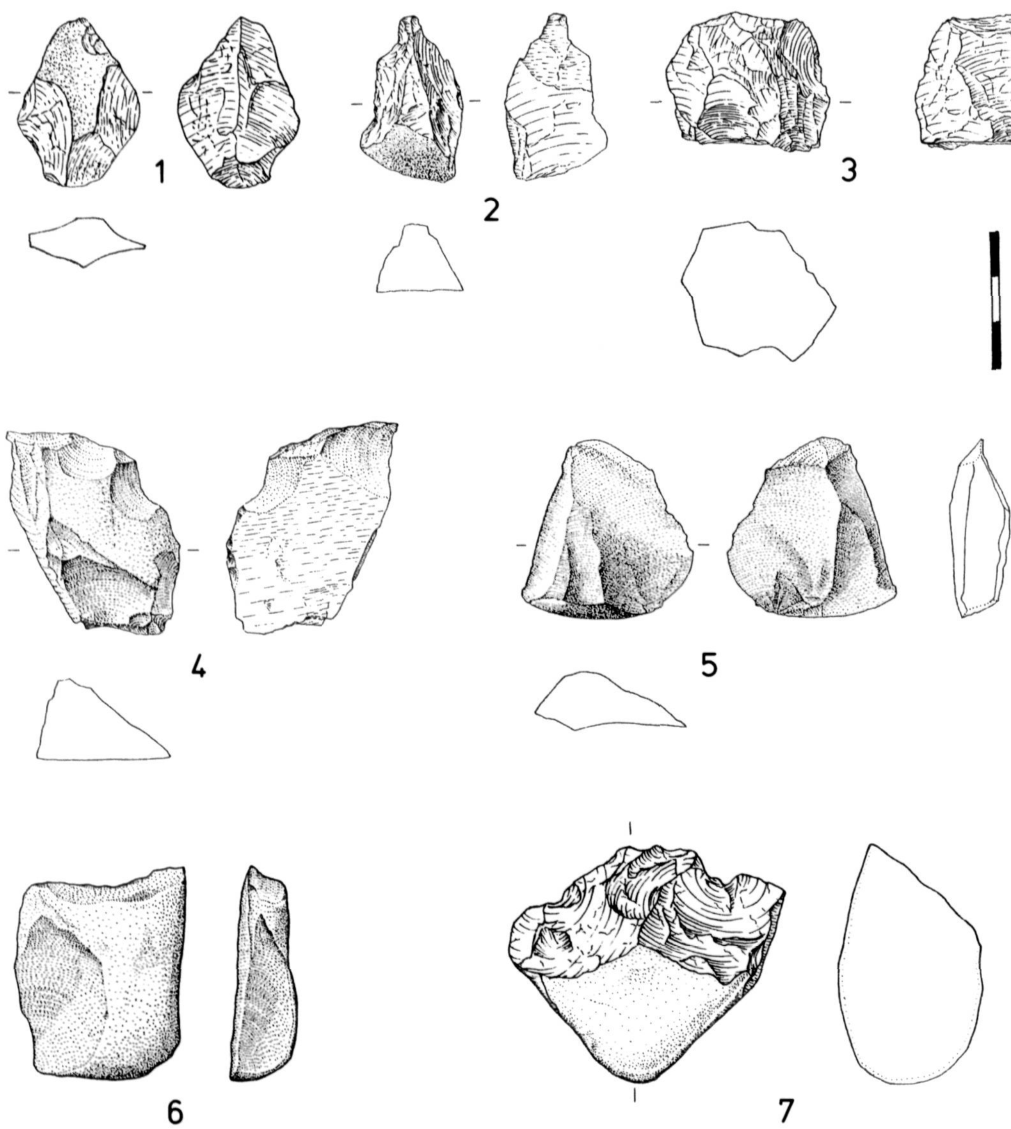

Fig. 6. Kärlich G. Quartz (1-3, 7) and quartzite artefacts. Scale in cm. After Vollbrecht (1992).

4.2. MIESENHEIM I

Miesenheim I was investigated under the direction of E. Turner from 1982-1991. The site lies on the slope of the Nette valley, some 5 km from the Kärlich clay pit (Boscheinen, Bosinski *et al.* 1984; Bosinski, Van Kolfschoten and Turner 1988; Van Kolfschoten 1990b; Turner, in press). The site originally lay close to a shallow body of water, possibly an old meander of the Rhine. The finds are located in a dark, organic "anmoor" sediment (Layer F) and in the grey-yellow loam (Layer G) immediately underlying this (Fig. 7). Higher in the section are found a pumice (Mie-DT1) and a basaltic tephra (Mie-BT1) which closely resemble tephra layers in Kärlich Layer H (Kae-DT1 and Kae-BT2 respectively). The Kärlich tephra have an identical mineralogical and chemical composition to those at Miesenheim I (P. van den Bogaard and Schmincke 1990) and are dated at the former site to 618 ± 18 Kyr (*maximum* age) and 453 ± 7 Kyr BP. Since the Miesenheim I heavy mineral spectrum is dominated by pyroxene and therefore younger than Kärlich Layer G (where brown hornblende is dominant), Miesenheim I is assigned to a phase between Kärlich G and H. The site probably belongs in the same interglacial during which the thick soil formed on Kärlich Layer G and which can be correlated with OIS 13.

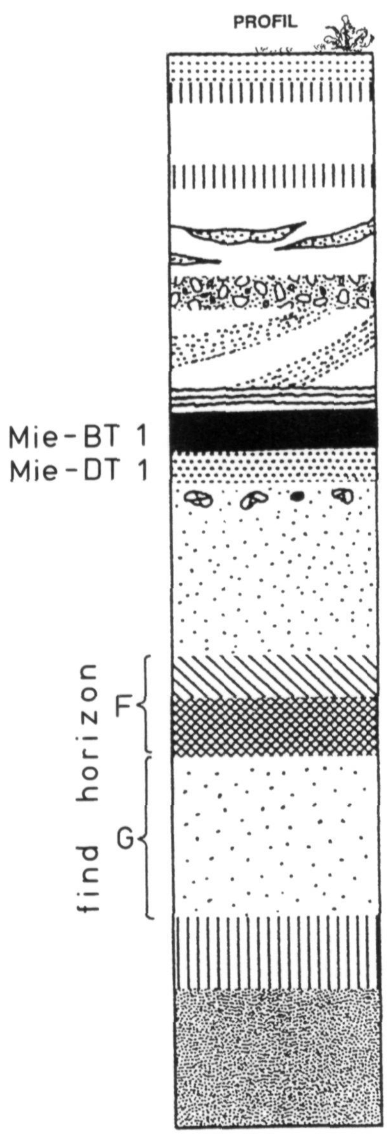

Fig. 7. Idealized section at Miesenheim I., total height approximately 5 m. After E. Turner.

The rich molluscan fauna (Roth, in press b) demonstrates an interglacial climate, somewhat more continental than at the present day. In addition it shows the local presence of wetland with standing water, swamp-like banks and patches of forest. The abundant small mammal remains confirm this picture (Van Kolfschoten, in press). Beaver (*Castor fiber*) and extinct giant beaver (*Trogontherium cuvieri*) may have further contributed to the presence of wetland conditions with their dams. *Neomys* cf. *newtoni*, *Sorex savini*, *Desmana* sp. and *Arvicola terrestris cantiana* inhabited the wetter parts of the shoreline, *Sciurus* sp., *Eliomys quercinus*, *Muscardinus avellanarius*, *Clethrionomys glareolus* and *Apodemus sylvaticus* occurred in adjacent woodland.

The small mammal fauna from Miesenheim I can, in addition, be assigned to the central Middle Pleistocene *Arvicola terrestris cantiana - Sorex (Drepanosorex)* sp. Concurrent-range-subzone (Van Kolfschoten 1990; in press a).

The large mammal spectrum is characteristic for an early Middle Pleistocene interglacial. This is particularly true of the species *Canis mosbachensis, Equus mosbachensis* and *Ursus deningeri* (Turner, in press). At the same time, the fauna reveals details of environmental conditions close to the site. Roe deer (*Capreolus capreolus*) and red deer (*Cervus elaphus*) dominate the fauna. The presence of horse (*Equus mosbachensis*) shows that open grassland areas were also present.

Of particular interest is the taphonomic investigation of the site (Turner, in press). Roe deer is definitely represented by at least 9 individuals (3 juveniles and 6 adults), but the spatial distribution of the material suggests that at least 13 individuals might be represented. The season of death of the young animals was between August and the winter months. Possibly the bones represent the remains of a large group of animals which were killed (?) here. Red deer is represented by at least 6 individuals (2 juveniles and 4 adults). The age structure and spatial distribution of the material suggests that this may be a "harem" of females and young animals

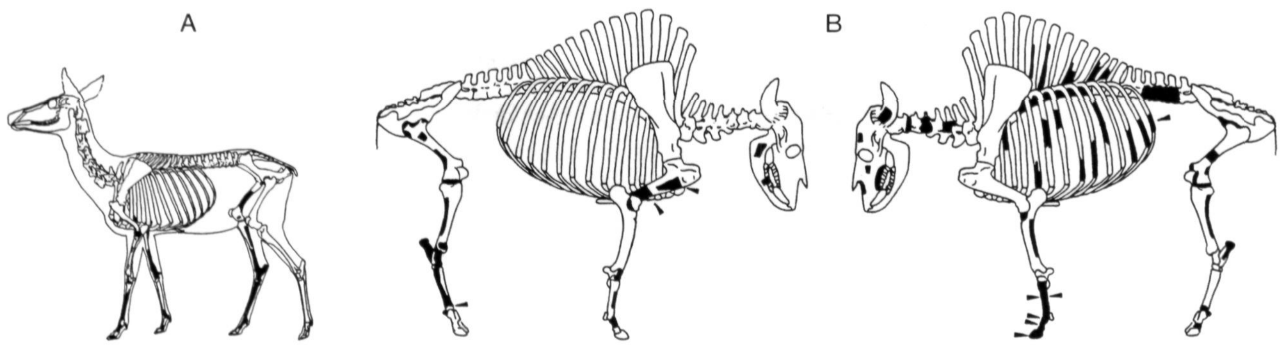

Fig. 8. Miesenheim I. A: Remains of the "partial carcass", Roe deer D as found during excavation, B: Remains of the "partial carcass" Bovid B, as found during excavation (from: Turner, *in press*).

killed (?) here in autumn or winter. Horse is represented by at least four individuals. The age structure of the material suggests that a "family group" is represented. In the case of the described species – roe deer, red deer and horse – the limb bones and skulls (with teeth) are always present, whereas elements of the rump (ribs and vertebrae) are rarely represented (Fig. 8). A similar distribution is often present on Middle and Upper Palaeolithic sites in the Central Rhineland and probably reflects a selection for meat-bearing parts by humans. A bovine carcass at Miesenheim I shows a completely different distribution pattern (Fig. 8): almost all parts of the skeleton are present in the case of

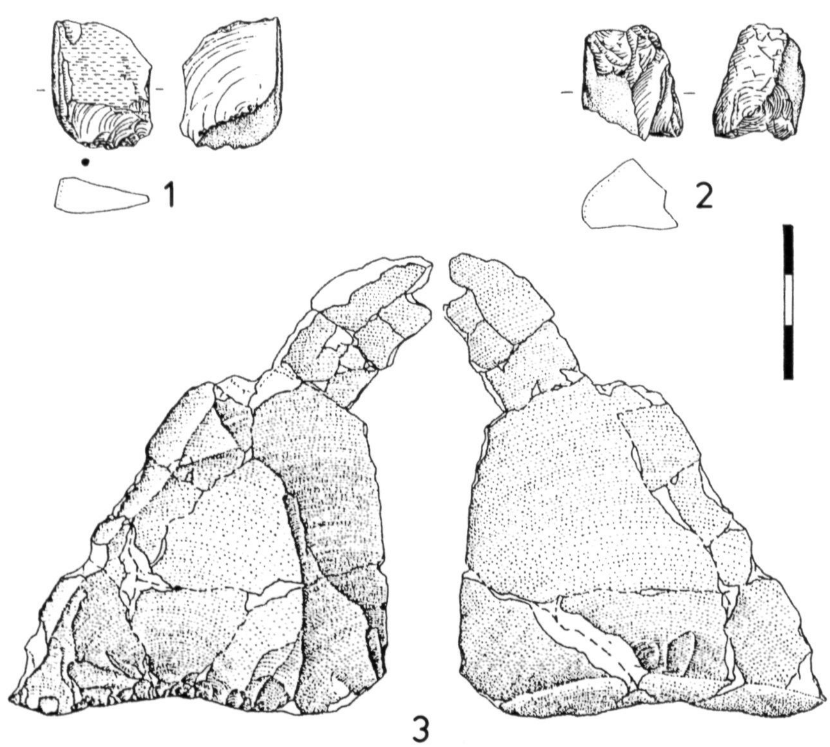

Fig. 9. Miesenheim I. Artefacts of lydite (1), quartz (2) and quartzite (3). Scale in cm. After E. Turner.

this old individual, which may plausibly have died naturally in the swampy waterside situation.

Due to fine-stratigraphical analysis it appears that the overgrown banks of the Pleistocene Rhine were repeatedly the scene of human hunting episodes. During one such episode a family group of four horses was killed; subsequently a group of 13 roe deer and a herd of six red deer were also successfully hunted. In addition, it is possible to demonstrate the presence at the site of animals which died naturally (shown particularly clearly in the case of a bovine) and were then scavenged by carnivores. The lithic assemblage is manufactured from materials which can be found in the area, such as quartz, quartzite and lydite. The presence of cores and refitted artefacts shows that most artefacts were produced at the site (Fig. 9). A flake of lydite and a large flake of fine-grained Tertiary quartzite appear, however, to have been brought to the site in their present form. The latter piece (Fig. 9.3) is retouched at the dorsal border of the striking platform and is the only modified artefact in the small assemblage. The artefacts have a similar spatial distribution to that of the faunal remains. The conjoin patterns of artefacts and of faunal remains both demonstrate relationships between different parts of the site. The artefacts probably demonstrate, similarly to the faunal remains, different episodes of activity at the waterside. At the east of the excavated area an accumulation of pebbles covering some 5 m^2 was uncovered. The presence of bones and artefacts next to and within this concentration links it to the human use of the site. It is improbable that this spatially defined, single layer of fist-sized pebbles is a natural accumulation. Possibly the stones were deposited here deliberately by man in order to create a drier and more stable area in the marshy sediment of the bank.

4.3. Mauer near Heidelberg

The famous site of Mauer is located in an ancient meander of the Neckar river 10 km southeast of Heidelberg. The site was originally an aggrading river bank upon which animal bones and the human jaw were washed together. The human mandible was discovered by Daniel Hartmann on October 21, 1907 and published by O. Schoetensack in a classic monograph the following year (Schoetensack 1908).

In the section of the sandpit the Neckar sands are overlain by several loess beds and soil developments, which, on the evidence of new investigations by Bibus (1992a), represent at least the last three cold stages and interglacials respectively.

The microfauna from the Mauer sands contains the species *Talpa minor*, *Talpa europea*, both *Castor fiber* and *Trogontherium cuvieri*, *Pliomys episcopalis*, *Arvicola terrestris cantiana*, *Microtus arvalis/M. agrestis*, and *Apodemus* sp. (Von Koenigswald 1992). The large mammal fauna consists of *Canis lupus mosbachensis*, *Ursus stehlini*, *Ursus deningeri*, *Hyaena arvernensis*, *Panthera pardus sickenbergi*, *Panthera leo fossilis*, *Felis (Lynx) issidorensis*, *Felis* cf. *silvestris*, *Homotherium* sp., *Elephas (Palaeoloxodon) antiquus*, *Equus mosbachensis*, *Stephanorhinus*

Fig. 10. The Mauer mandible. After O. Schoetensack.

hundsheimensis, Sus scrofa priscus, Hippopotamus amphibius antiquus, Alces latifrons, Cervus elaphus acoronatus, Capreolus süssenbornensis and *Bison schoetensacki* (Von Koenigswald 1992).

This is an interglacial fauna; the presence of *Hippopotamus* shows an Atlantic climate with mild winters and a forested landscape. Biostratigraphically the microfauna is very similar to that of Kärlich G and, in particular, that of Miesenheim I. W. von Koenigswald (1992) specifically points to the occurrence of both *Arvicola terrestris cantiana* and *Pliomys episcopalis*, which dates these sites – Kärlich G, Miesenheim I and Mauer – to the central part of the Middle Pleistocene. It is probable that the "Mauerer Waldzeit" (Müller-Beck 1964) is equivalent to the interglacial represented by the Kärlich G soil formation and at Miesenheim I, and that this can be correlated with OIS 13.

The mandible of *Homo heidelbergensis* (Fig. 10) is large and massive, the teeth by contrast, relatively small. A protuberance of the chin is totally absent. The specimen corresponds best to those from Ternifine and Montmaurin, although there is also a strong resemblance to the *Sinanthropus* mandibles from Choukoutien (Howell 1960; Gabunia 1992). All these finds are assigned to late forms of *Homo erectus*, which is in good correspondence with the chronological position of the Mauer site.

During the 1950's A. Rust conducted investigations at the site. He believed that he could recognize flat pebbles of New Red Sandstone with "struck" edges and "prepared" notches and "noses" as artefacts (Rust 1956 a-b; 1957; 1965; 1971). The artificial nature of these pieces has not been generally accepted and the creation of an eponymous "Heidelberger culture", containing numerous clearly pseudo-artefacts of diverse origin, further discredited them. Recently, small chert pieces collected by K.F. Hormuth from the Mauer sands before the Second World War, have been relocated (Beinhauer, Fiedler and Wegner 1992). It is not proved that these pieces were worked by humans and unlikely that they were related to the Mauer jaw bone.

4.4. Achenheim Layer 30

At the base of the major loess section at Achenheim near Strasbourg, bones of *Castor* sp., *Ursus deningeri, Dicerorhinus etruscus, Equus mosbachensis, Hippopotamus, Cervus* and *Alces* have been found in the Rhine sands below the loess (Wernert 1957; Heim, Lautridou *et al.* 1982; Junkmanns 1991). This fauna can be compared to those of Mauer, Kärlich G and Miesenheim I and may possibly represent the same Middle Pleistocene interglacial. In the same layer was found a cobble showing a single flake removal possibly worked by man (Wernert, Millot and Van Eller 1962).

4.5. Kärlich, lower Layer H

Whereas the finds described so far from the middle phase of the Lower Palaeolithic can all be assigned to interglacial conditions with a moist-temperate climate, the finds from the base of Kärlich Loess H were deposited during a period of steppe conditions with a prevailing dry continental climate. Human presence during such a climatic phase is new to this period of the Lower Palaeolithic of western Central Europe. Kärlich Layer H is younger than both Layer G at the same site and the site of Miesenheim I and is correlated with OIS 12.

In 1983 K. Würges investigated a site which lay at the edge of a channel filled with pumice (Kae-DT1) and basaltic tephra (Kae-BT2). Although the site had already been largely destroyed by quarrying machinery (Würges 1984), it was possible to recover a tusk and a thigh bone of a steppe elephant together with 60 quartz and quartzite artefacts (Fig. 11). The majority of the finds consists of flakes, a number of which are produced in bipolar technique. In addition, five cores, four struck cobbles and an intensively battered quartz hammerstone were also found. Among the modified forms are two scrapers and two "points", together with a number of partially edge-retouched artefacts. Apart from this largely destroyed situation, a number (68) of collected artefacts is known from the same stratigraphical position in various parts of the clay pit (Vollbrecht 1992). Besides quartz and quartzite artefacts, this number includes a lydite core. The majority of the pieces are "chunks" and flakes, but six cores and a small number of retouched forms are also present. Finally, J. Vollbrecht discovered and investigated a further, still unpublished, site (Kärlich III/"Uhu-site") at the base of Layer H in the northwest quarry face of the pit.

5. Late Lower Palaeolithic sites

The late Lower Palaeolithic sites are from the period ca. 400-300 Kyr BP (OIS 11-9). The Middle Palaeolithic begins in our region at the base of the ante-penultimate loess bed (OIS 8).

5.1. Kärlich Seeufer

In the southeast of the Kärlich clay pit a topographical depression formed subsequently to the deposition of the Brockentuff. The feature seems a result of the eruption and is possibly a crater. The depression became partly filled with redeposited Brockentuff; subsequently water was able to collect and a small lake was formed. Peat deposits formed during the infilling of this lake represent, on the evidence of their contained pollen and macroscopic remains, the second half of the same interglacial in which the tuff ring was erupted (Bittmann, in press). The first phase present is a mixed-oak-forest, in which oak

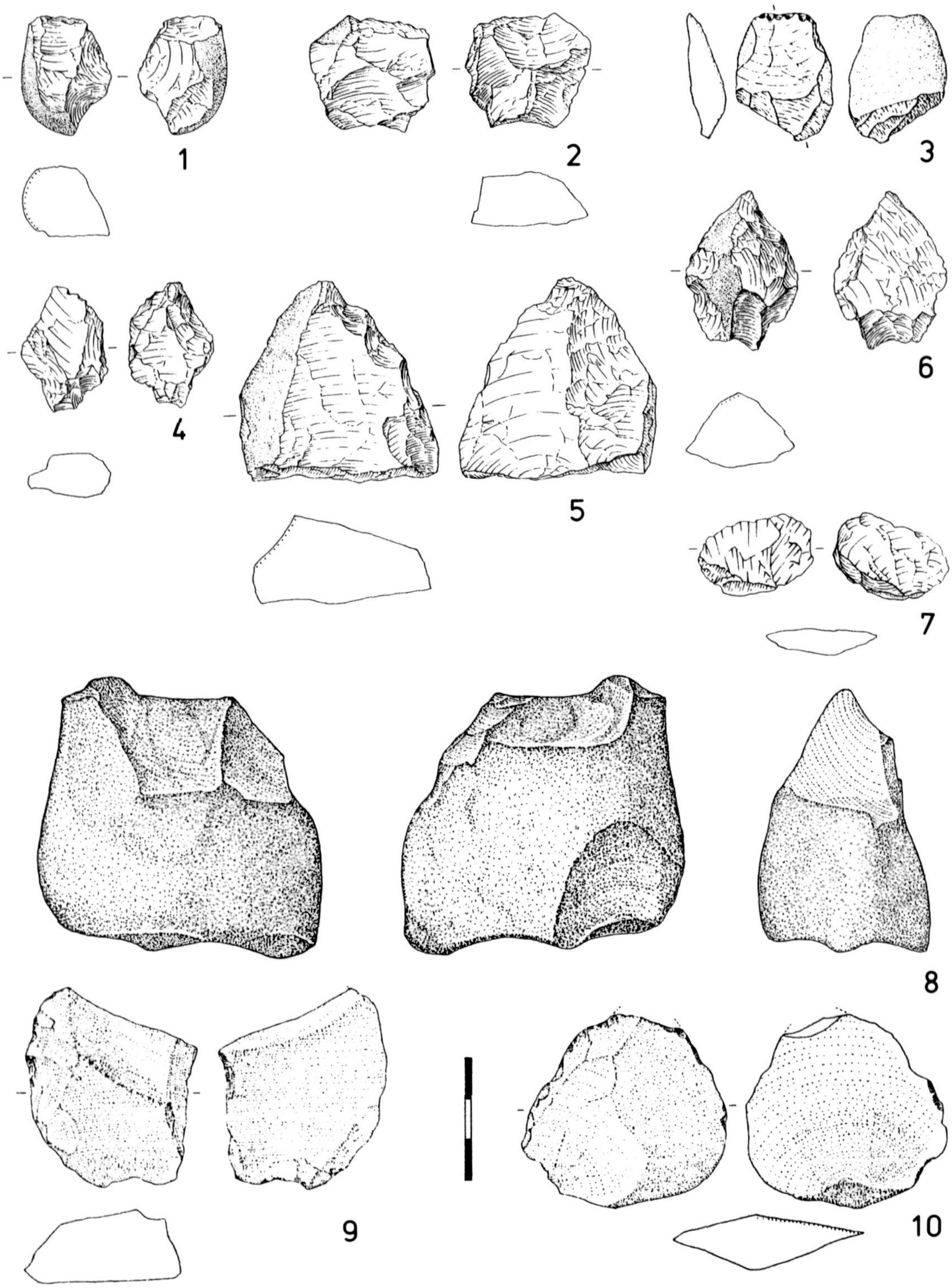

Fig. 11. Kärlich lower Layer H. Quartz (1-7) and quartzite (8-10) artefacts. Scale in cm. After K. Würges and J. Vollbrecht.

dominates over elm and lime. This is succeeded first by a phase in which hazel is the dominant species and then by a phase dominated by hornbeam. The presence of wingnut (*Pterocarya*) and nettle tree (*Celtis*) during the latter period shows that temperatures were warmer than at the present day. The pollen diagram shows a subsequent rise of fir. Finally, the values of both the hornbeam and the fir decrease and an increase in the presence of spruce and pine marks the end of the interglacial.

The palynological interpretation of the vegetational development can be complemented by a large range of plant macro-remains, including wood remains up to the size of tree trunks (Bittmann, in press).

The "Kärlich interglacial" differs from the Holstein Interglacial through e.g. the presence of *Celtis* and *Azolla filiculoides*, but also in its high values for hornbeam and low values for alder, and must represent an older interglacial phase. The best parallel is Bilshausen near Göttingen, which is assigned to the Cromer Complex (Bittmann 1990; in press). Bittmann proposes to equate the Kärlich interglacial with a "Cromer V" interglacial correlated with OIS 11. During the hornbeam phase of this interglacial, there is evidence for the presence of a group of hominids on a small "peninsula" formed in the northeast part of the lake by sandy material and Brockentuff eroding from an upslope position (Bosinski, Brunnacker *et al.* 1980; Kröger, P. van den Bogaard *et al.* 1988).

The lithic artefacts are made from materials present in the neighbouring terrace gravels, in particular from quartz and quartzite. A problem concerning the artefacts is that the eruption of the Brockentuff tuff ring not only broke through Devonian slate and Tertiary clay, but also through the High Terrace gravels, so that the Brockentuff contains numerous naturally fractured pebbles. Many of these are "cores" and "flakes". Several attempts have been made to establish criteria for distinguishing such tephrofacts derived from the Brockentuff from true artefacts (see also Raynal *et al.*, this volume). In view of the unsophisticated technology in use during the Lower Palaeolithic this is not possible for many finds, so that a large "grey area" remains of pieces which might equally have been fractured by man or by the eruption. Despite these problems it is possible to identify some 150 certain artefacts from the Kärlich-Seeufer site. Flaking technology and flake forms are generally simple (Fig. 12), but there are two cores which foreshadow the Levallois technique. Some flakes are partially edge-retouched. A fragment of wood attached by a concretion to one of these pieces may represent remains of hafting. Only a small number of flakes have regularly retouched scraper-edges. In addition, cleavers of different sizes (Fig. 13) and bifaces are also present. The two most regular bifaces (Figs 14-15) are made of reddish-brown quartzite and are similarly proportioned and flaked. The lower surface of one piece is largely natural cortex, that of the second piece is formed by a natural cleavage plane. A further class of artefact comprises pebble tools of different types and sizes. The Kärlich-Seeufer artefacts were found in a fan of sediments originating from repeated hill wash and extending into the depression. Most of the artefacts are fresh, with sharp edges, and have certainly not been transported over a long distance. Hammerstones and conjoined artefacts are evidence for the production of artefacts at the site.

Animal bones were discovered in the same area as the stone artefacts. The most common category is formed by bones and teeth of the straight-tusked elephant, which is represented at the site by at least 8 individuals (Kröger, P. van den Bogaard *et al.* 1988). The age structure of the elephants includes juveniles, prime adults and old individuals. The most frequent body part is the head, including the molars and tusks, whereas parts of the rump are rarely represented. Besides the dominant straight-tusked elephant, bones and teeth of red deer (*Cervus elaphus*), a bovine (*Bos* or *Bison*), horse (*Equus* sp.), pig (*Sus* sp.), reindeer (*Rangifer tarandus*) and a felid were also found. Recent analysis by S. Gaudzinski (in press) indicates that the bones and stones were reworked from various directions during various periods, thus denying a primary context character for the site.

The situation excavated at Kärlich-Seeufer has parallels at Lower Palaeolithic sites in Italy (Fontana Ranuccio, La Polledrara) and Spain (Torralba, Ambrona, Aridos). At all these sites there has been a long discussion of the role of humans in the accumulation of the recovered assemblages and, in particular, about the question of active elephant hunting. Without entering into this particular discussion, which can be decided only with difficulty on the basis of the archaeological assemblage, it would be carrying things too far not to accept the shells of hazel nuts found with the lithic assemblage and the animal bones as the food remains of hominids.

5.2. Kartstein travertine

The Kartstein travertine in the North Eifel consists of several units formed during different interglacials. The main travertine massif recently was dated about 300 Kyr BP by N. Frank (see Vollbrecht, in press) and probably belongs to OIS 9. During the investigation of younger archaeological horizons in caves and abris which had subsequently formed at the base of the massif, H. Löhr discovered pebble tools and animal bones embedded in the travertine (Brunnacker, Hennig *et al.* 1982). The context of the pieces, which are cemented into the travertine matrix, precludes a meaningful investigation of the site.

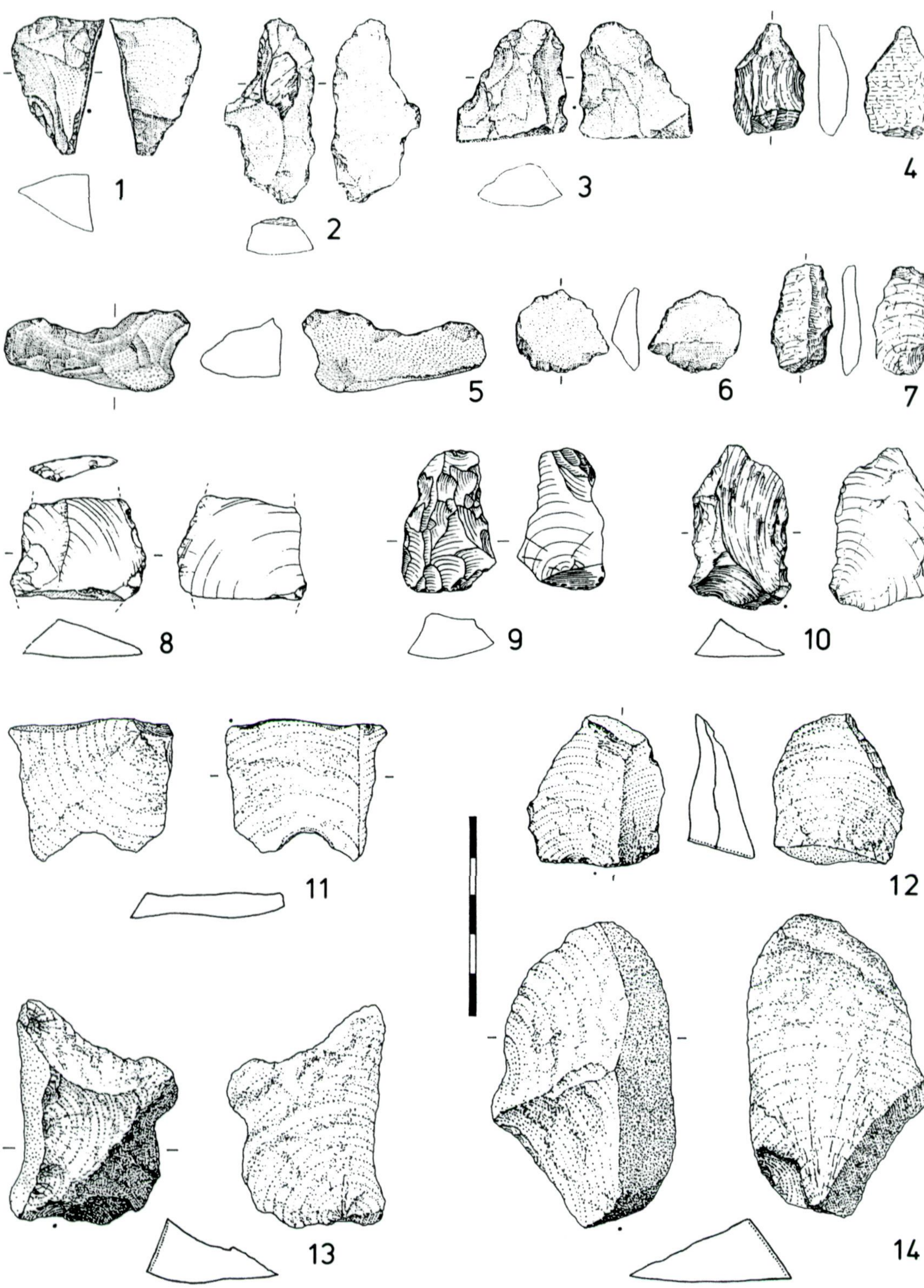

Fig. 12. Kärlich-Seeufer. Flakes. A fragment of wood adheres to the dorsal face of artefact 2. Scale in cm. After K. Kröger.

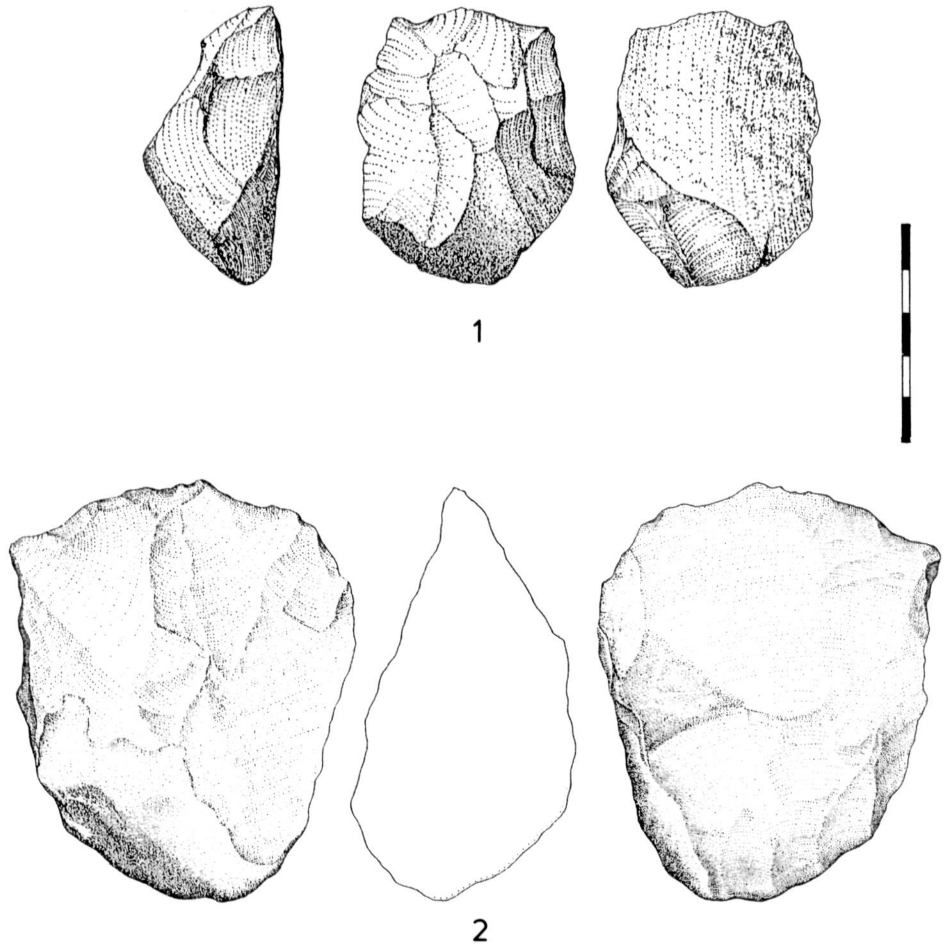

Fig. 13. Kärlich-Seeufer. Cleavers. Scale in cm. After K. Kröger.

6. Lower Palaeolithic finds of uncertain age

6.1. Münzenberg region

Finds of pebble tools, flakes and bifaces collected from the surface of ancient terraces close to Münzenberg in Upper Hessia have been published in several articles by H. Krüger since the 1950's (Kröger 1959; 1975; 1977/78; 1987; 1989; 1994; Fiedler 1983; 1994; Moncel 1989). The majority of this material can, very probably, be assigned to the Lower Palaeolithic and it has also been possible to trace the find-bearing horizon below a loess section containing the two most recent loess beds (Bibus 1976). Nevertheless, this only provides a *terminus ante quem*; the true age of the material is still unknown and the investigation of a stratified site in this region remains a priority.

6.2. Bönnigheim

Animal bones and stone tools were discovered below a stratified loess section in a pit at Bönnigheim near Ludwigsburg (Wagner 1990; 1991). The stratigraphy of the site shows that the finds are older than the ante-penultimate cold stage (OIS 8) (Bibus 1992b). The bones are identified as the remains of the skeletons and teeth of a temperate fauna, including straight-tusked elephant, rhinoceros, bison, pig and red deer (Wagner 1991). Associated with the bones was a pebble tool made of exotic tabular chert.

6.3. Steinheim

The Steinheim skull (Berckhemer 1933; Adam 1988) and the finds from the travertine localities Lauster, Haas and

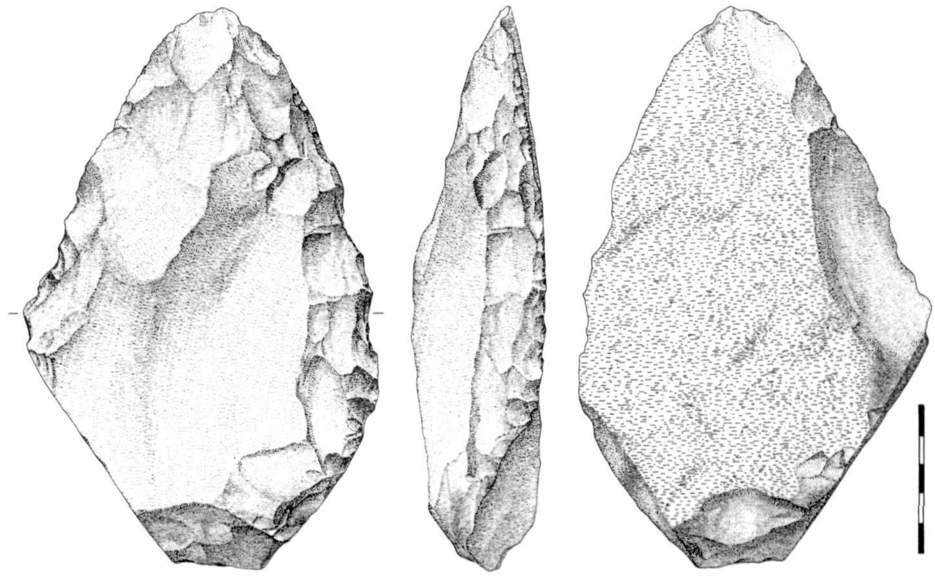

Fig. 14. Kärlich-Seeufer. Biface. Scale in cm.

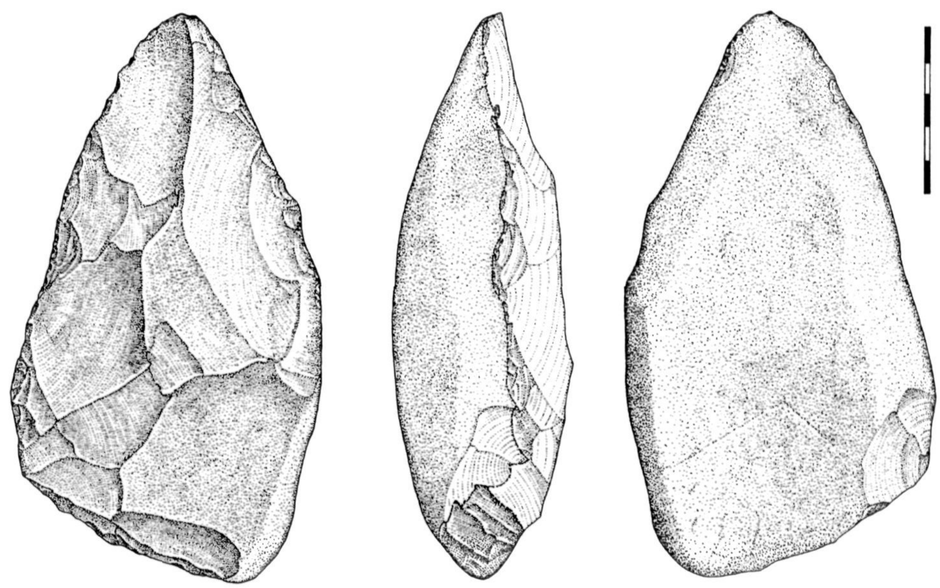

Fig. 15. Kärlich-Seeufer. Biface. Scale in cm.

"Bunker" in Bad Cannstatt (Wagner 1980; 1984; 1987; 1992; Adam, Reiff and Wagner 1986) probably derive from the interglacial dated to about 220 Kyr BP (OIS 7) and are thus rather early Middle Palaeolithic in context. At Steinheim this is rendered likely by the stratigraphic dating of the "*antiquus* layers", in which the skull was found, to before the penultimate cold stage (Adam 1988).

In the case of the Bad Cannstatt travertine, dating evidence is provided by the geographical distribution of the various travertine stages within the valley of the Neckar (Adam, Reiff and Wagner 1986), the U-series dating of the travertines to 170-295 (Haas quarry) and 145-260 Kyr BP (Lauster quarry) (Grün, Brunnacker and Henning 1982), an ESR date for an elephant tooth from the Lauster quarry of 237 ± 26 Kyr BP (Grün and Brunnacker 1986) and by the character of the lithic assemblage. The "Bunker" site, for example, besides numerous pebble tools, yielded small numbers of chert Levallois flakes (chapeau de gendarme) which could be partly refitted and were probably struck from one core (Wagner 1987, 18).

7. Conclusions

The earliest hints regarding the occupation of Western Central Europe date to the end of the Lower Pleistocene. Isolated finds (esp. Kärlich A) with only limited information probably date from around the time of the Jaramillo Event.

The occupation of our working area is better documented for the early Middle Pleistocene period. From Kärlich G there are quartz and quartzite artefacts as well as fauna including *Megaloceros verticornis* and *Arvicola cantiana terrestris*. The Middle Pleistocene interglacial at Miesenheim I is younger than Kärlich G and may correlate to OIS 13. The large mammals include *Capreolus capreolus, Cervus elaphus, Equus mosbachensis,* and *Bos/Bison*. The finds of Achenheim layer 30 and the biostratigraphically similar material from Mauer, including the famous lower jaw of *Homo heidelbergensis* probably belong to the same Middle Pleistocene interglacial as Miesenheim I. While all the sites mentioned above date to interglacials, the site Kärlich H *unten*, below the tuff Kae-DT1 which has been dated to about 450 Kyr BP, can be situated in a glacial steppe landscape.

The approximately 400 Kyr old site Kärlich-Seeufer is an example of a late Lower Palaeolithic shore and bank site with many elephant bones as well as bifaces and cleavers. This site raises problems of interpretation comparable to those at similar sites in other parts of Europe. The finds from the Kartstein travertine date to about 300 Kyr BP and belong to the end of the Lower Palaeolithic in Western Central Europe.

note

1 Translated by Martin Street

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