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Further Evidence of a Lower Pleistocene Arrival of Early Humans in Northern Europe – The Untermassfeld Site (Germany)

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ABSTRACT

The discovery of 24 stone artifacts and two bone tools at the German fluvial site of Untermassfeld associated with a rich vertebrate fauna of the Epivillafranchian provide further evidence of a Lower Pleistocene arrival of early Homo in northern Europe, since results of geological, paleomagnetic and biostratigraphic investigations point to an absolute age of approximately 1.07 million years (ma). The typological study of the lithic artifacts is accompanied by the analysis of the mineralogical structure of the raw materials and use wear traces of simple flakes and retouched lithic fragments. Signs of thermal alteration on the surface of a stone tool may denote former exposure to fire. Hominin processing of animal resources is indicated by at least one knapped bone tool and bone surface modifications considered to be of cultural origin. Finally, lithic material from further archeological find sites of the Werra Valley associated with assumed Lower Pleistocene river sediments are discussed.

Key words: *Lower Pleistocene, Untermassfeld site, lithic artifacts, bone tools, early* Homo*, Epivillafranchium, use-wear traces, cutmarks*

Introduction

Former claims to establish a first colonization of Europe prior to 0.5 ma (million years) before present in southern Europe but also north of the Alps have always led to controversy usually centred around the artifactual character of assemblages and/or their chronological position[1–4]. The authors argue that those assemblages mostly consist of isolated pieces which have been collected or sorted out from natural gravel deposits and fall in the range of naturally produced artifacts. Therefore those finds are considered to be too rare and undiagnostic to prove a Lower Pleistocene settlement of humans in Europe, since artifact finds from primary context or fine-grained deposits from this time horizon are completely lacking.

Besides increasingly solid data from southern Europe indicating that Europe was occupied for the first time over a million years ago (see discussion below), reliable evidence of a first colonization of northern Europe far earlier than postulated stems also from recent discoveries at the following sites:

At the already known German faunal site of Dorn-Dürckheim 3 (Figure 1) a quartzite polyeder and a retouched flake have been recovered from fresh water deposits of reversed polarity just below the Matuyama-Brunhes boundary together with an associated scraper found at the base of the excavation profile, representing an age of approximately 0.8 ma[5]. The Cromer Forest-bed Formation at Pakefield, Suffolk in England (UK) has recently revealed several incontestable flint artifacts whose early Middle Pleistocene age (c. 0.7 ma) is confirmed by lithostratigraphy, palaeomagnetism, amino acid geochronology, and biostratigraphy[6]. Moreover, new evidence comes also from Happisburgh (Norfolk, UK) located at c. 53° northern latitude where 78 flint artifacts have been unearthed in river deposits on the foreshore. The findings are demonstrating that early Pleistocene ho-

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minins were present in northern Europe prior to 0.78 ma corresponding to the end of a warm stage. The age of the artifacts is constraint by the geographical context, reversed polarity, the occurrence of biostratigraphically significant mammals, and paleobotany[7].

This article reports on new artifact finds from Central Germany. During 15 years of systematic investigations of Pleistocene river sediments of the Werra Valley, a tributary of the larger River Weser running to the North Sea, Lower Palaeolithic stone tools were discovered in association with deposits of pre-Elsterian river terraces[8,9] (Figure 1, open asterisks). These investigations recently led also to the identification of lithic artifacts (6 cores/core-tools, 7 flakes, 1 hammerstone, 10 retouched fragments) and two small specimens of worked bone in low-energy sediments of a sand pit near Untermassfeld which is already known as an important Lower Pleistocene paleontological site (Figure 1, black asterisk). The specimens were associated with the fossil bearing fine- to medium-grained sandy layers (Upper Fluviatile Sands) yielding faunal remains of Epivillafranchian age[10,11]. A selection of specimens is preserved at the Thüringer Landesamt für Denkmalpflege (Weimar).

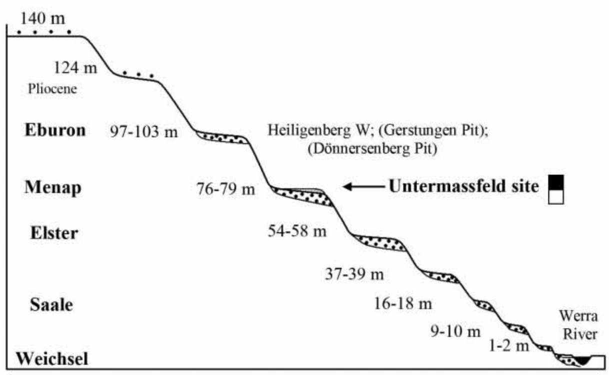

Fig. 2. Terrace sequence from the middle part of the Werra River (altitude in meters above present level of the channel) correlated with major cold stages of the Pleistocene of Central Europe (modified from Ellenberg[14,15] and Ellenberg & Kahlke[18]) with position of archeological sites in the context of fluviatile deposits mentioned in the text. The change of magnetic polarity in the layers of faunal remains at Untermassfeld is shown due to the local stratigraphy. Sites put in parentheses are associated with fluvial deposits which are influenced by subrosion and are shown in its purported primary position.

Preservation of Lower Pleistocene Fluviatile Sediments in the Werra Valley

The chronostratigraphical classification of the numerously preserved fluviatile sediments in the ancient course of the River Werra have been already undertaken since the beginning of the last century[12,13]. Later on Ellenberg was able to correlate fluviatile deposits of primary altitude with major cold stages of the Pleistocene of northern Europe and elaborated the currently applied terrace sequence of the River Werra[14,15] (Figure 2). Sediments which were influenced by local processes of subrosion are attributed to its original position in the sequence by petrological/mineralogical analyses and their stratigraphical position to deposits containing organic residues of known age. His results, concerning the assumed age of Lower Pleistocene deposits (Älterer Zersatzgrobschotter: ÄZGS, Jüngerer Zersatzgrobschotter: JZGS), were later on confirmed by magnetostratigraphical results (i.e., reverse polarity)[16,17].

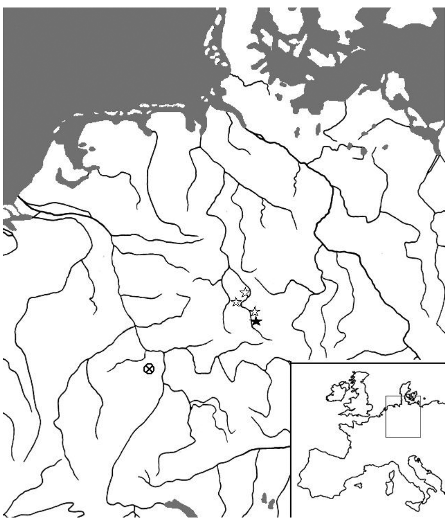

Fig. 1. Geographical map of the central part of Europe with the location of archeological sites mentioned in the text; asterisks: sites of the Werra Valley; circled cross: the site of Dorn-Dürckheim 3.

The Site of Untermassfeld (Thuringia)

Paleontological excavations at the Lower Pleistocene fluvial site of Untermassfeld (Thuringia, Germany) have been carried out since its discovery in 1978. The locality (Figure 3) is situated at c. 360 m AMSL (above mean sea level) at the southwest border of the Thüringer Wald in the central part of Germany on the right slope of the River Werra. The Pleistocene sequence begins with 7–8 m of coarse gravels (JZGS) which were deposited during the Eburonian (Lower Pleistocene) according to the terrace sequence of the Werra Valley and are overlain by 21 meters of floodplain deposits comprising the Lower and Upper Fluviatile Sands (Figure 4). The bones of a rich Epivillafranchian vertebrate fauna consisting of moderate to thermophilous elements (e.g., *Hippopotamus amphibius antiquus, Eucladoceros giulii, Stephanorhinus hundsheimensis*, an evolved form of *Mammuthus meridionalis*, *Bison menneri, Alces carnutorum, Cervus* s.l. *nestii vallonetensis, Capreolus cusanoides, Equus wuesti, Macaca sylvana* ssp., *Pachycrocuta brevirostris, Homotherium crenatidens, Megantereon cultridens adroveri, Panthera onca gombaszoegensis, Acinonyx pardinensis pleistocaenicus, Lynx issiodorensis, Puma pardoides, Canis (Xenocyon) lycaonoides, Canis mosbachensis, Ursus* cf. *dolinensis, Mimomys pusillus, Microtus thenii*, Emydini gen. et sp. indet.) are mainly preserved in the channel

Fig. 3. Untermassfeld site: Lower Pleistocene fossiliferous sands.

infill (Upper Fluviatile Sands) cutting into floodplain deposits (Lower Fluviatile Sands) and to a lower extent in the latter. The fossiliferous sands are stratigraphically positioned just below and within the Jaramillo polarity subzone corresponding most probably to MIS (marine isotope stage) 31, a prominent warm stage aged to approximately 1.07–1.05 ma[10,11,18,19].

Stone tools

Raw materials

Although the assemblage yet is not very large (N=24), chert (Muschelkalkhornstein) seems to be apparently the principal material chosen apart from one siliceous limestone object (i.e., hammerstone). At Untermassfeld this chert derives from two sources: chert pebbles and

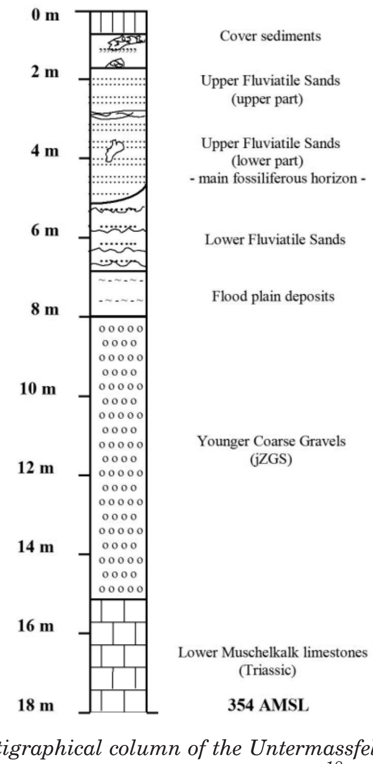

Fig. 4. Stratigraphical column of the Untermassfeld site, modified from Ellenberg & Kahlke[18].

tabular chert. Chert pebbles are available from the Lower Pleistocene and Pliocene gravels of the River Werra[14] antedating the Lower and Upper Fluviatile Sands at Untermassfeld[18] whereas tabular chert derives from the immediate surrounding limestone rocks (Unterer Muschelkalk) of the site formed during it's diagenesis. Intentionally shaped tools or dorsal flake patterns which result from knapping tabular chert are extremely rare. Most of the artifacts are not easy to assess typologically. The morphology of flake debris can vary greatly ranging from whole flakes with conchoideal fracture features (Figure 6) to pieces of shatter or chunks which lack characteristic fracture propagation features. This material is of lower quality as opposed to chert pebbles with better flaking properties. Larger pieces of chert plates which served as cores show a maximum thickness of c. 5 cm and commonly a broad cortex on both sides. They were obtained from weathered outcrops.

Chert pebbles which are commonly composed of homogenous chert because having survived hydraulic transport in favor, show better flaking properties and were shaped by direct percussion (Figure 8a, b).

In general the petrological composition of chert (Muschelkalkhornstein) from the Werra River Valley is quite different. It varies on amorphous SiO_2 recrystalized with proper flaking quality (Figure 5c), and silicified Muschelkalk frequently containing void spaces, secondary crystalline infillings and fossils (Figure 5d). These impurities interfere with the direction of applied force and cause the chert to fracture irregularly. Package size and shape of the used tabular chert allow its flaking mainly with bipolar technique. Due to its mediocre quality secondary shaping or trimming has been avoided. But sharp edges of many flakes or fragments (Figure 6) show mac-

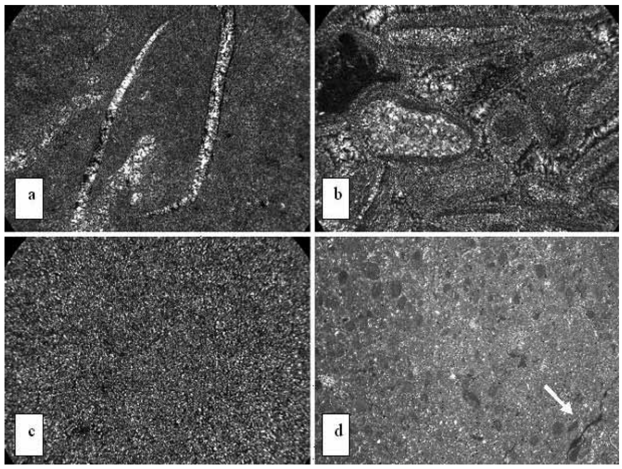

Fig. 5. Photomicrographs of thin sections of chert pebbles under crossed nicols (a–c) and macroscopic photograph of a pebble out of Siliceous Muschelkalk (d) from Lower Pleistocene deposits of the Werra River. a) Very uniform crystal size with fossil remains. b) Oncoids, and primary porosities partly filled with Q cement. c) Uniform crystal size. d) Piece showing some natural fracture lines (arrow). Width of 5a–c is approximately 30 microns; the width of 5d is approximately 1.5 cm.

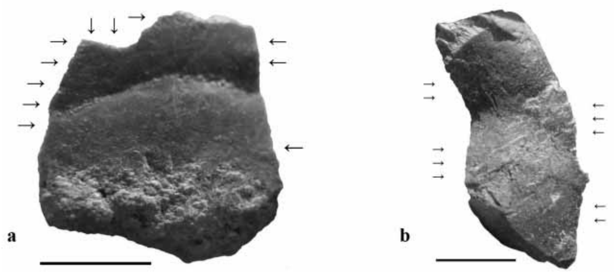

Fig. 6. Un-shaped chert flakes with cones, radiating hackle lines, and macroscopic use-wear (arrows) from Untermassfeld. a) Flake struck from tabular chert with thick cortex Scale bar 0.5 cm. b) Flake showing a non-cortical but not prepared striking--platform. Scale bar 1 cm.

roscopical definite use-wear traces (marginal retouch, splintering, small notches). Further examination with a stereomicroscope using the low-power approach (Figure 7) reveals typical morphological features of macro-edge wear (step scars, snap fractures, grooves/striations, edge rounding/abrasion) corresponding to damage caused by cutting, sawing and scraping of organic materials observed in actualistic experiments[20–24]. This cannot be caused by soil movement, trampling or post-depositional impacts of coarse gravels, because this specimens were embedded in a fine-grained sand body.

Concerning spatial distribution, the occurrence of chert specimens seems to be limited to the sandy layers surrounding the faunal remains. Neither do they occur in the Lower and Upper Fluviatile Sands uncovered in small trenches c. 50–100 m north of the excavation area, nor are they observable in the cover sediments containing only unsilicified limestone pieces without traces of human modification originating from eroded limestone rocks nearby.

Selected specimens

Cortical flake (Figure 8a) Typical features of conchoideal flaking like hackle lines, a well preserved bulb of percussion, and the point of impact on the cortical striking platform are visible on the ventral surface of this flake. The flake was struck from a chert pebble. On its sharp edge some small retouches are visible probably caused by usage.

Core-tool (Figure 8b) This chert pebble is characterized by multiple bifacial flake removals leaving some cortex on both sides by centripetal flaking (direct percussion). The specimen may also be classified as a chopping-tool.

Flat chert fragment with retouches (Figure 8c) Small fragment or bipolar flake of tabular chert exhibiting several retouches on one lateral edge which may be due to utilization. Cortex is completely absent. Hackle lines which extend from both margins of both cleavage planes result probably from bipolar flaking.

Pointed flake (Figure 8d) Longish chert flake with loss of its striking platform and parts of lateral edges. The piece exhibits conspicuously a smooth surface reflecting light and producing a »surface lustre» or »greasy» texture which serves as an indication of thermal alteration to many investigators[25–27]. On its ventral surface the remnant of a large bulb of percussion and multiple hackle lines are clearly visible. Small retouches of the pointed end are originated by knapping, as well as usage. This specimen may have split in part secondarily by thermal fracturing.

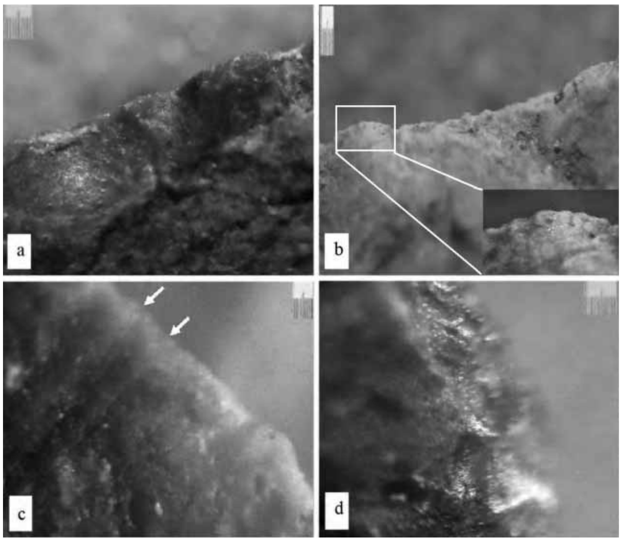

Fig. 7. Photomicrographs of macro-edge wear of un-shaped chert flakes and larger fragments. a) Step scars. b) White patinated chert with unifacial snap fractures distributed along the entire edge length. c) Parallel grooves and macrostriations running perpendicular to the edge (arrows). d) Small shallow negatives, abrasion of edge and ridges. Scales 10 microns.

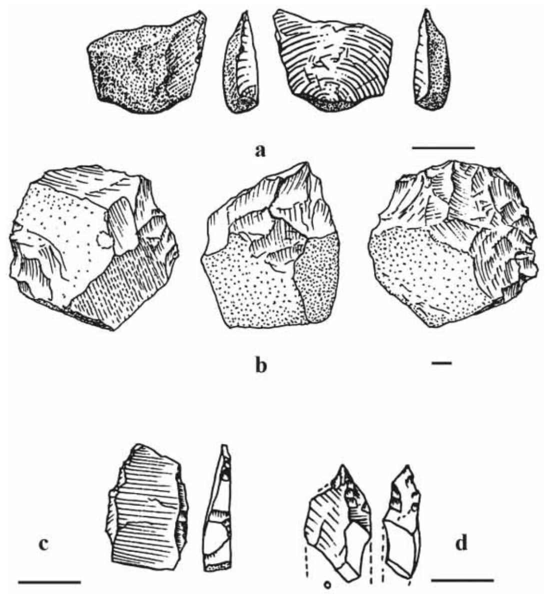

Fig. 8. Lithic artifacts from Untermassfeld site made out of chert (Muschelkalkhornstein). a) Cortical flake. b) Core-tool. c) Flaked piece with retouches. d) Pointed flake showing signs of thermal alteration. Scale bars 1 cm.

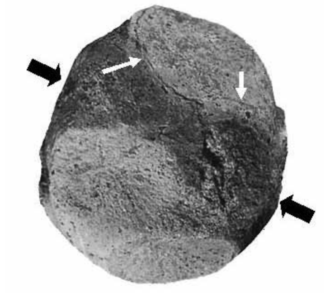

Fig. 9. Hammerstone of limestone with flake scars, partially detached flakes (white arrows) and battered areas (black arrows) (modified from Ellenberg & Kahlke, plate 12–2[18]).

Hammerstone (Figure 9) A small limestone pebble measuring c. 4.0 x 3.2 cm recovered from the fossiliferous Upper Fluvial Sands[18] shows traces commonly observed in hammerstones which had been formed through repeated impacts by working on lithic material or bones. The surface is covered by both negatives of detached flakes and partially detached flakes, as well as pitted areas obviously resulting from intensive battering. The natural origin of this specimen from reworked coarse gravels of the Lower Pleistocene fluvial deposits of the River Werra is ruled out because pebbles of limestones are not preserved in this heavily weathered deposits[14] and they do not occur in the partly interfingering Hangschuttfächer as well.

Bone tools and evidence of hominin interaction with fauna

Small bone scraper (Figure 10) This small specimen of bone compacta which is partly broken (ancient), exhibits unifacial several flake scars whereas the opposite side is represented by cortex. The object appears to have been fashioned from a limb bone fragment of a medium-sized to large-sized animal. This is much plausible because producing a plane piece with numerous overlapping flake scars which were struck almost exclusively from one direction needs a relative large and straight bone blank.

Use-wear traces (multiple micro-retouches) are visible along the entire edge generated by flake removals. As there are no clear features of conchoideal fracturing like bulb, striking platform or radiating fissures, this piece may either worked out of a bone splinter or if characteristics were present they have been probably removed by knapping.

Bone flake with retouches (Figure 11) Features of conchoidal flaking like acute-angle platform, bulb, impact point, feather termination and radiating hackle lines are clearly visible on this cortical bone specimen, but they are sometimes found in non-cultural bone flakes caused by bone-crunching carnivores as well[28]. Nevertheless this specimen must be attributed to an anthropogenic origin due to the presence of continuous edge retouches on its ventral side forming a tip which is partially broken (ancient). A modification by rodents (tooth marks) is not very probable because they usually produce longish, parallel, and plane scars which are expected to occur on the cortex. The dorsal surface of this flake is represented exclusively by cortex.

Cutmarks (Figure 12) Hominin interaction with fauna has been previously already assumed by Musil analyzing the breakage pattern of a horse humerus (*Equus wuesti*)[29]. Further evidence stems from linear incisions on bone surfaces which are assigned to be cutmarks. One specimen, a long bone shaft fragment of a medium-large sized mammal shows traces of butchering and modifica-

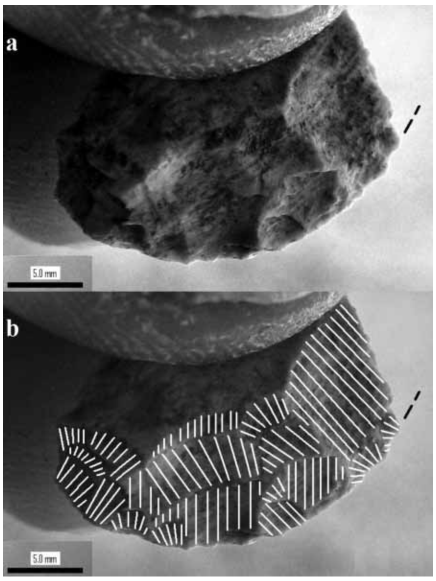

Fig. 10. Unifacial flaked bone scraper made out of bone compacta, partially broken. a) Endosteal view. b) Design of the same view with plotted lines on flake scars indicating direction of force (irregular retouches are left open). Scale bars 0.5 cm.

Fig. 11. Small bone flake with a broken tip displaying ventral retouches (arrow). Scale bar 1 cm.

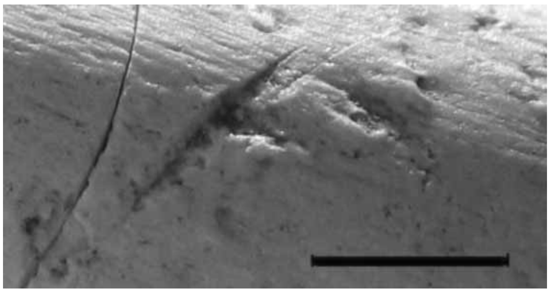

Fig. 12. Incisions with V-shaped cross-sections on a long bone shaft fragment among small tooth punctures. Scale bar 1 cm.

tion by carnivores. Two diverging incisions visible on its outer surface characterized by V-shaped cross-sections with narrow entrance and exit points, shoulder effects and internal microstriae are unquestionable of anthropogenic origin[30,31]. One carnivore tooth mark (puncture) has clearly affected the wall of the inferior incision indicating the order of bone modification (hominin-to-carnivore). Quantitative results of the nature and distribution of bone modifications concerning the whole sample are not available at the time because a systematic overall analysis of the thousands of bone specimens has not yet been carried out.

Existence of other Lower Paleolitic Fluvial Find Sites in the Werra Valley

Heiligenberg W (Großensee, Thuringia) Eight small flake tools have been recovered from a sandy-loamy layer comprising also scatters of Lower Pleistocene fluviatile pebbles underlying the Holocene soil in a small trench dug at the eastern edge of the 100 m-terrace in 1998. Fluviatile sands are underlying this artifact bearing layer. The deposits are consistent with the older accumulation phase of the Lower Pleistocene (ÄZGS) referring to its altitude above present level of the Werra River[14,15], the typical heavy-weathered coarse gravels (especially rhyolites) and the occurrence of chert pebbles[12]. Some of the flakes have non-cortical striking platforms and show dorsal negatives and retouches; all the edges and ridges of artifacts are slightly rounded (Figure 13a–e).

Gerstungen clay pit (Gerstungen, Thuringia) In 2000 five small chert tools were found in association with silty deposits of the older Lower Pleistocene gravels (ÄZGS) overlying Reuverian clay[32]. The primary levels of the deposits were influenced by subrosion, so that the level of the Lower Pleistocene fluvial deposit had dropped by more than 40 m[14]. One flake which was secondarily notched was struck from a core of fine chert which was reduced unidirectional (Figure 13f). Another flake tool is struck from a multidirectional core (Figure 13g). Both artifacts show sharp edges, clear conchoidal fracture features, dorsal negatives without remaining cortex, and non-cortical striking platforms. Three other flakes are slightly abraded.

Dönnersenberg Pit (Breitungen, Thuringia) 31 slightly patinated Lower paleolitic tools of chert, quartz and quartzite pebbles (Figure 13h–k) were found in 2002 in a small area (c. 50 m^2) on the surface of a 4–5 m thick layer of silty clay overlying older Lower Pleistocene gravels (ÄZGS)[14,16] in a sand pit with ongoing commercial use near Breitungen. These deposits are located at the edge of a subrosion depression and had dropped by c. 70 m. It is very probable that these artifacts originate from the Lower Pleistocene sediments at the site because chert pebbles (Muschelkalkhornstein) occur only in gravels older than Middle Pleistocene age[14]. A prepared core technology or handaxes were not observed. In fact many flakes display non-cortical, but non-facetted striking-platforms possibly belonging to a pre-Acheulian industry. The specimens are only slightly patinated and exhibit sharp edges signalizing a deposition in a low-energy environment.

Discussion

The recovering of indisputable stone and bone artifacts from the sandy layers which contain the late Lower Pleistocene fauna at Untermassfeld provides reliable evidence of an early arrival of humans in Europe north of the Alps at around 1.0 ma before present. Archeological finds at three other fluvial sites in the Werra Valley are

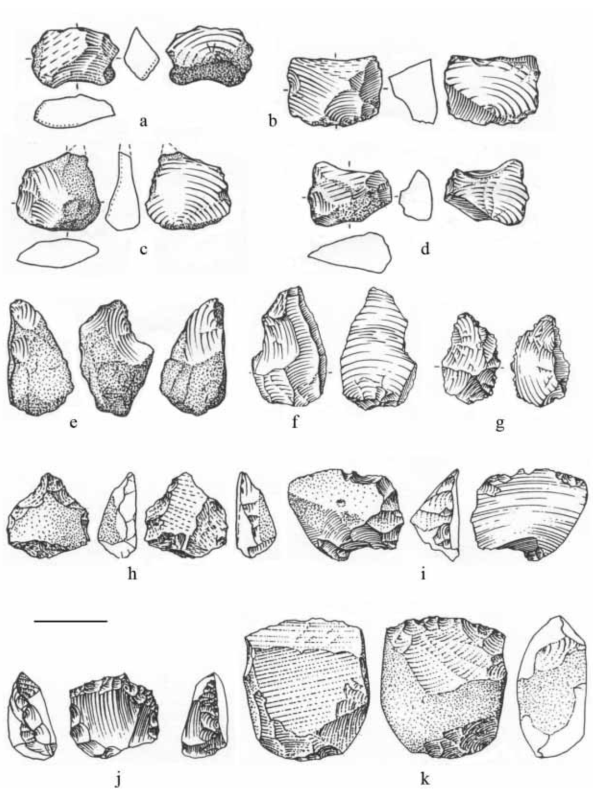

Fig. 13. Stone tools associated with Lower Pleistocene deposits of River Werra (scale bar 2.5 cm). a–e) Heiligenberg W. f–g) Gerstungen Pit. h–k) Dönnersenberg Pit. Raw materials: a–g, i, j) Chert (Muschelkalkhornstein). h) Quartz. k) Quartzite.

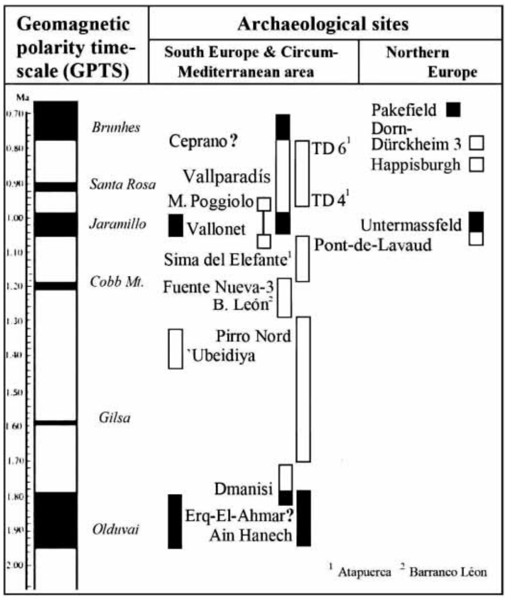

Fig. 14. Estimated age of European and Circum-Mediterranean archeological sites ≥ 0.7 ma (references are given in the text) including Untermassfeld site. Sites with secure results of magnetic polarity are shown accompanied by vertical bars representing upper and lower limits of estimated dating.

assumed to be also of Lower Pleistocene age. Despite their indisputable lower paleolithic character they do not yield firm proof of Lower Pleistocene age at present (lack of faunal remains, no stratigraphically well-defined finds) as it is the case at Untermassfeld site.

Flaking technology and flake forms of artifacts at Untermassfeld are generally simple. Chert pebbles were flaked by direct percussion without using a prepared core technology. In the case of tabular chert many fragments display no signs of conchoidal fracturing and are most probably generated by bipolar technique due to the poor flaking quality and unsuitable package size of the material. The artifactual character of many specimens is confirmed by visible use-wear of edges. These traces cannot be the result of natural rock-desintegration, frost action or hydraulically induced impacts caused by rocks or pebbles because these lithic fragments originate from the same low-energy deposits like the fossils. 42% of artifacts are more or less fresh with sharp edges representing most probably no reworked material. But the remainder displays some slight abrasion and shows commonly a greyish patina indicating that some specimens were probably transported over a short distance while some others may have undergone a longer period of subaerial exposure. This indicates that the stone artifact assemblage represents no primary context occurrence but rather reflects some time resolution as it also plausible for many bones.

The presence of bone tools is at first unexpected because many scholars believe that they have emerged at the earliest in the late Middle Pleistocene. But bone tools and bone usage have already been reported from Plio-Pleistocene and Lower Pleistocene archeological sites of Africa at the beginning of the 1970ies[33]. Reanalyses of these finds from Olduvai Gorge in Tanzania[34] and new finds and analyses from Sterkfontein and Swartkrans in South Africa which have been dated to about 1.8–1.0 ma[34–36] confirm the presence of worked bone already with the emergence of human culture. Bone tools have also been observed at the European Lower Pleistocene archeological sites of Vallonet Cave in France[37] and Barranco León in Spain[38] and are also reported from assumed Lower Pleistocene sediments of Fosso Meringo site (Pofi) in Italy[39].

In light of lithic raw material with only poor flaking properties the presence of bone tools at Untermassfeld may simply represent an example of human opportunism according to the law of least effort. This has also caused simple reduction sequences and the scarcity of shaped stone tools targeting on sharp edges. Therefore, debitage has been adapted to the size, shape and poor flaking properties of the almost exclusively available tabular chert.

Concerning site formation processes, the Untermassfeld site documents no situation in which the material appears to be preserved *in situ*. Although embedded in fine-to-medium grained fluviatile sands[10,18] (low-energy deposits), the major part of bone assemblage seems to be transported by hydraulic forces, albeit this was in many cases apparently only a few meters. This is evidenced by surface polishing and microscopical features of abrasion despite the lack of macroscopic edge rounding of many specimens as well as the presence of several articulated bones or sections of skeletons. Stone tools and worked bone specimens are suggested likewise to be in secondary position.

Taphonomic features of faunal remains at Untermassfeld site (e.g., high proportion of carnivores, high representation of juvenile individuals of *Pachycrocuta brevirostris*, hyena-induced damage of many bones, skeletal element abundances of ungulates, proportion of juveniles of different sizes of herbivores[10,11]) indicate that a significant part of animal remains may represent bone material from hyena dens washed in from places in the immediate vicinity (e.g., fissures in surrounding limestone rocks).

In sum, evidence of butchery activities and the presence of stone tools, worked bone and knapped bone tools may imply some hominin-carnivore interactions on the adjacent river banks. Conceivably, some bones may also have been butchered before being transported to dens or feeding areas by carnivores (e.g., hyenas) followed finally by a short fluvial transport. This should be examined more closely in future analyses.

Conclusion

Early human appearance in Europe before the Middle Pleistocene both south and north of the Alps (i.e., Central Europe) has already been claimed since the early 1980ies[40,41].

In the 1990ties, based of a systematic revision of material from European sites which were thought to be as early as the oldest sites of Africa, Roebroeks and Kolfschoten stated that the existence of such early sites in Europe before 0.5 ma was undemonstrated (also termed »short chronology«)[1,2,4]. But the discovery of hominin remains (TD6) and lithic artifacts of a simple core-flake industry (TD6 and TD4) at Gran Dolina near Atapuerca (northeastern Spain) with a minimum age of 0.78 ma[42] was to change this viewpoint. Almost simultaneously the excavation of even older stone tools at two sites in southern Spain (Fuentenueva 3 and Barranco León near Orce), dated to about 1.2–1.3 ma[43–47], and at the Italian site of Monte Poggiolo, dated to about 1.0 ma[48,49], completely falsified the »short chronology«. In accordance with these finds is also Vallonet, a cave site in southern France which is already known since the 1960ies. This site yielded undoubtedly lithic artifacts associated with faunal remains from the Jaramillo polarity subzone, 1.0 ma[50,51]. Confirming the »long chronology» of Europe, only a few years later also hominin remains were found in association with lithic artifacts at level TD9 at Sima del Elefante (Atapuerca, Spain), attributed by fauna and magnetic polarity and cosmogenic burial dates to an age of 1.1–1.2 ma[52,53]. At the new discovered site of Vallparadís (northern Spain) the sequence of several archeological layers provides key information about subsistence and adaptation of early European hominins in the late Lower Pleistocene between c. 0.9–0.7 ma[54]. But the initially assumed age (c. 0.8 ma) of an already in the 1990ies unearthed erectoid cranium at Ceprano in Italy[55] has been recently questioned by lithostratigraphy and paleomagnetic data[56]. Nevertheless solid dating evidence of sites mentioned above testifies an early arrival of humans in South Europe prior to 1.0 ma with a repeatedly or perhaps continuously occupation in the late Lower Pleistocene.

These earliest European finds are consistent with a precedent colonization of the Southeast Mediterranean area already at 1.7 ma ago[57–60] evidenced by the archeological and paleoanthropological record in North-Africa, the Levant and the Caucasus. So only a short time later, hominins may have extended their range to South Europe probably across the Black Sea region. This is indicated by new excavated archeological finds at the faunal site of Pirro Nord in southern Italy attributable to an age of 1.3–1.7 ma[61,62] and very recently at the faunal site of Lézignan-le-Cèbe in southern France[63] dated around 1.57 ma representing the oldest occurrences of the genus *Homo* in Europe known so far.

Looking further north, a hitherto by most scholars unexpected early range expansion of hominins northwards, is evidenced by two new archeological sites. The dating of Mode 1 tools (e.g., Pont-de-Lavaud site, France) in very high fluviatile terraces north of the Massif Central (Loire basin) by Electron Spin Resonance (ESR) has given an absolute age of 1.0–1.1 ma[64,65]. 700 km further north on the East Anglian coast (UK) at Happisburgh (c. 53° N) about 80 flint artifacts were excavated from site 3 dating securely from either MIS 21 (0.866–0.814 ma) or MIS 25 (0.970–0.936 ma)[7].

In the course of this early dispersal route hominins reached the western part of Central Europe at Untermassfeld (c. 50° N, 10° E) already at about 1.07 ma before present possibly with the immigration of new taxa (e.g., *Hippopotamus*)[66] filling the chronological gap between the oldest sites of South Europe and the younger sites of Dorn-Dürckheim 3 (Germany) and Pakefield (UK) in northern Europe (Figure 14). These finds open some interesting perspectives on the settlement of Lower Pleistocene Europe facing hominins from southern Eurasia with a range of new challenges including ecological adaptation.

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DALJNJI DOKAZI O DOLASKU LJUDI U SJEVERNU EUROPU U VREMENU DONJEG PLEISTOCENA – NALAZIŠTE UNTERMASSFELD (NJEMAČKA)

S A Ž E T A K

Otkriće 24 kamena artefakta i dvije koštane alatke na Njemačkom riječnom nalazištu Untermassfeld u asocijaciji s bogatom vertebralnom faunom Epivillafranchiana pridonose daljnjim dokazima o dolasku ljudi u sjevernu Europu u razdoblju Donjeg Pleistocena, s obzirom na činjenicu da rezultati geoloških, paleomagnetskih i biostratigrafskih istraživanja ukazuju na apsolutnu starost od prije oko 1,07 milijuna godina. Tipološka studija kamenih artefakata popraćena je analizom mineraloške strukture sirovinskog materijala i tragova upotrebe jednostavnih odbojaka i prerađenih kamenih fragmenata. Znakovi toplinske alteracije na površini kamene alatke može ukazivati na ranije izlaganje vatri. Ljudsko iskorištavanje životinjskih ostataka indicirano je s najmanje jednom obrađenom koštanom alatkom te modifikacijama na površini kosti za koje se smatra da imaju kulturološko porijeklo. Nadalje, elaboriran je i litički materijal s arheoloških nalazišta iz doline Werra u asocijaciji s riječnim sedimentima Donjeg Pleistocena.