Sonderdruck aus

BEITRÄGE ZUR ALLGEMEINEN UND VERGLEICHENDEN ARCHÄOLOGIE

BAND 21
2001

VERLAG PHILIPP VON ZABERN · GEGRÜNDET 1785 · MAINZ

Thomas Frank / Peter Breunig / Peter Müller-Haude / Katharina Neumann /
Wim Van Neer / Ralf Vogelsang / Hans-Peter Wotzka

The *Chaîne de Gobnangou*, SE Burkina Faso: archaeological, archaeobotanical, archaeozoological and geomorphological studies*

1. Introduction

The studies presented here are part of an ongoing project financed by the German Research Council (DFG) and the J. W. Goethe University of Frankfurt/Main. In co-operation with the University of Ouagadougou the project started in 1988 with a programme named "Cultural development and history of language in the natural environment of the West African savanna" (Haberland 1989). This broad and very general topic required an interdisciplinary approach realised by including both German and African researchers from several disciplines like anthropology, linguistics, archaeology, physical and cultural geography as well as botany and archaeobotany. The overall programme was applied to case studies carried out in the two countries of Burkina Faso and Nigeria expanded to the Republic of Benin in a later stage of the project.

Concerning archaeology, the chosen study area in the southeast of the country had not been explored before. Faced with an archaeological terra incognita, it appeared reasonable to be guided by a programme outlined in a very general way. The intention was to record stages of Holocene occupation with specific focus on the transition from hunters and gatherers to food-producers (the so-called "neolithisation" in European and Near Eastern terminology) and to provide a base for theoretical considerations about the nature of cultural change in the later prehistory of West Africa. In addition, the participation of natural scientists offered the

* Acknowledgements: We like to thank the following institutions and colleagues for their support: the German Research Council (DFG) funded this study within the framework of the interdisciplinary research project SFB 268 *Kulturentwicklung und Sprachgeschichte im Naturraum Westafrikanische Savanne* at the J. W. Goethe University of Frankfurt/Main; the local authorities in Burkina Faso always did their best to support our research programme. Special thanks to the *Centre National Du Recherche Scientifique Et Technologique* (Ouagadougou) for granting research and to *La Direction Du Patrimoine Culturel* (Ouagadougou) for export permits. We cordially acknowledge all members of the field campaigns for their contribution to this research and the people of the Gulmancé for their hospitality. The archaeozoological contribution presents research results of the Interuniversity Poles of Attraction Programme – Belgian State, Prime Minister's Office – Federal Office for Scientific, Technical and Cultural Affairs. Prof. Dr. Kalo Antoine Millogo of the Archaeology Laboratory at Ouagadougou University helped us in many ways at the official level and in the field. Ulrike Kleinfeller M.A., Lindlar, analysed the lithic artefacts from Kidikanbou 89/10. The drawings of artefacts are owed to Barbara Voss, SFB 268, Frankfurt University. Prof. Dr. Eric Van der Straeten (University Antwerpen) is acknowledged for the identification of the rodent remains. We like to thank Dr. Aziz Ballouche (Université d'Angers) for the French translation of the abstract. Dr. Bernhard Weninger, Radiocarbon Laboratory at the Institute for Prehistoric Archaeology at the University of Cologne/Germany, added valuable hints, discussion of the data and technical support.



Fig. 1. Pedestal Rocks in the Chaîne de Gobnangou.

chance to intensify the discussion how far these changes were influenced by particular environmental settings. As the mentioned transition not only took place in the Later Stone Age, but in an even more substantial way also in subsequent periods, the research was extended to Iron Age developments in an advanced stage of the project. With this programme as a guideline, fieldwork started commonly with all other disciplines in the Gourma area (Southeast of Burkina Faso) in 1988 and lasted until spring 1991. The present paper summarises the results of these first steps.

Soon, extensive surveys resulted in an increasing amount of sites, but almost all of them show attributes of being rather late in date. In addition, we hardly came across stratified cultural deposits, and therefore had to realise the almost complete absence of organic materials, which form the crucial point to recognise the economic change as a central aspect of the research programme. The only exceptions from the archaeological invisibility of early stratified sites were found in the Chaîne de Gobnangou, a sandstone escarpment rising more than 100 m above the surrounding flat grounds. These sites are presented here. A preliminary report already had been published (Breunig/Wotzka 1993), but archaeological, archaeobotanical and archaeozoological studies carried out later now allow to go into more details.

Close to the southern fringe of the escarpment and in the neighbourhood of the village of Kidikanbou a dense cluster of stone artefacts exceptionally rich in microlithic tools were found on the surface and traced down into stratified deposits by excavation (chapter 3.2). In particular, the hunting component among the stone artefacts and the lack of a clear association with pottery supported our assumption of having recorded a snapshot from a hunters and gatherers stage most probably predating food production.



Fig. 2. Waterfall above the Maadaga Rockshelter at the southern fringe of the Chaîne de Gobnangou.

In view of substantial cultural deposits expected by the topographic situation the large rockshelter of Maadaga, close by the site of Kidikanbou, looked very promising. Nevertheless, excavations proved the shallow Holocene deposits of being completely mixed. However, Middle Stone Age layers were found below representing one of the rare evidence of stratified materials from this period in West Africa (chapter 3.1).

Of most importance is the site of Péntènga (chapter 3.3). Numerous archaeological finds, botanical and faunal remains were recovered from a stratigraphy covering different phases of a Holocene sequence. But the economic change indicating the transition from hunters and gatherers to farmers or herders remains invisible.

P.B.

2. Geomorphology

Introduction

The landscape in south-eastern Burkina Faso is characterized by monotonous plains. So the sandstone range of Gobnangou in the Tapoa Province is a remarkable landmark. It stretches with almost 100 km length in SW-NE direction and in the southern part it rises more than 100 m above the foreland. The sandstone massive is strongly fissured: deep, canyonlike valleys – which developed along tectonic clefts – are dissecting the range and features like pedestal rocks (Fig. 1) and caves are often to be seen. It is a terrain with a "relief ruiniforme" (Laclavère 1993: 11; Petit 1994). The range is drained by small watercourses and some of them carry water even in the late dry season. During the rainy season a couple of waterfalls pour down from the range, some are 10 to 20 or more metres high (Fig. 2).

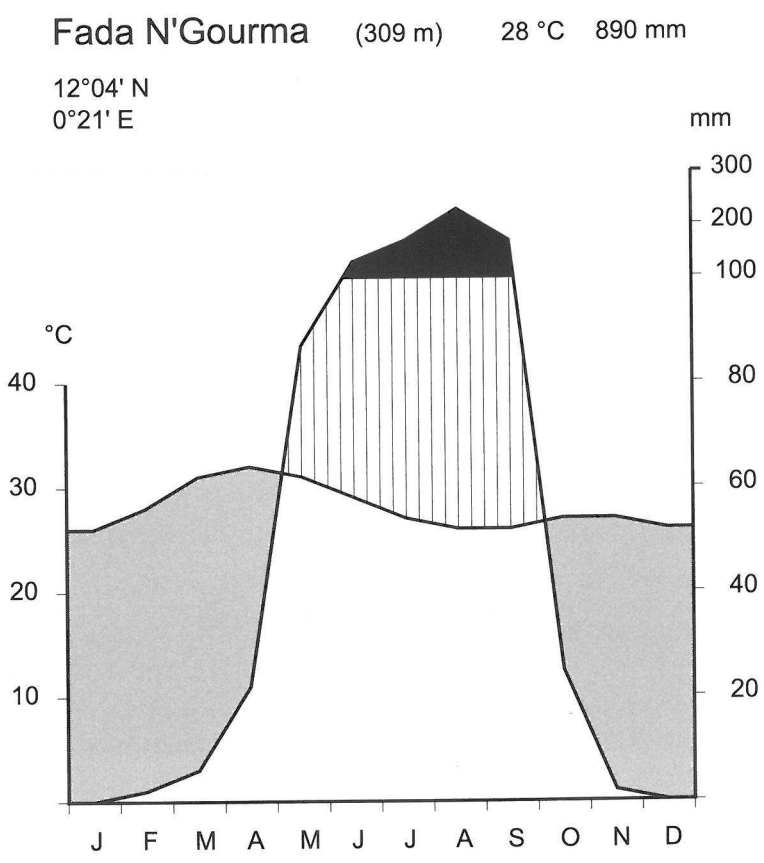

Fig. 3. Climate diagram of Fada N'Gourma (Data from Rudloff 1981).

The population density in the foreland of the sandstone chain – up to 50 inhabitants per square kilometre (Geis-Tronich 1991: 26) – is much higher than in the neighbouring areas. On both sides of the range several Gulmancé villages are situated very close to the range. Millet, peanuts and beans are intensively cultivated in the foreland. Asked for the reasons to settle in this area, the Gulmancé name the suitable soils for cultivation and the availability of water. Elder people often recall another reason: in the past people used the caves of the range to hide away from slavehunters (Mischung/Müller-Haude 1995: 96).

Climate and Vegetation

The mean annual temperature in south-eastern Burkina Faso amounts about 28 °C. Rainfall is concentrated on the rainy season in summer, the average amount of precipitation is 900 mm. Using the climate classification system of Troll/Paffen (1964) the region is part of the V3-Zone (savanna climate). In the course of a year three "seasons" can be distinguished: The rainy season lasts from the middle of May to early October, followed by the cooler dry season. During this time strong winds may transport large amounts of dust from the Sahara (Harmattan) and for many weeks the hole landscape is covered by a cloud of dust. In March the wind changes southwards and the hot dry season begins. The atmospheric humidity rises and in April and May the temperature increases up to 45 °C (Fig. 3).

The savanna is the typical vegetation form of the semi-humid tropics. Southern Burkina Faso takes part of the northern Sudan-Zone, which is characterized by 750–1000 mm annual rainfall and a dry season of 6–7 months (Guinko 1984). But man affects the vegetation by cul-

tivation, bush-fires, collection of firewood and the selective use of certain species. So the vegetation is part of a cultural landscape, which is influenced by an intensive agro-silvicultural use (Kessler/Boni 1991). There are many kinds of trees in the foreland of the Gobnangou, whose leaves or fruits are harvested, such as *Adansonia digitata* (Baobab), *Butyrospermum parkii, Bombax costatum*, *Lannea microcarpa*, *Parkia biglobosa*, *Tamarindus indica*, *Acacia albida* and the cultivated *Mangifera indica* (Mango tree).

The vegetation of the sandstone range itself is adapted to the different local conditions and is highly variable. In the study of Küppers (1996) plant communities of the little and bigger fissures in the rock and the shallow soils are differentiated. On the deeper soils plant communities developed wherein tree species like *Terminalia laxiflora*, *Combretum glutinosum* and *Burkea africana* are frequently represented. In the canyons liane are numerous and the plant communities resemble those of the more southerly located Guinea Zone (Küppers 1996: 173).

Geology and relief

The Gobnangou range lines the northern border of the Volta basin, whose centre is situated in Ghana, where it is the geological basis of the Volta Reservoir (Fig. 4). The range is the continuation of the sandstone ranges of Kwahu, Mampong, Konkori, Gambaga and Madjoari, which also mark the edge of the basin. The quartzitic sandstone belongs to the oldest rocks of the basin. The sedimentation of the sands occurred in the Upper Proterozoic directly on the basement complex (Affaton 1975; see Drouet 1986).

Then, in the late Precambrian, the area was affected by a glaciation and the range was carved by glaciers. This is proved by glacial striae and tillites near the village of Tansarga at the northern end of the range (Leprun/Trompette 1969). After the glaciation, still in the Precambrian, a remarkable series of sediments – limestone, phtanite, shale – was deposited into the glacially eroded areas. By means of several localities, where the series was found, Sougy (1971) reconstructed the zone of the glacial erosion. It became evident that the precambrian relief, as it was embossed by glaciers, is influencing the present relief and hydrography. Most of the tributaries to the Volta Basin have their access through the zones of glacial erosion, which are filled with geomorphological soft rocks, that were much easier to erode than quartzitic sandstones. The borderline of glacial erosion is possibly of interest for further archaeological investigations, because it marks the places, where the phtanite can be found. The phtanite (silex) was an appreciated material for the production of tools during the *Later Stone Age*.

The plateau of the sandstone range of Gobnangou is a planation surface truncating the resistant strata. The level of the surface is between 320 and 360 m above sea-level. Some of the neighbouring laterite plateaus have the same altitude. These facts among others lead to the assumption, that they are all relics of the same planation surface. Considering the level, it could be the 'relief intermédiare' (Boulet/Leprun 1969; Michel 1977), which corresponds to the 'topographie cuirassée fondamentale' (Beaudet/Coque 1986) and whose genesis took probably place during the late Tertiary (see Runge 1990; Müller-Haude 1995).

In the following periods the morphological hard sandstone became embossed, because the altered basement rocks north of the range and the shales in the south were eroded. New erosion surfaces developed, bordering the range. Two levels, 'haute glacis' and 'moyenne glacis', are distinguished by Boulet/Leprun (1969: 18). Both are covered over vast areas by lateritic duricrusts. The lowest level is the Pendjari Plain where the river Pendjari meanders towards the Volta Reservoir. Its altitude is about 200 m above sea level and it is built upon shales.

Although the sandstone range was not eroded down to another planation level, erosion took place during the Quaternary. On the plateau top many canyons and intramontaneous basins with deep soils developed. In many places pedestal rocks and rock towers stand upon the nude rock and very often karren and

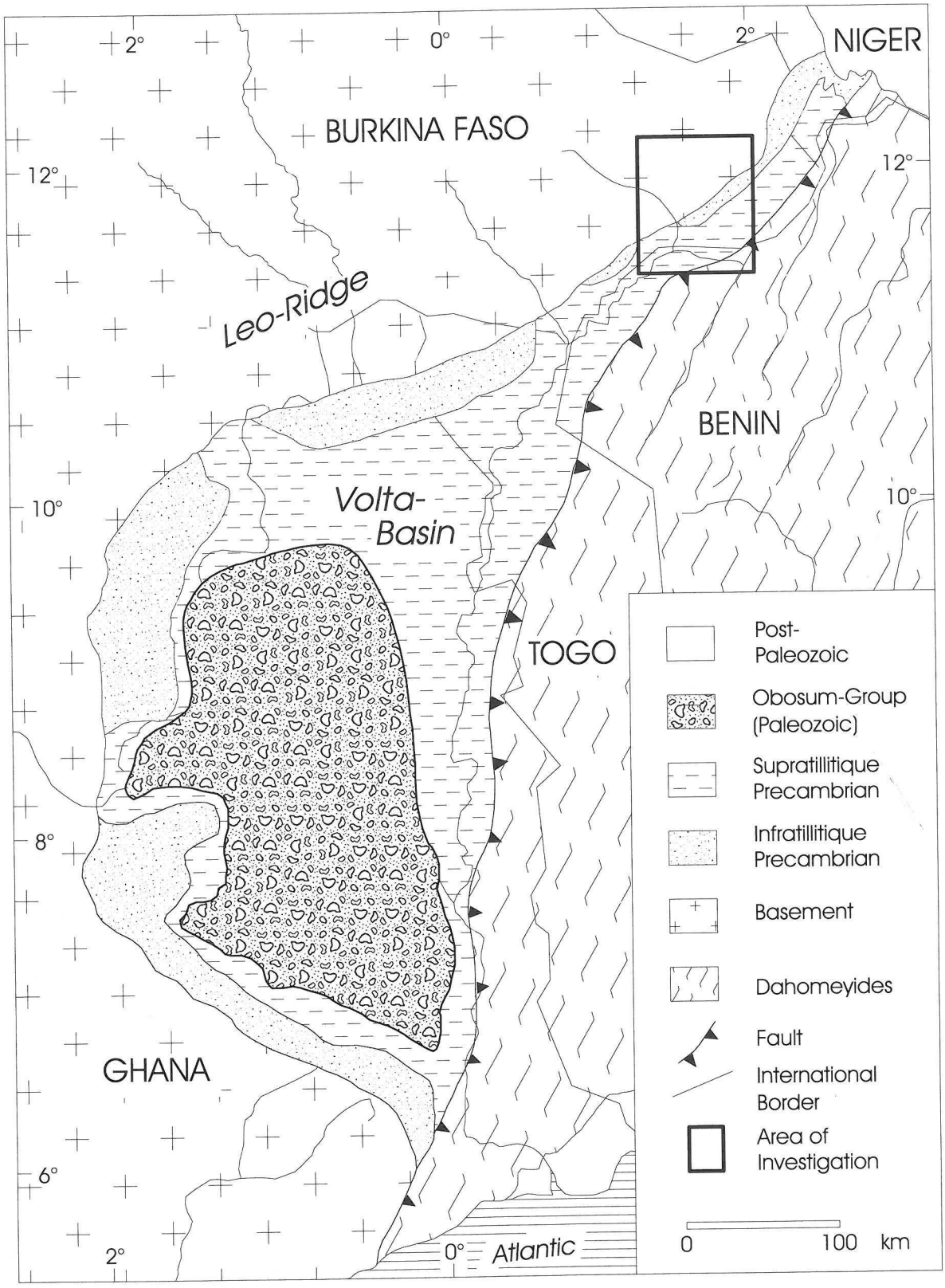

Fig. 4. Geological map of the Volta Basin (after Drouet *et al.* 1984, modified by P. Müller-Haude).

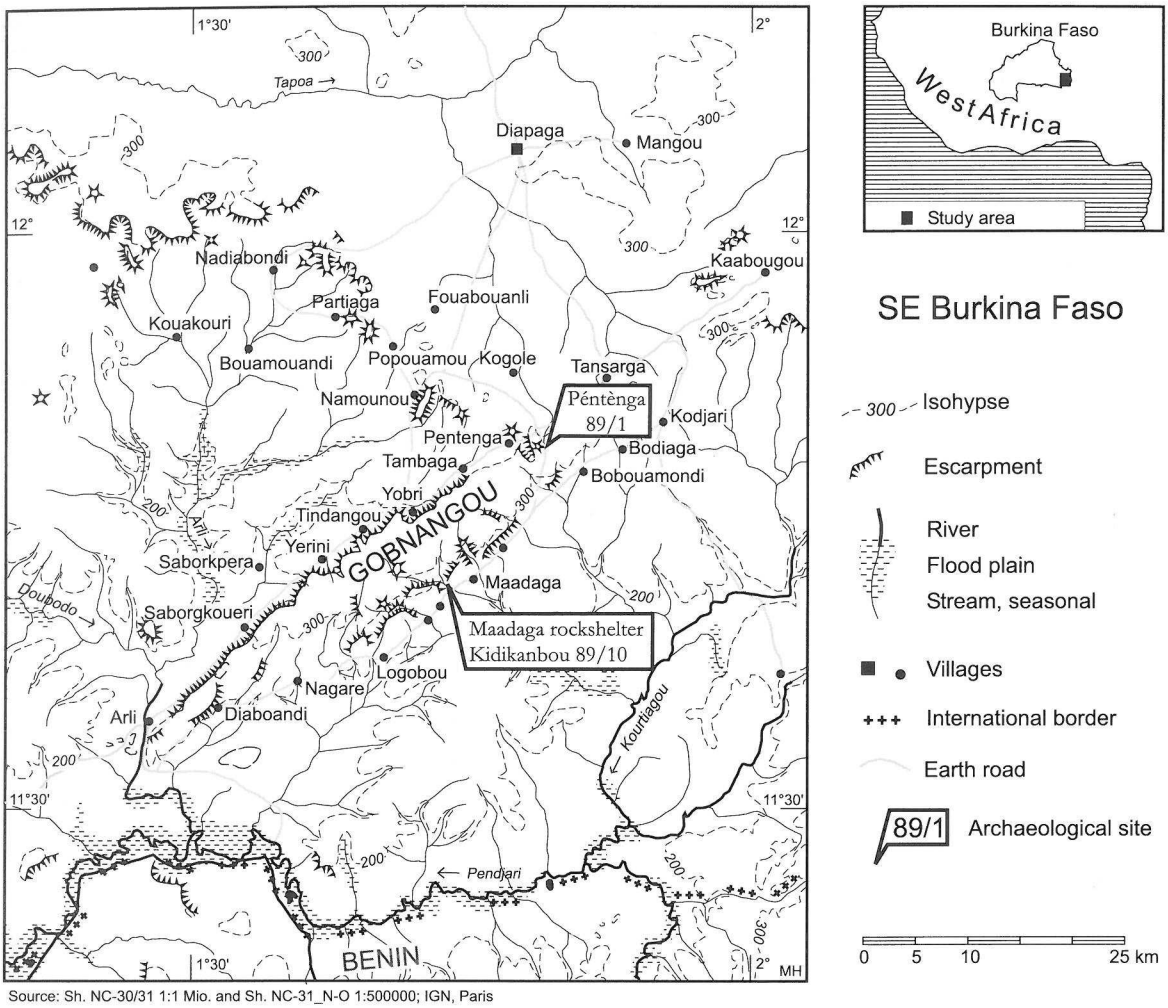

Fig. 5. Map of SE-Burkina Faso with archaeological sites discussed in the text (mapping by P. Müller-Haude).

bedding caves texture the rock walls. Most of these geomorphologic features are supposedly karst phenomena, caused by solution processes. Similar features were described in other sandstone areas of West Africa (Sponholz 1989). At the southern side the sandstone range rises from the plain with a vertical wall and in the fold there are many stack caves (the geomorphologic setup is reminiscent of a "Karstrandebene"). One of the stack caves is a rockshelter near Maadaga where a long archaeological sequence was found (Breunig/Wotzka 1993; Neumann/Ballouche 1992; Ballouche *et al.* 1993; see contribution Vogelsang).

P.M.-H.

3. Archaeology

The sites presented below are two rockshelters and an open-air-site which supplied both a considerable vertical depth and amount of artefacts in the same geographical region. They represent the richest sites in the area and the following results are based upon several unpublished studies which will now be presented as a whole. Besides the interpretation the documentation of the inventory is an important concern of the authors. This may help further studies in the region to ameliorate our knowledge about this white spot on the archaeological map (Fig. 5).

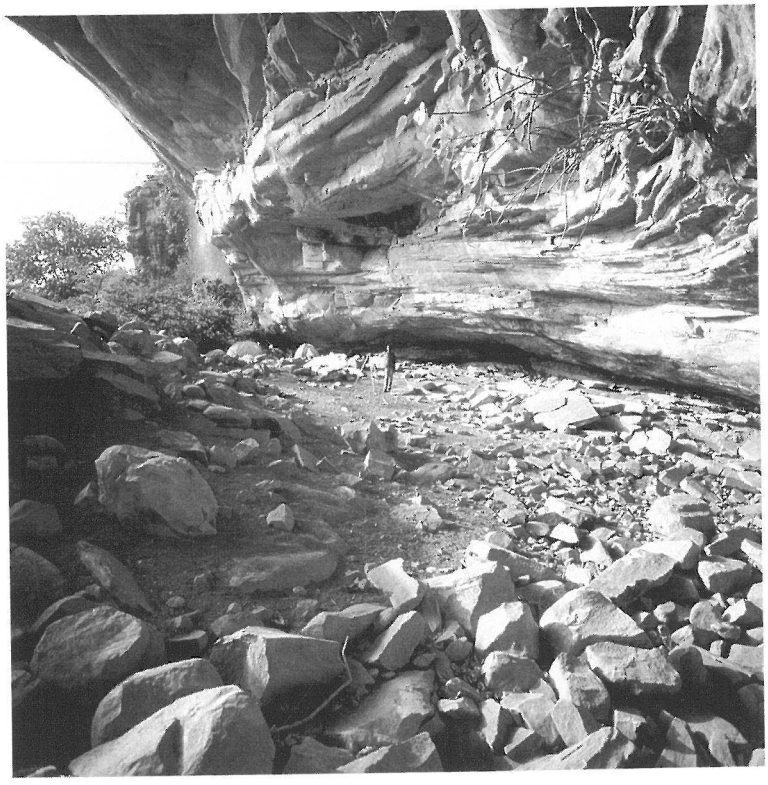

Fig. 6. View at the rockshelter of Maadaga (Scale indicated by person in the centre).

3.1. Maadaga Rockshelter

Location

The rockshelter Maadaga is situated on the southern edge of the Chaîne de Gobnangou, between the eponymous village of Maadaga and the settlement of Kidikanbou. The plateau forms an escarpment only in this part of the southern border, whereas normally it slopes gently. Sandstone crests in the foreland of the plateau are residuals of the retreated escarpment. Seasonal rivers run through the valleys, formed by the escarpment and these crests. They are fed after the rainy season by cascades, falling from the plateau into pools. These pools, some of them several metres deep, are important water reservoirs and are surrounded by a thick vegetation cover. This makes the area a favourable ecological region.

The rockshelter opens to the east, approximately 7 m above one of these pools, right next to a waterfall. The interior is 60 m wide and extends up to 25 m into the rock (Fig. 6). The height from the modern floor to the roof is 20 m. These dimensions are extraordinary and Maadaga is by far the largest rockshelter in the region. The shelter has been even larger in earlier times, as indicated by large mounds of bigger lumps of rock under the drip-line, presumably rock fall from the roof of the shelter (Fig. 7, Section A–B). These boulders form a barrier, that prevented the erosion of the sediment. Thus deposits accumulated that are unusually comprehensive.

The excavation

Three trenches (BF 89/8, BF 90/1, BF 90/2) were excavated in different areas of the inner part of the shelter (Fig. 7). Altogether 14 sq. m. up to a maximum depth of 1.90 m from the surface were excavated. Large rocks and compact debris horizons reduced the excavated area in the basal

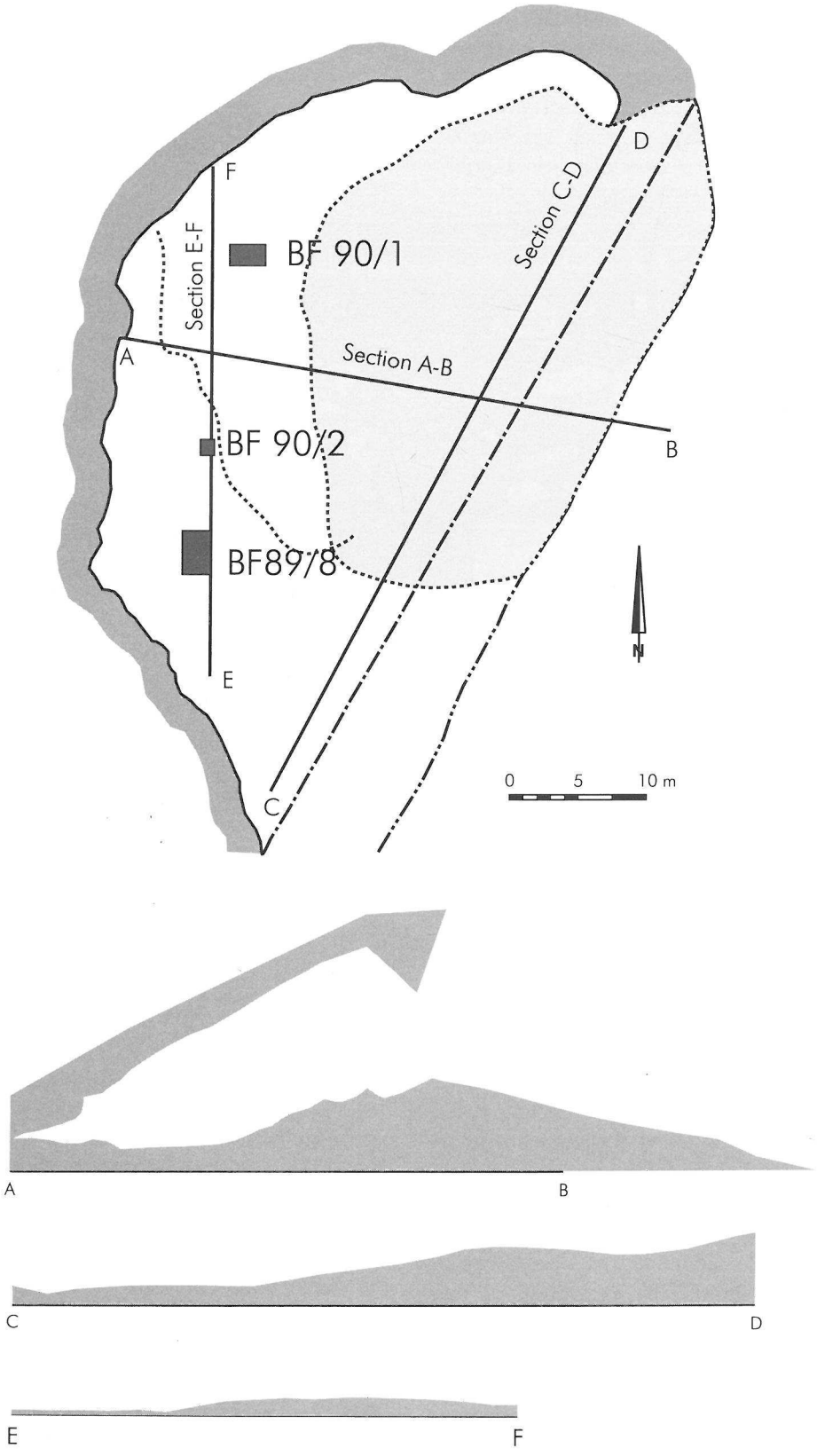

Fig. 7. Plan of Maadaga Rockshelter with various sections. Excavation areas: dark grey rectangles. Accumulation of rockfall: light grey area. Dripline: dotted line.

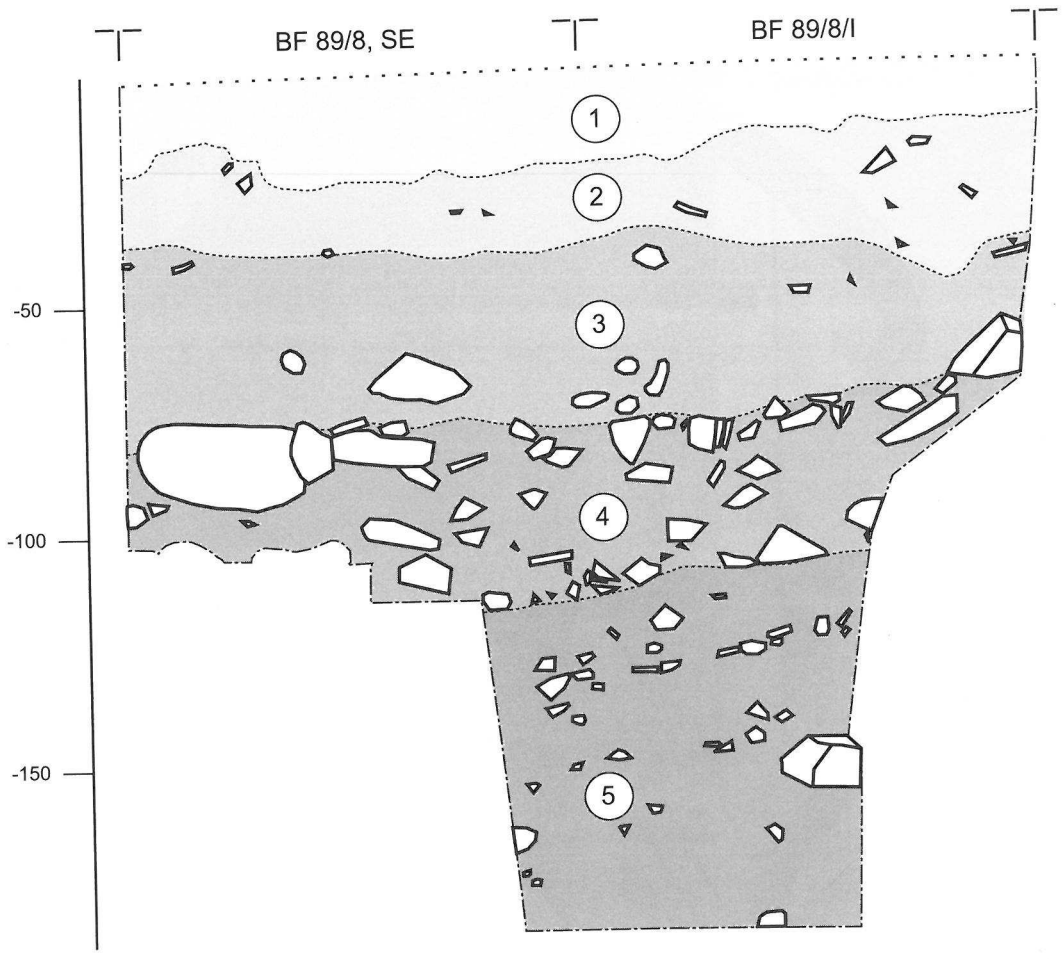

Fig. 8. Section of excavation trench BF 89/8 in Maadaga Rockshelter.

layers. For this reason it is not clear, whether the bedrock was reached. The excavations carried out by Breunig/Wotzka (in 1989) and by Wotzka (in 1990) followed the same methodological scheme. The trenches were divided into square-meters that were excavated in spits of 5 cm in the upper part and 10 cm in the basal layers. The whole sediment was sieved with a mesh width of 4 mm. The excavation of the basal part of the stratigraphy was very difficult, because of the hard consistency of the sediment that first had to be soaked with water. Also numerous larger rocks had to be crushed with hammer and chisel.

Stratigraphy

The deposit with a maximum depth of 1.90 m (in trench 89/8) can be divided in five layers (Fig. 8):

– the surface layer 1 consists of a loose-packed, sandy sediment of dark brown colour with a high amount of organic material and very little rock debris. The thickness varies from only a few centimetres up to more than 30 cm.

– layer 2 is 20 cm thick on average. The differences to the surface layer are the brighter colour and the very hard consistency. Botanical re-

mains and bones are nearly absent and disappear completely in the layers underneath.

– layer 3 is even harder than layer 2, with a higher clay fraction. The sediment is very homogeneous and nearly free of stones. The maximum thickness is 40 cm.

– layer 4 is a densely packed rock debris horizon of rock fall from the roof of the shelter. Most of the stones are angular rubble mixed with boulders that are up to 30 cm large. The intensive weathering of the roof might indicate climatic variations.

– layer 5 is a consolidated sandy clay loam of dark brown colour. There is a clear border to layer 4, indicated by the abrupt end of the debris horizon. The layer is 80 cm thick but seems to continue even deeper. The excavation had to stop at this depth because of the small area remaining.

The finds

The deposit of Maadaga is up to now the most extensive stratigraphy in Burkina Faso. For the main research emphasis of the archaeological project – the transition from hunting and gathering to farming – the results of the analysis were nevertheless disappointing. Only the surface deposit, layer 1, contains material from the Late Holocene period: pottery is numerous, a few iron artefacts were found and various microlithic tools are characteristic stone artefacts. Unfortunately modern botanical remains in the basal part indicate that layer 1 is completely mixed.

In layer 2 only a few abraded potsherds and microlithic tools were found. Presumably these are displaced pieces from the surface layer. No bones are preserved and the only botanical finds are single charcoal fragments. The abrupt change of preservation conditions and the consolidation of the sediment point to a long period between the sedimentation of layer 1 and 2. This is confirmed by the total change in the composition of the inventory. With regard to the stratigraphy of Péntènga 89/1 the absence of microlithic tools points to an age of more than 7,000 years. The undifferentiated stone artefact assemblages of layers 2, 3 and 4 have not been analysed yet. The stone artefacts from layer 5 were examined, because they seemed to be of Middle Palaeolithic character. Stratified deposits of this age are very rare in West Africa. For this reason a presentation of the Middle Palaeolithic[1] assemblages from Maadaga seemed to be important, even though the whole sequence was recorded only in a small area. Due to large boulders that could not be removed, the excavated area in layer 5 diminished and the remains of two square-metres (8/I/8/SE, trench 89/8) were combined (Fig. 8). The analysis is confined to the material from these spits.

The stone artefacts from layer 5

Layer 5 and the transitional spit to layer 4 contained altogether 3,632 stone artefacts. Lithic chips (< 1 cm) are clearly under-represented (n = 1,054), since it was difficult to separate them from the consolidated sediment. Their sample might not be representative and for this reason they are disregarded in the further analysis.

Furthermore the extremely hard sediment could only be excavated with hammer and chisel. This excavation method led to the breaking of some of the stone artefacts. All refits of stone artefacts (n = 56) are based on such modern breaks. The resulting falsification of the number of stone artefacts is nevertheless insignificant. More problematic is the usage of the solid quartzitic sandstone, that forms the cave, as raw material for the production of stone artefacts. As the angular debris could hardly be separated from natural rock fall it is nearly absent in the sample.

These restrictions and especially the limited excavated area must be kept in mind, and permit only a preliminary assessment of the material that has to be scrutinized by further excavations.

[1] The terms "Middle Palaeolithic" and "Middle Stone Age" are used in this paper as synonyms, describing archaeological material from a broadly corresponding time period. There is certainly a need to discuss the synonymous usage of these terms.

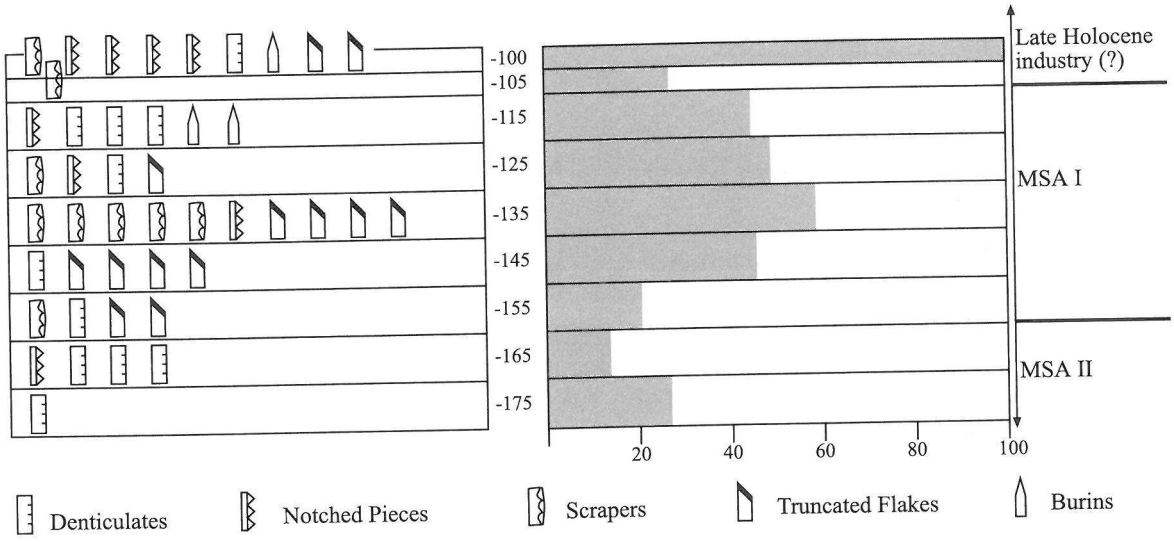

Fig. 9. Amount of stone tools (left) and density of all stone artefacts relative to the excavated volume (right, scale = index [number of artefacts without chips/excavated volume in ccm*100]) at Maadaga Rockshelter.

The densities of stone artefacts, the raw material composition and other technological criteria suggest a division into three stone artefact complexes.

The first division is connected with a change of the sediments from layer 4 to 5. The artefact density of the uppermost analysed spit (-100) is outstandingly high (Fig. 9). The artefacts of this and the next spit (-105) show no Middle Palaeolithic attributes and belong to an undifferentiated stone artefact assemblage of most probably late Pleistocene/early Holocene age. The following spits (spits -110 to -155) contain a Middle Palaeolithic assemblage and at the bottom of the excavation (spits -165/-175) a third complex starts, containing a coarse Middle Palaeolithic assemblage. A differentiation of the assemblages by formal tool types is not possible, because standardized tools are absent. The only retouched tools are scrapers, notched pieces, denticulates and truncated flakes (Fig. 10). Differences are only proportional. So notched pieces dominate the Holocene assemblage, whereas the younger Middle Palaeolithic assemblage is characterized by scrapers and truncated flakes, and the coarse Middle Palaeolithic assemblage by denticulates. More significant are the differences in artefact size and raw material preferences. The average length of the complete flakes and blades decreases from the oldest to the youngest assemblage (Fig. 11). This is connected with a change of the preferred raw material. In both Middle Palaeolithic assemblages quartzite/quartzitic sandstone is the dominating raw material, whereas quartz dominates the younger assemblage. The percentage of angular waste decreases from the oldest to the youngest assemblage, although it is nearly missing in the quartzitic sandstone raw material group. So the real portion of angular waste in the Middle Palaeolithic assemblages must have been much higher. The production of blades was of no importance in the whole sequence. Whereas most of the cores of the undifferentiated industry can be classified as regular cores, especially double platform cores, most of the Middle Palaeolithic cores are irregular. Levallois and discoid cores are represented only by few pieces. The dominating regular core type is *Outils écaillés* (core reduced pieces). These are exhausted cores and verify the use of a bipolar flaking technique.

An evaluation of the assemblages is difficult, because of the small size of the sample, the lack

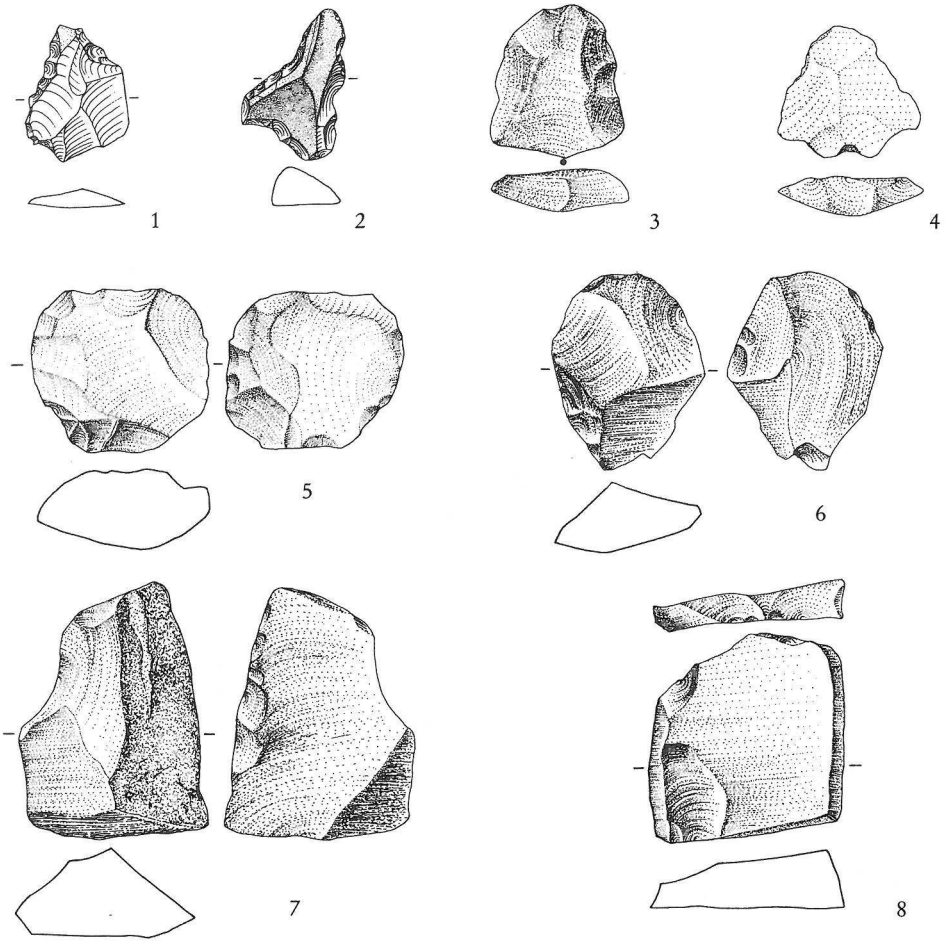

Fig. 10. Retouched stone artefacts from the Middle Stone Age layers of Maadaga Rockshelter. Scale 1:1.

Attribute	Early Holocene (?)	MSA I	MSA II
Mean length of complete artefacts	0.95	1.58	2.45
% of facetted platform remnants	6.0	7.3	9.3
% of quartzite/quartzitic sandstone	13.8	50.8	33.9
% of angular waste	44.0	48.7	64.5

Fig. 11. Attributes of the stone artefacts of the different complexes at Maadaga Rockshelter.

of absolute dating and missing reference stratigraphies in West Africa. The lower deposits of Shum Laka (Rockshelter) in Cameroon (Cornelissen 1996) might be comparable to the undifferentiated stone industry of layers 2–4 from Maadaga.

Up to now Middle Palaeolithic assemblages are not known from rockshelter deposits in West Africa. The dating of surface sites is always problematic and a number of macrolithic sites, formerly classified as Middle Stone Age, are now known to be of Holocene age (MacDon-



Fig. 12. View at the site of Kidikanbou 89/10 at the beginning of the excavation. In the background the escarpment of the Chaîne de Gobnangou.

ald/Allsworth-Jones 1994). The occurrence of macrolithic tools, like core-axes and foliates as well as "typical" unmodified Middle Stone Age stone artefacts, like blades and triangular points with facetted platform remnants in Holocene deposits up to the Iron Age is proved in the stratigraphy of Shum Laka (Lavachery 1996). The macrolithic assemblages of Holocene age in West Africa display many characteristics of a Middle Stone Age industry, though these finds are always associated with younger artefacts, like pottery and microliths. These younger elements are already absent in Maadaga layer 3. Therefore a classification of the assemblages of layer 5 as Middle Stone Age seems justified. The small sample corresponds to other western African assemblages (Allsworth-Jones 1986) as it has a great deal more in common with the Mousterian-like Middle Palaeolithic of northern Africa (Wendorf/Schild 1992) than the Middle Stone Age of southern Africa. Levallois cores and flakes are common and the tool-kits contain numerous scrapers and denticulates. On the other hand blades and foliates were of no importance.

The small assemblage from Maadaga permits no further statements. Further excavations are absolutely necessary for the assessment of the Middle Palaeolithic stone artefact assemblage from Maadaga. This work seems to be worthwhile, despite the lack of botanical and faunal remains, which makes statements about the Pleistocene environment and subsistence strategy impossible. When the problem of absolute dating could be solved, the assemblage could make an important contribution to our understanding of the Stone Age technological developments in western Africa.

R.V.

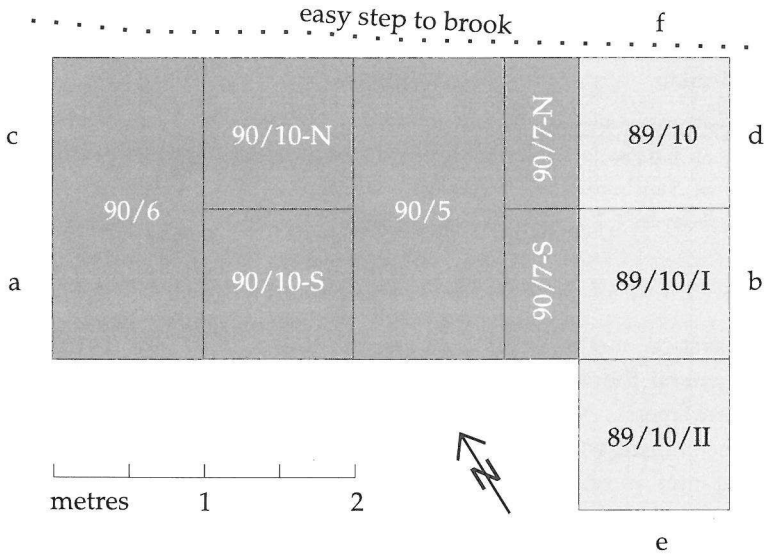

Fig. 13. Excavated units of the open-air site Kidikanbou 89/10 (light grey = 1989, dark grey = 1990).

3.2. Open air site Kidikanbou 89/10

Introduction

This *Later Stone Age* campsite is situated on the southern fringe of the Chaîne de Gobnangou and was discovered during field research in 1989 to the south-west of Maadaga Rockshelter. It consists of 10 sq. m. excavated in 1989 and 1990 (cp. Breunig/Wotzka 1993: 159–160; Kleinfeller 1993). In 1989 five metres southeast a test pit of 100 × 200 cm was examined down to 60 cm below surface (89/11). It was poor in finds and is only mentioned as a separate column in the inventory below (Fig. 15; cp. Breunig/Wotzka 1993: 161–162).

The site is situated in the flat foreland of the Chaîne, 300 m southeast of the steep ascent to the plateau (Fig. 12). Its position between two levels at the southern bank of a brook, nearly parallel to the edge of the brook-valley, caused the assumption that parts of the site had been destroyed by erosion. The surface of the excavated area slopes slightly from SW to NE and is partly eroded, a fortunate fact that led to the discovery of the site. A high density of microlithic stone artefacts representing all stages of stone-tool production within a spot of one sq. m. drew the attention to the place. It was assumed that an *in situ* situation of a working place for microlithic points had been exposed during the last rainy season (Breunig/Wotzka 1993: 160). A study of the area by P. Müller-Haude has identified the soil as an acrisol whose Ah/p-layer is probably eroded and which has undergone considerable bioturbation (Müller-Haude, pers. comm.).

Starting with the square in which the artefacts were discovered at the surface (89/10) the excavation was extended two sq. m. towards the south and in 1990 seven sq. m. west of this trench were attached (Fig. 13). So finally 10 sq. m. with a volume of five cu. m. were excavated, containing more than 6,000 stone artefacts, mostly from a grey fine-grained chert (phtanite, cp. contribution Müller-Haude above). Among these 1,489 (25%) are formal tools and 897 (60%) of these are microliths. This high amount of microliths, nearly 15% of all stone artefacts, is rather unusual at least for settlements. A few fragments of pottery are highly weather-worn and cannot be classified by either formal or ornamental criteria. Their relation to the stone artefacts is not evident as the sediment is mixed by animal activities to an unknown extent.

Excavation method	Excavation units: 90/6	90/10-N 90/10-S	90/5	90/7-N	90/7-S	89/10 89/10/I 89/10/II
spits of 2–3 cm		L3			L3	
spits of 5 cm						
natural layers		L1, L2			L1, L2	

Fig. 14. Excavation methods and units at Kidikanbou 89/10.

Excavation method and stratigraphy

In general the sites were excavated in units of square metres with artificial spits of 2–5 cm. The sediment was screened by sieves with 3 and 2 sq. mm meshes. While in 1989 three sq. m. were excavated strictly in artificial spits of 5 cm it was tried in 1990 to separate layers, particularly to find out if there is a microlithic stratum which may represent an old living floor. Therefore units 90/5 and 90/6 with an intact surface west of the area excavated in 1989 were opened simultaneously and the technique was refined by excavating in spits of 2–3 cm (Fig. 14). There a "red, supposed microlithic stratum" underneath a thin grassy covering was assumed. It was after the excavation of square 90/5 that three layers were identified in the profile from top to bottom as follows:

Layer 1 (L1): sandy, light cover-layer, a few cm thick, partly up to 10 cm.

Layer 2 (L2): greyish-brown, darker and more loamy than layer 1, about 10 cm thick, grading into layer 3.

Layer 3 (L3): reddish-brown sediment down to the final spit.

After that the baulk of 50 × 200 cm between the units of 1989 and 90/5 was examined and divided in a northern and a southern half (90/7-N; 90/7-S). The northern part was dug in horizontal spits but the artefacts were assigned to the natural layers as far as possible. Only in the northern half a "mixed layer 2/3" appeared which may be due to the difficulties to distinguish layers 2 and 3 during spit excavation. Subsequently in the southern half L1 and L2 were excavated separately and the following L3 was excavated in artificial spits of 2–3 cm. Because the frequency of artefacts changed significantly from L2 to L3 it was assumed for the first time that L2 could be "a microlithic cultural stratum sealed by a sandy cover".

Finally the remaining block of 100 × 200 cm between 90/5 and 90/6 was excavated as a northern (90/10-N) and a southern square (90/10-S). L1 and L2 were excavated separately from each other and the following L3 was examined in artificial spits. The question whether L2 is the assumed original stratum could not be answered definitely in 90/10 as in the southern half artefacts were still numerous in the first three spits of L3. In the excavator's opinion this cannot be explained by mixture caused by animal activities only.

Altogether the situation is a bit complicated as in the beginning the site was excavated in artificial spits. After we recognized natural layers in the profile we followed them as long as they were visible. In sections where we lost sight of the layers we changed our excavation method from natural strata back to artificial spits.

Microlithic tool types and their stratigraphical differentiation

The number of formal tools indicating settlement activities, such as scrapers or borers, is quite low at the site (Fig. 15). By contrast, microliths reach 60% of all formal tools and any stage of microlith-production is present, leaving no doubt that the remains of a special working place have been discovered. Here the formal tools of chronological significance, 838 microliths of undoubted stratigraphical origin, will be discussed. These artefacts are better suited to detect a typological sequence within

Categories	Formal Tools: Units 90/6	90/10	90/5	90/7	89/10	89/10/I	89/10/II	Sum	Unit 89/11
complete microliths	24	42	73	123	217	89	13	581	3
fragmentary microliths	11	15	54	48	100	77	11	316	1
micro-burins	14	29	77	63	64	21	10	278	3
retouched flakes	8	12	5	2	28	5	1	61	3
flakes with polish	–	1	–	–	–	–	–	1	2
retouched blades	–	1	1	1	6	–	1	10	–
retouched fragments	7	16	18	11	80	17	2	151	–
artefacts with wear traces	3	8	3	2	6	1	1	24	2
outil écaillé	3	3	5	–	14	1	–	26	2
borer	–	1	1	–	3	–	–	5	–
scraper	–	3	3	1	2	1	1	11	1
terminally retouched tools	–	–	–	–	2	–	–	2	–
burins	1	–	4	1	–	–	1	7	–
burin bladelets	1	–	1	–	–	–	–	2	–
quartzite, retouched	1	12	–	–	–	–	–	13	15
sidescrapers (MSA?)	–	–	1	–	–	–	–	1	–
Sum	73	143	246	252	522	212	41	1489	32
	Other Artefacts & Stones								
cores	3	–	2	2	10	3	–	20	–
flakes	77	97	197	132	313	135	46	997	–
preparation flakes	–	5	1	–	1	–	1	8	16
blades	10	24	32	34	83	49	13	245	–
fragments	182	268	435	584	678	333	127	2607	–
debris	9	9	7	–	10	13	1	49	34
raw pieces	1	–	1	–	–	–	–	2	6
worked raw pieces	–	–	–	2	5	–	1	8	–
hammerstones	–	1	–	–	–	1	–	2	–
hammerstones in secondary use	–	1	–	–	1	–	–	2	–
quartzite-sandstone	73	44	39	35	45	3	–	239	–
stone	2	–	–	–	–	–	–	2	90
slag	–	–	1	–	–	–	–	1	–
retouching debris	25	44	187	118	58	51	13	496	–
chips (quartz, quartzite)	8	19	19	14	12	3	4	79	10
chips' weight in grammes	*39*	*50*	*81*	*161*	*285*	*118*	*23*	*757*	–
Sum	390	512	921	921	1216	591	206	4757	156
Total	463	655	1167	1173	1738	803	247	6246	188

Fig. 15. Inventory of archaeological remains at Kidikanbou 89/10.

the stratigraphy than other formal or non-formal tools.

The microliths cover a small spectrum grouped in six formal classes, dominated by micro-points and triangles (Fig. 16). The high amount of fragmentary microliths is remarkable and can be a further hint at the type of place.

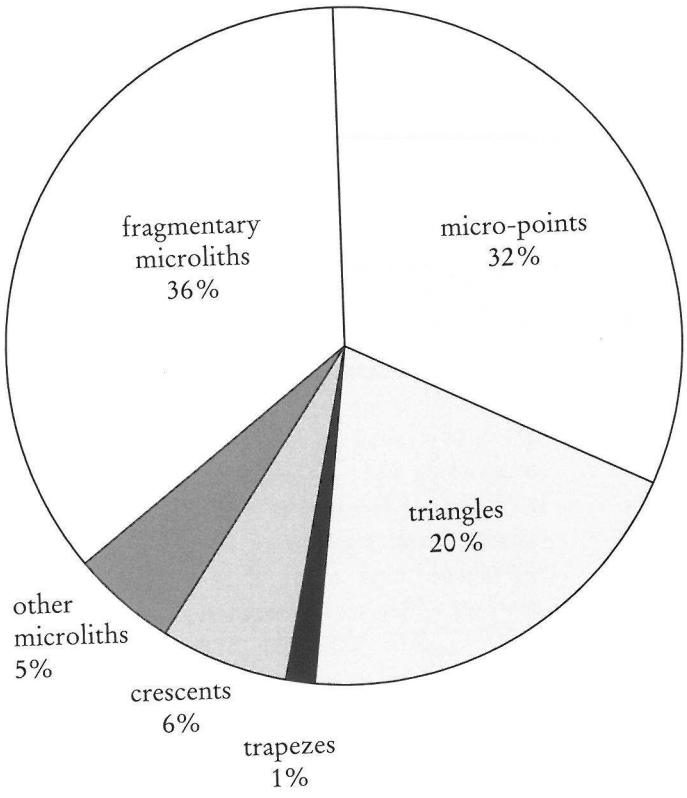

Fig. 16. The microlith classes (n = 838) of Kidikanbou 89/10.

Splitting these classes into types according to formal aspects of the retouch shows a limited variety of types (Fig. 17). Nearly 50% of the micro-points have a retouched base, mostly with a convex or straight retouch (Fig. 18, 1–6). More than a third of the micro-points shows no modification of the base (Fig. 18, 7–8) and 16% have a broken base (Fig. 18, 9–12). Most of the triangles (Fig. 18, 13) are scalene, particularly elongated scalene. Trapezes (Fig. 18, 14) are too rare for differentiation and 80% of the crescents are asymmetrical. Among the other microlithic forms only the truncated micro-points are worth mentioning, supporting the general dominance of micro-points at the site. The chronological position of this *Later Stone Age* assemblage cannot yet be determined.

Examination of the stratigraphical distribution of these types has shown that their occurrence depends on the general frequency of artefacts in a spit or layer (Kleinfeller 1993). As artefact frequency increases downwards in the units, and from SW to NE within the excavated area, it is not possible to create a reasonable stratigraphical order of types. It can be stated that the frequency of artefacts corresponds to the SW to NE slope mentioned above. This is demonstrated in Fig. 19 to 21 below, presenting the distribution of microlith classes in sections a–b, c–d and e–f (for section plan see Fig. 13).

Most microliths were found in unit 89/10 where their vertical distribution shows a high frequency in the range of 21–57 cm below measure-point. In the neighbouring units this range shrinks to 24–43 cm in the southern (Fig. 21) and to 21–34 cm in the western units (Fig. 19 and 20). One may describe this distribution pattern as a wedge-shaped decrease of the "microlithic range" from the "centre" to the areas west and south as indicated by the lines in the figures. This arrangement coincides with the slope of the surface from west to east and

Microlith-Classes and types	Units 90/6	90/10-N	90/10-S	90/5	90/7-N	90/7-S	89/10	89/10/I	89/10/II	Sums	%
Micro-points	11	9	9	30	32	21	94	55	8	269	
no retouched base	6	5	3	12	8	8	33	18	3	96	35.7%
broken base	1	1	–	5	6	2	16	10	2	43	16.0%
convex retouched base	3	2	4	4	8	9	24	13	1	68	25.3%
distinct retouched base	–	1	–	–	1	–	1	1	–	4	1.5%
straight retouched base	1	–	–	7	3	2	19	5	1	38	14.1%
concave retouched base	–	–	2	2	6	–	1	8	1	20	7.4%
Triangles	7	7	9	18	31	11	62	18	4	167	
isosceles	–	–	–	1	1	1	3	–	–	6	3.6%
scalene	2	1	3	9	17	4	22	7	3	68	40.7%
elongated scalene	4	5	4	7	12	6	33	9	1	81	48.5%
big triangles	–	–	–	–	–	–	1	–	–	1	0.6%
with obtuse base	1	1	2	1	1	–	3	2	–	11	6.6%
Trapezes	2	0	0	5	0	1	3	0	0	11	
symmetrical	–	–	–	1	–	1	2	–	–	4	36.4%
asymmetrical	1	–	–	2	–	–	–	–	–	3	27.3%
trapezoid arrow-head	1	–	–	2	–	–	1	–	–	4	36.4%
Crescents	1	3	0	8	10	6	12	9	1	50	
small (<15 mm)	–	–	–	–	2	–	3	–	–	5	10.0%
middle (16–25 mm)	–	–	–	2	1	–	1	1	–	5	10.0%
asymmetrical	1	3	–	6	7	6	8	8	1	40	80.0%
Other microliths	2	4	1	10	1	3	16	7	0	44	
with surface retouch	–	–	–	–	–	–	1	–	–	1	2.3%
micro-doublepoint	–	–	–	–	–	–	1	–	–	1	2.3%
bended backed micro-point	–	–	–	–	1	1	2	–	–	4	9.1%
truncated micro-point	2	3	–	4	–	–	10	5	–	24	54.5%
untypical microlith	–	1	1	2	–	1	2	2	–	9	20.5%
unfinished microlith	–	–	–	4	–	1	–	–	–	5	11.4%
Fragments	11	10	5	53	22	23	85	77	11	297	
fragmentary microlith	11	10	5	53	22	23	85	77	11	297	
Sums	34	33	24	124	96	65	272	166	24	838	

Fig. 17. Classes and types of microliths of Kidikanbou 89/10. Percentages of types relate to classes.

south to north. So it is likely that the artefacts have accumulated at the lowest point of the area. Considering this it is difficult to accept "a microlithic cultural stratum sealed by a sandy covering" as it was assumed for L2. Apparently there are still many microliths found below L2, particularly in the north-east corner of the site. Here, L1 and L2 were eroded and numerous exposed artefacts had enabled the discovery of the site.

As mentioned above the site is situated in a soil reduced by erosion and worked heavily by animal activity. The distribution of microliths reflects this in two ways. Their stratigraphical occurrence, like that of all other artefacts, follows the pattern of erosion. The distribution

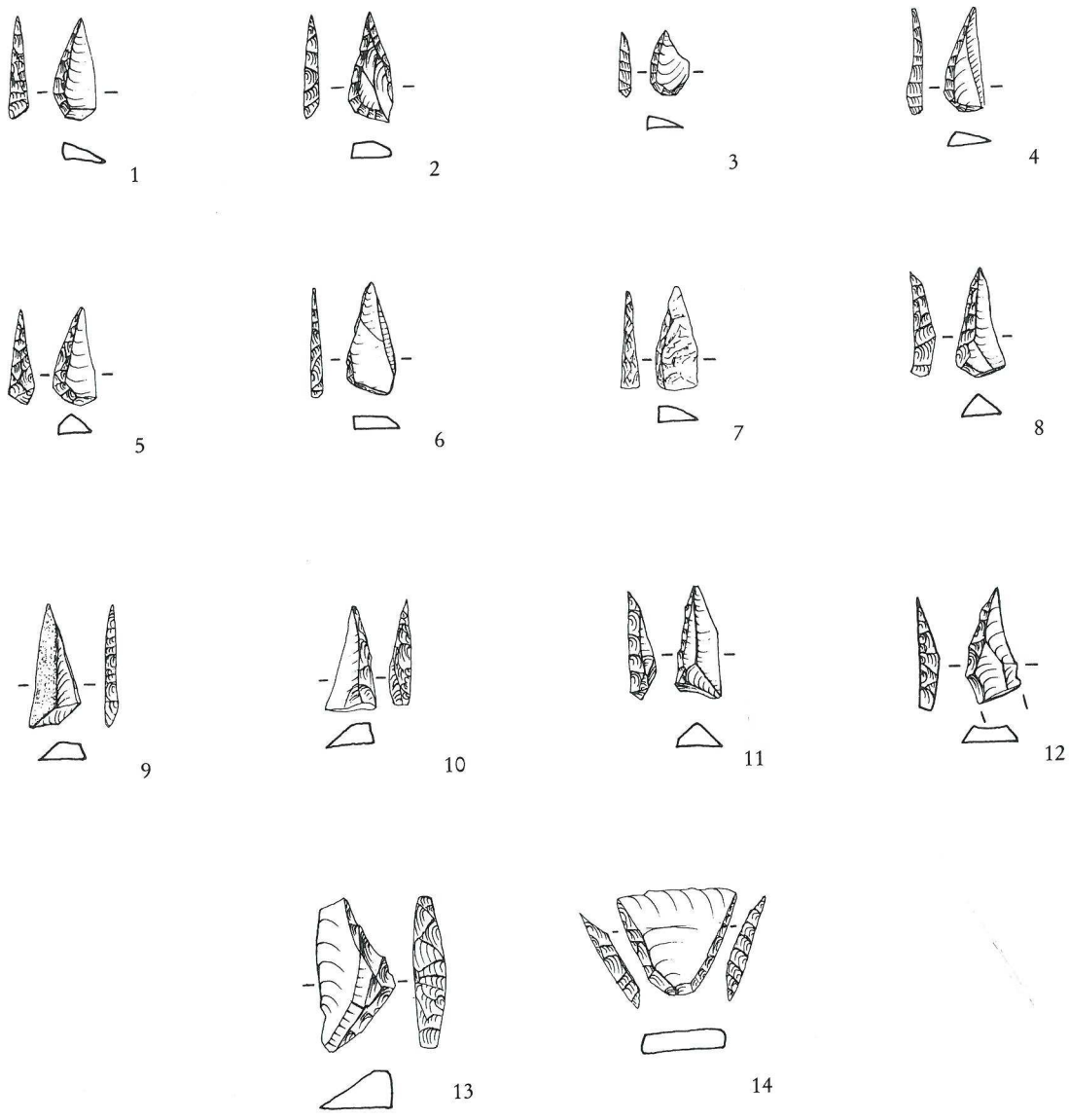

Fig. 18. Kidikanbou 89/10. Microlithic tools. Scale 1:1.

of the small variety of types is homogenized by vertical mixture of the artefacts caused by animal activity.

Conclusion

The open air site Kidikanbou 89/10, situated at the eroded edge of a brook valley, is the mixed remainder of a working place for microliths. It is not *in situ* and the distribution of microliths shows no stratigraphical significance. However, the small variety of types gives rise to the assumption that the artefacts may represent the same archaeological layer. The lack of potsherds fits into the picture of a working place for hunting preparations. A limited variety of microlithic points was produced and probably mounted here. The high amount of 300 fragmented microliths cannot be explained as pieces

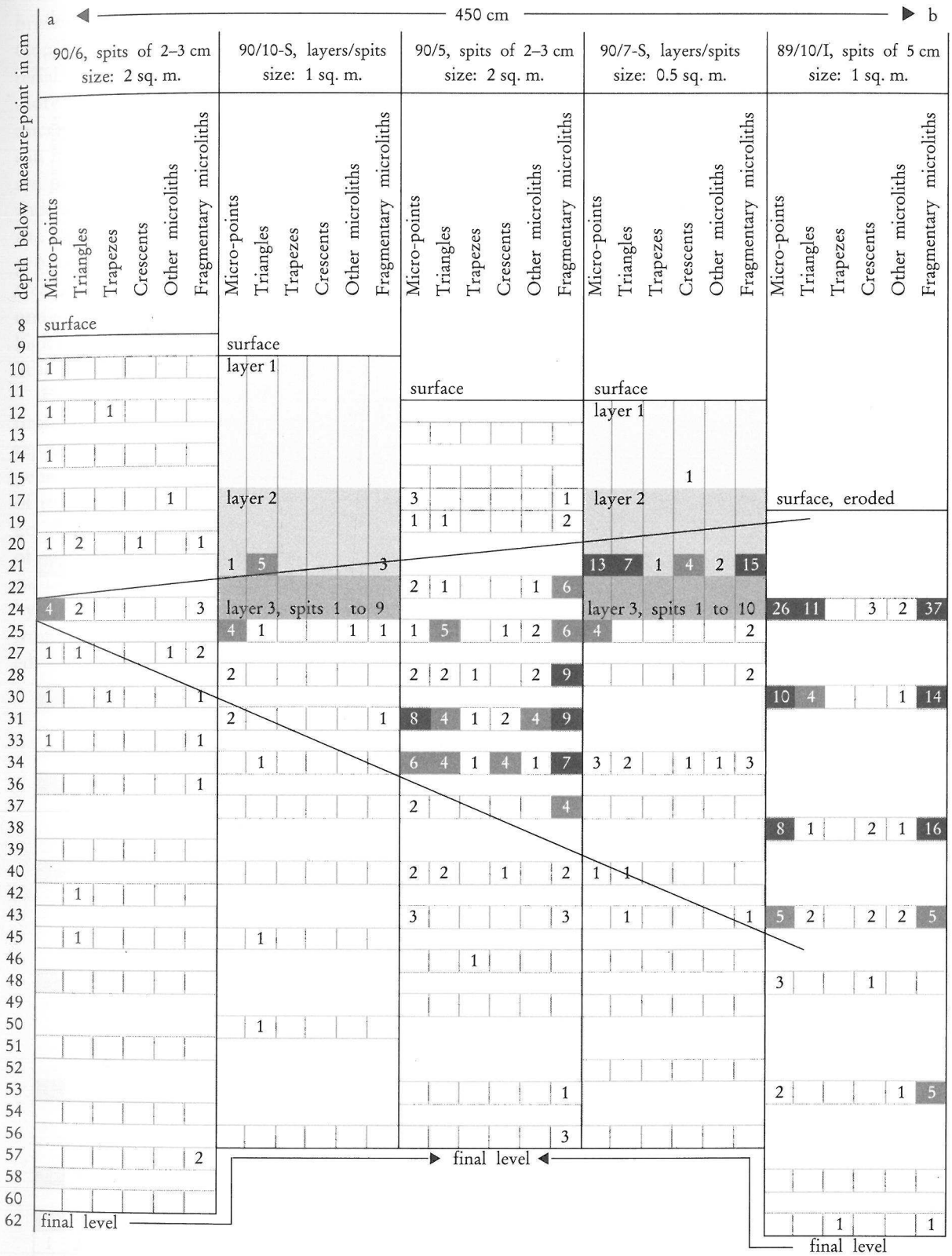

Fig. 19. Distribution of microlith classes in section a–b of Kidikanbou 89/10 (cp. Fig. 13). ■ = >3 pcs., ■ = >6 pcs.; empty boxes = no microliths; lines = borders of "microlithic range". Note that the size of units varies from 0.5 to 2 sq. m.

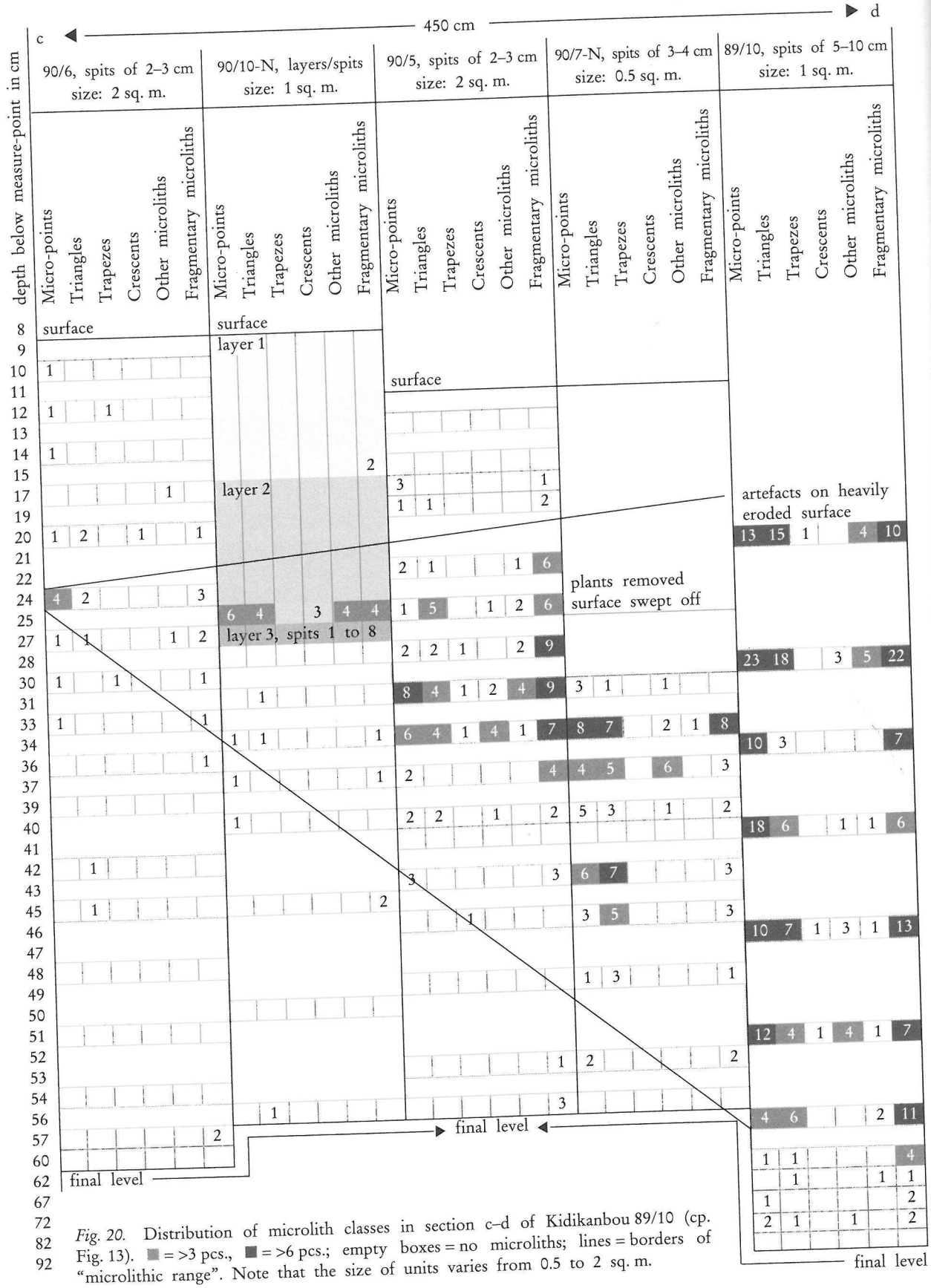

Fig. 20. Distribution of microlith classes in section c–d of Kidikanbou 89/10 (cp. Fig. 13). ■ = >3 pcs., ■ = >6 pcs.; empty boxes = no microliths; lines = borders of "microlithic range". Note that the size of units varies from 0.5 to 2 sq. m.

broken during production only. Considering the good raw material a waste proportion of more than one third of the microliths seems unlikely. One can imagine that many of them are points broken on the hunt and taken from the shaft at the site where new points were produced immediately. Use-wear analysis would help to understand the reasons for the high ratio of fragmented microliths.

Hunters came here several times for short-term stays to repair their arrows. This happened during a certain period of the *Later Stone Age*. As we do not know the original size of the site it may have been a casual working place, shaded by a tree or a regular camp from where hunting trips started.

Th.F.

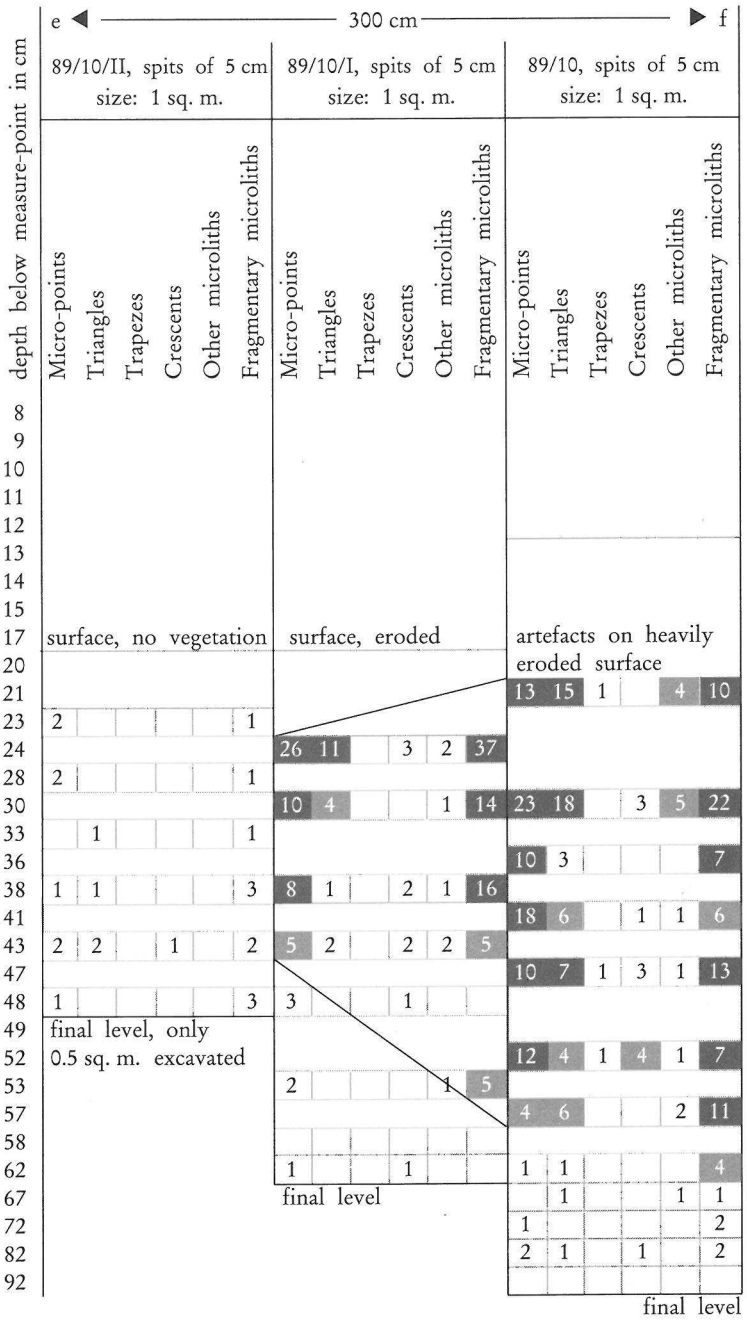

Fig. 21. Distribution of microlith classes in section e–f of Kidikanbou 89/10 (cp. Fig. 13). ■ = >3 pcs., ■ = >6 pcs.; empty boxes = no microliths; lines = borders of "microlithic range". Note that the size of units varies from 0.5 to 2 sq. m.

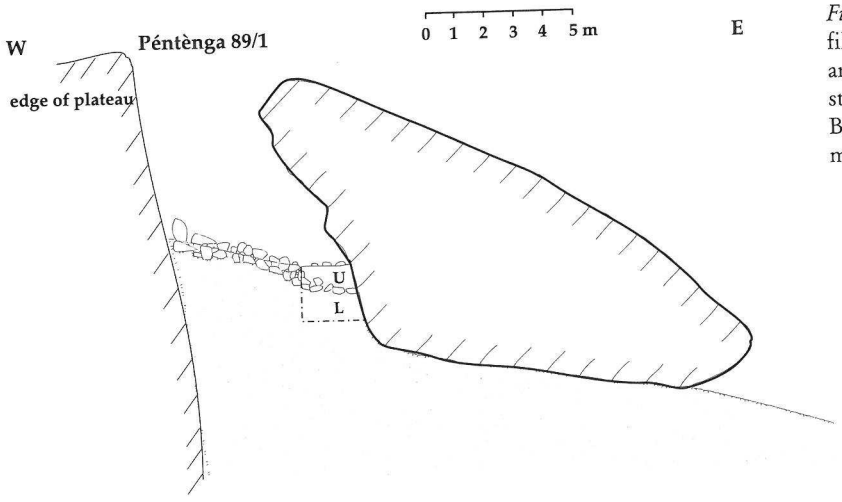

Fig. 22. Schematic west-east profile of the shelter, the excavated area and the U(pper) and L(ower) stratigraphical units (according to Ballouche *et al.* 1993: 18, fig. 5, modified by Th. Frank).

3.3. Péntènga 89/1 Rockshelter

Introduction

The site is a rockshelter on the northern fringe of the Chaîne de Gobnangou (view of the site: Breunig/Wotzka 1993: Fig. 12, 1). It was discovered during field research in 1988 and a small test pit was excavated. In 1989 an extensive excavation followed and subsequently preliminary reports were published (Neumann/Ballouche 1992; Ballouche *et al.* 1993; Breunig/Wotzka 1993). Further analyses were undertaken, but have remained unpublished. The present contribution summarizes the present state of research concerning the site.

The shelter is formed by a huge rock probably broken off from the edge of the plateau close to the pass-road at the northern fringe of the Chaîne (Fig. 22).

It is surrounded by a dense vegetation of trees and bushes. The boulder is tilt hillside down so that its former surface is now approximately parallel to the angle of the hillside on which it lies. At its upper end the rock shelters a small area of approximately 10 sq. m. The combination of the step-like edge of the plateau and the rockshelter creates a space of a few metres width, shaded nearly all day, but poorly protected against rain. The rock constitutes a barrier that prevents the sediment from being washed downwards, at least in its central part. Although no surface finds were detected the situation seemed favourable for stratigraphical sedimentation of archaeological remains. In 1988 a small test pit of ½ sq. m. confirmed this assumption yielding some potsherds and charcoal beneath the surface. At its lower end the block provides a second small sheltered area of approximately three sq. m. where artefacts were found too.

Excavation and stratigraphy

In 1989 an area of 200 × 300 cm in the upper shelter was excavated down to 186 cm below surface, without reaching the bedrock. Parts of the backward wall have a polish which probably originates from the former inhabitants touching the wall again and again. As the sediment was very loose it was impossible to cut vertical sections. Instead the walls had to be sloped such that the volume excavated can only be estimated at 6–8 cu. m. At nearly all levels the sediment consisted of a powdery and very loose material with intermediate blocks of sandstone. Some of these larger blocks could hardly be moved manually. In general blocks occurred individually, but at a depth of 75 cm below surface there was a dense layer of them. This stone layer may result from an intense breaking off from the ceiling or a block stream that has flown downwards from the edge of the plateau. A

huge slab at 186 cm below surface, covering nearly the entire excavation area, could not be moved by hand and made it impossible to continue working. The very homogeneous sediment was excavated in artificial spits of 5 to 10 cm, depending on the occurrence of larger rocks, and it was screened by sieves with 3 and 2 sq. mm meshes. The consequence of this excavation technique is that the volume of spits does not only differ because their thickness varies from 5 to 10 cm, but that the excavated area generally decreased from top to bottom due to slanting side walls. This is an important fact to remember when it comes to analysis of the vertical distribution of remains.

There were no natural layers to be differentiated by colour or consistency. Only occasionally was it possible to remark a change in the quantity and quality of finds after sieving the sediment and comparing the remains with those from the spits above and below. At some spits concentrations of ashes (e. g. spits 1, 2, 13) or burnt clay (e. g. spit 16) indicated fire places. In fact, the stone layer at 75 cm below surface marks the only division of the sediment clearly visible during excavation, separating an upper and a lower horizon. Sediment analyses of these units by Peter Müller-Haude at depths of 30 and 145 cm have shown that 80% of the material are sandstone derivatives. The lower unit contains some portions of clay ("loamy sand") missing in the upper unit ("silty sand"). Hence a refined stratigraphy within the units could only be gained by analysing find distributions.

Absolute chronology

Initially, we were sceptical whether the charcoals used for dating originated from human activities and considered the possibility that this material may result from prehistoric bush or forest fires. But archaeobotanical and archaeozoological results, as well as the high proportion of burnt stone artefacts[2], particularly in the lower unit, left no doubt about the anthropogenic character of these samples.

Twelve radiocarbon dates reflect the time depth represented and indicate some degree of stratification (Fig. 23).

Except for the recent sample from spit 11, indicating interference of younger material at this level, the series of radiocarbon dates starts in the middle of the 7th millennium cal BC and ends in the 11th–13th centuries cal AD. The sequence as a whole apparently mirrors a continuous succession of time marks, but which can be subdivided into four stratigraphic zones. Two early zones are dated to *c.* 6,600–5,450 cal BC (spits 21–15) and *c.* 3,600 cal BC (spit 13). A middle zone is dated to *c.* 820–570 cal BC (spit 11), and all AD dates may be lumped into a late zone, dating from *c.* 150–1,250 cal AD (spits 10–4). However, it must be noted that the sediment between 110 cm and 170 cm covers the span from the middle of the 7th to the middle of the 6th millennium cal BC, with one date (KI 3351) somewhat out of sequence. Only 15 cm further up, the dates jump to the middle of the 4th millennium, and a further 15 cm upwards the early and mid-1st millennium cal BC is indicated. The two gaps of between 20 and 30 centuries each cannot be explained by missing samples only.

Nine thermoluminescence dates on potsherds are also available. Five of these relate to early ceramics from the lower stratigraphic unit and are approximately three millennia more recent than the corresponding radiocarbon dates, indicating severe perturbation of sediment within this unit (Wotzka/Goedicke, this volume).

According to the radiocarbon dates, the stone layer must have been deposited at some time between the middle of the 1st millennium cal BC and the mid-1st millennium cal AD. Above this layer the dates cover a range of eight to ten centuries but seem to reflect a perturbation of sediment as suggested by the samples at 20 cm below surface (KI-3350, UtC-2316). Thus, it is very likely that the stratigraphic units above and below the stone layer are mixed to a certain extent. The stone layer apparently constituted a relatively impermeable boundary

[2] The burnt stone artefacts still offer the opportunity for thermoluminescence dating not carried out yet.

spit	cm below surface	^{14}C bp (lab. no.)	^{14}C cal BC/AD 95% confidental range
*1	0		
2	5		
3	15		
4	25 [20]	890 ± 38 (KI-3350)	1,030–1,250 AD
		1,640 ± 50 (UtC-2316)	256–540 AD
5	30		
6	40		
7	50		
8	60		
9	65		
10	75 [70]	1,650 ± 90 (KI-3470)	145–600 AD
11	80	**recent (UtC-2315)	recent
		2,580 ± 40 (UtC-2314)	820–606 BC
		2,590 ± 50 (UtC-2317)	835–566 BC
12	85		
13	95	4,825 ± 40 (KN-5187)	3,652–3,542 BC
14	105		
15	115 [110]	6,990 ± 160 (KI-3474)	6,120–5,560 BC
16	125		
17	135 [130]	7,590 ± 90 (KI-3351)	***6,600–6,220 BC
18	145		
19	155		
20	165		
21	180 [170]	7,000 ± 100 (KI-3352)	6,285–5,445 BC
		7,140 ± 60 (UtC-1992)	6,100–5,844 BC
		7,480 ± 60 (UtC-1993)	6,440–6,170 BC
	186	huge slab, end of excavation	

Fig. 23. Radiocarbon dates and botanical samples at Péntènga 89/1. Grey = level of botanical samples; [xx] = depth in cm of ^{14}C and botanical samples; ▶ = stone layer; *spit 1 equalized the natural surface with differences up to 16 cm; **fruit-stone *(Lannea microcarpa)*; ***90% confidential range. Calibrated results as proposed by the laboratories.

which built up as a stream of blocks deriving from the edge of the plateau at some time between 500 cal BC and 500 cal AD.

As to the oldest dates of the sequence it is of interest that the three dates related to spit 21 can be regarded as consistent after "Monte Carlo Wiggle Matching" (Jöris/Weninger 2000). The gaussed date from this procedure is 6,108 ± 63.6 cal BC, which we may take as the date of initial occupation at Péntènga 89/1 (Fig. 24).

Th.F.

3.3.1. Stone artefacts

The artefacts have been studied by Peter Breunig and Hans-Peter Wotzka who presented the main facts in a German preliminary report (Breunig/Wotzka 1993: 165–171). Hence the artefacts themselves were not re-analyzed. In this paper we will not only present them in more detail but try to expand the analysis especially in regard to stratigraphy and questions of chronology.

Nearly 8,000 stone artefacts were excavated, including scattered finds, which could not be

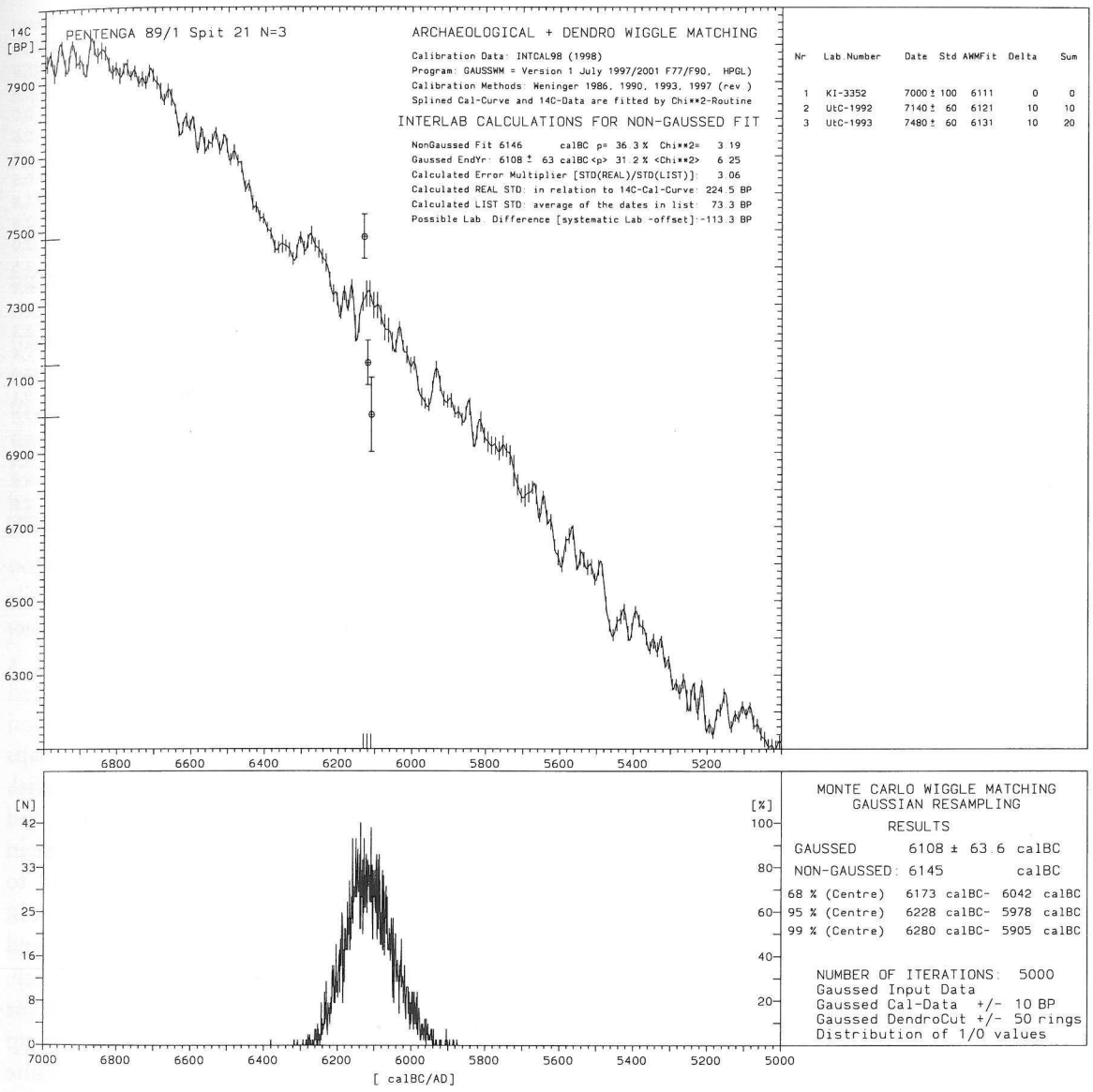

Fig. 24. Monte Carlo Wiggle Matching of radiocarbon dates from Péntènga 89/1, spit 21 (by B. Weninger, Cologne).

allocated to spits. Most of them are unretouched pieces (Fig. 25). The distribution of raw materials is dominated by a silex of high quality which has many colour varieties and occurs in slabs. Silex of this quality is generally rare in West Africa where most *Late Stone Age* industries are made from quartz and quartzite (Shaw 1981: 98). Its deposits were discovered by P. Müller-Haude during his geomorphologic research at a distance of 10–20 km from the site

classification	n	%
unretouched pieces	7,508	94.8%
nuclei	62	0.8%
microliths	204	2.6%
micro-burins	41	0.5%
non-microlithic tools	93	1.2%
other stone artefacts	11	0.1%
total	7,919	

Fig. 25. Classes of stone artefacts at Péntènga 89/1.

spit	cm below surface	flakes	chips	blades	bladelets	debris	nuclei	fragments basal	fragments medial	fragments distal	burnt	others	sums	%
*1	0	54	29	–	1	8	–	7	7	13	12	–	131	1.8
*2	5	2	–	–	–	–	–	–	1	2	–	–	5	0.1
*3	15	2	–	–	–	–	–	–	–	–	–	–	2	0.0
4	25	16	5	–	3	2	1	4	5	6	–	–	42	0.6
5	30	24	18	–	3	7	2	8	13	8	7	–	90	1.2
6	40	11	7	–	–	1	–	5	4	4	2	–	34	0.5
7	50	41	56	2	3	10	2	3	8	1	4	1	131	1.8
8	60	56	76	1	1	13	–	6	11	11	14	3	192	2.6
9	65	40	61	–	2	1	–	10	9	7	16	–	146	2.0
10	75	66	52	2	3	3	–	7	16	16	23	–	188	2.5
11 ▶	80	151	85	3	10	26	4	31	60	53	54	–	477	6.4
12	85	152	70	2	4	4	4	14	11	20	27	–	308	4.1
13	95	268	85	5	11	26	6	43	61	51	61	4	621	8.3
14	105	238	70	12	11	33	6	34	61	51	38	–	554	7.4
15	115	365	237	24	19	22	7	69	67	61	126	–	997	13.4
16	125	215	233	12	10	40	6	27	24	41	70	–	678	9.1
17	135	487	264	32	44	32	11	70	106	98	122	–	1266	17.0
18	145	301	51	13	29	59	6	42	63	58	52	–	674	9.0
19	155	190	48	8	7	7	3	20	18	23	38	–	362	4.9
20	165	155	40	10	6	10	4	23	33	35	41	–	357	4.8
21	180	91	16	4	2	5	–	24	21	16	24	3	206	2.8
	186	huge slab, end of excavation												
	total	2925	1503	130	169	309	62	447	599	575	731	11	7461	
	%	39.2	20.1	1.7	2.3	4.1	0.8	6.0	8.0	7.7	9.8	0.1		

Fig. 26. Distribution of unretouched pieces and nuclei at Péntènga 89/1. *Data of spits 1–3 are not reliable since spit 1 equalized the natural surface with differences up to 16 cm; ▶ = stone layer.

around the settlements of *Kodjari* and *Kidikanbou*. At *Kidikanbou* the silex-layer rises above the surface as a flat mound where many flakes testify its exploitation (Breunig/Wotzka 1993: 165, footnote 31). We do not know anything about the beginning, duration and type of exploitation. Perhaps it was continued until subrecent times. Today some old people in the region occasionally use this kind of silex together with a piece of steel to make fire. Besides this silex minor quantities of quartz, quartzite and other stones occur. But silex contributes around 80% to the unretouched pieces throughout the sediment sequence. The formal tools are almost exclusively made of silex and only very rarely of quartz. This is of course due to the excellent technical properties of the silex, hence preferred for tool production. Yet the question arises as to why quartz was used at all when silex was easily accessible and abundant.

Looking at the total, the assemblage of unretouched pieces is dominated by flakes and chips (Fig. 26). This indicates stone tool production at the site, supported by the amount of debris and fragments. By contrast, the small portion of nuclei seems striking but is perhaps a hint to an intense working of the material. Judging from the small number of blades and bladelets these either have not been the main intent of stone-working or they were used to a high degree for the production of formal tools. Regarding the percentage of microliths and micro-burins the latter seems more likely (cp. Fig. 25). Fragments occur as basal, medial or distal pieces, in equal proportions, summing up to 22%. The number of burnt pieces is quite high and possibly points to long-term settlement activities at distinct times.

The sediment above the stone layer contains the minor part (961 = 13%) while the sequence below that line yielded the mass of finds (6,500 = 87%). This significant difference is not surprising as the radiocarbon dates of the upper unit point to the Iron Age while all dates of the lower unit fit into the *Later Stone Age*.

Within the lower unit 30 cm of sediment from spit 15 to 18 contain 3,615 pieces which is almost one half of the total (48.5%). Judging from the frequency this horizon appears to contain the main archaeological layer, with the

unit	flakes	chips	blades	bladelets	debris	nuclei	basal	medial	distal	burnt	others
upper	40.1%	22.6%	0.3%	1.7%	3.8%	0.6%	5.4%	9.0%	10.5%	5.6%	0.2%
lower	41.7%	16.9%	1.8%	2.1%	3.9%	0.9%	6.4%	8.1%	8.0%	10.1%	0.2%

Fig. 27. Percentages of unretouched pieces and nuclei in the upper and lower units at Péntènga 89/1.

highest density in spit 17. This is remarkable as the size of the excavated areas became smaller from spit to spit (see above). The effect of this is reflected in the smaller quantities of spits 19 to 21. Following this result we will interpret these 30 cm of sediment as the main archaeological layer. This assumption has to be proved by the analysis of the formal tools below.

Throughout the sequence the percentage occurrence of unretouched pieces varies only slightly from spit to spit. Summing up the percentages of the upper and lower unit shows a few distinctions (Fig. 27). Chips are more frequent in the upper unit while blades, bladelets and particularly burnt pieces occur more often in the lower unit. This distinction may reflect both the different technological and cultural habits of the inhabitants and a change in function of the site at different periods.

The majority of formal tools are microliths, here defined as tools not exceeding a length of 25 mm. Microlithic industries have been associated with an adaptation to savanna ecology and hunting economy (Shaw 1981: 96–97). The following types have been identified (Fig. 28).

Those types commonly accepted as inserts of hunting tools, including other and fragmentary microliths, are predominated by crescents and micro-points (Fig. 29). The distribution of all types is shown in Fig. 30. The quota of micro-burins and fragmentary microliths is quite high, indicating an intensive production and possibly repair of hunting gear at the site.

Concerning the units, vertical distribution is similar to that of unretouched pieces and nuclei. While only 11% (26 pcs.) occur in the upper unit the lower unit holds the mass of microliths (219 = 89%). Similar to the unretouched artefacts, microliths are irregularly scattered within the lower unit and show high densities in spits

type	type name	example on Fig.
1a	small crescent (<15 mm)	32, 1
1b	medium crescent (>15<25 mm)	32, 2
2a	micro-point, unilaterally retouched	18, 7–8; 32, 3
2b	micro-double-point, unilaterally retouched	32, 4
2c	micro-point, unilaterally retouched, additionally retouched at the base	18, 2–6; 32, 5
2d	backed micro point, angular	
2e	terminally retouched micro-point, oblique	32, 6
3a	isosceles triangle, acute-angled	
3b	isosceles triangle, obtuse-angled	18, 13; 32, 7–8
3c	scalene triangle	32, 9
4a	symmetrical trapeze	32, 10
4b	trapezoid arrow-head	18, 14; 32, 11
4c	trapezoid point	
5	micro-sidescraper	
6	micro-endscraper	
7a	terminally retouched microlith, straight	
7b	terminally retouched microlith, oblique	
7c	terminally retouched microlith, concave	
8	denticulated microlith	
9	notched microlith	
10	outil écaillé	
11	borer	
12	laterally retouched microlith, semi-abrupt (*Ouchtata*-like)	
13	other microliths (not specified)	
14	micro-burin	32, 12
15	fragmentary microlith	

Fig. 28. Microlithic tools (Breunig/Wotzka 1993: 166–168; English terminology mainly according to Richter 1984: 9–10).

15 and 17. In contrast to the distribution of unretouched pieces/nuclei a decrease in quantities from spit 19 to 21 is not clearly visible, except for the low quota in spit 21.

Generally at Stone Age sites the quota of microliths varies within a certain range in relation to the total of artefacts. But here percent-

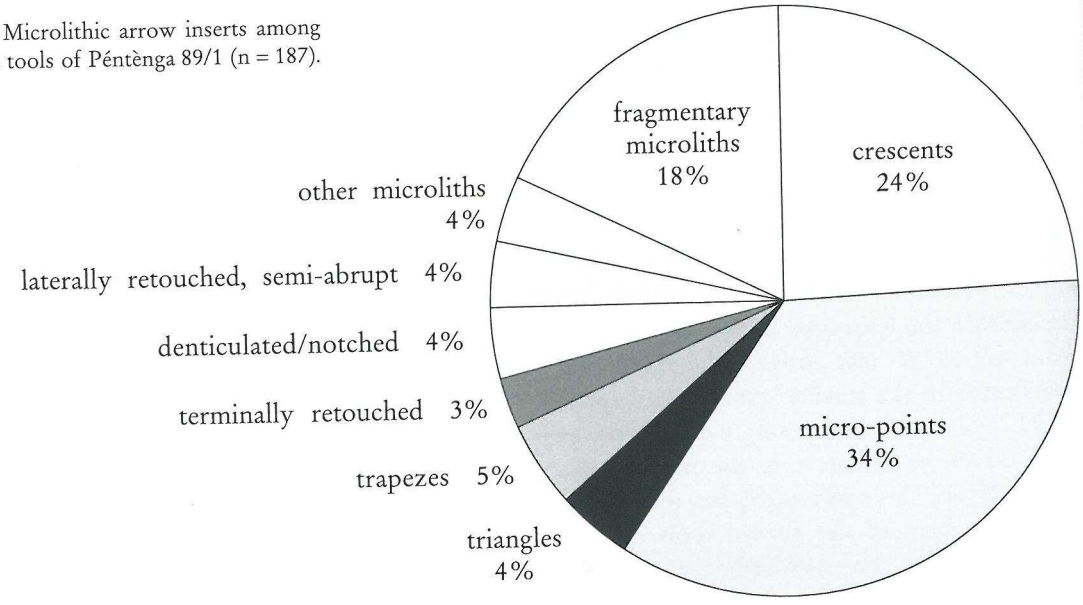

Fig. 29. Microlithic arrow inserts among the stone tools of Péntènga 89/1 (n = 187).

spit	cm below surface	microlithic types: 2d	7b	3b	3c	4a	4c	5	6	7a	7c	8	11	3a	2c	4b	9	12	13	2e	10	2b	1a	1b	15	2a	14	sums	%
*1	0																											0	0.0
*2	5																											0	0.0
*3	15								1							1					1				1	2	1	7	2.9
4	25																							1	1			2	0.8
5	30										1					1									1	2	1	6	2.4
6	40																										1	1	0.4
7	50																											0	0.0
8	60														1									2	1			4	1.6
9	65															1									1			2	0.8
10	75																				1			1		2		4	1.6
11	▶ 80	1								1		1									1		2	1	3	2	2	14	5.7
12	85				1			1		1								1			1	1			2	1	1	10	4.1
13	95						2					1	1	1	1		1				1	1	1		4	3	4	21	8.6
14	105					1													1				5	5	1	2	4	19	7.8
15	115			1														1	1	2	1	1	4	3	2	4	8	28	11.4
16	125														1		1			1		3	1	2			1	10	4.1
17	135					1		1	1		1			1	1	2	3	3	4	3	3	3		5	11	15	12	70	28.6
18	145				1									2	1							2		5				11	4.5
19	155																		1	1	1	1	1	4	1		2	12	4.9
20	165		1										1							1	1	2	2		1	3	4	16	6.5
21	180			1														2		1					3	1		8	3.3
	186	huge slab, end of excavation																											
	total	1	1	2	2	2	2	2	2	2	2	2	2	2	4	5	5	5	7	7	9	11	14	16	29	33	37	41	245	
	%	0.4	0.4	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.6	2.0	2.0	2.0	2.9	2.9	3.7	4.5	5.7	6.5	11.8	13.5	15.1	16.7		

Fig. 30. Distribution of microlithic types at Péntènga 89/1, sorted by frequency from left to right. *Data of spits 1–3 are not reliable since spit 1 equalized the natural surface with differences up to 16 cm; ▶ = stone layer.

ages oscillate from 0.0 to 6.3% (Fig. 31). In the following the sediment of the upper unit will be neglected because it is very likely that it originates from the Iron Age and moreover is perturbed. Besides it contains only the minor part of artefacts and has no microliths which are not also present below the stone layer. Looking at the percentage distribution within the lower unit, one finds it fairly regular between 2.7 and 4.3% except for spits 16 to 18. There a high quota in spit 17 is flanked by very low portions in spits 16 and 18. This seems to be an effect of the perturbation mentioned in the discussion of absolute dates above (cp. archaeobotanical results below). This is a regrettable fact particularly as it affects the range assumed to be the archaeological main layer, at least concerning the unretouched pieces and nuclei.

The microlithic spectrum of Péntènga 89/1 is a part of the general *Later Stone Age* assemblage (Fig. 32). But it is impossible to refine its position within a typo-chronological framework because no such system is as yet available for western Africa. Therefore we are only at the very beginning of pointing out *fossiles directeurs* among the lithic types of the west African *LSA*.

Concerning Péntènga 89/1, the analyses done so far let us assume that the range between spits 15 and 19 contains the main layer of the *LSA*, although probably perturbed to a certain extent. This perturbation makes it difficult to define which of the non-microlithic tools are part of the inventory although their majority occurs in that range (Fig. 33). So they somehow belong to that range but will not be discussed here (cp. Breunig/Wotzka 1993: 168–169). Nevertheless we find suitable radiocarbon dates between the middle of the 7th and 6th millennia cal BC for that range. The association of microliths with much younger dates pointing to the Iron Age in the overlaying spits is likely to be an effect of perturbation as well. However, it cannot be excluded that some tradition in making stone tools survived and faded slowly during the Iron Age. Yet the base seems stable enough to declare crescents and micro-points as elements of a Western African hunter equipment between the

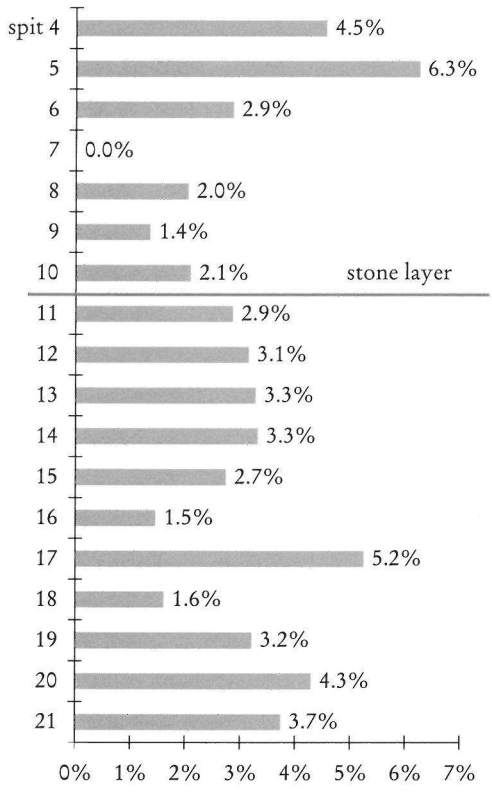

Fig. 31. Percentage of microliths relative to the total of stone artefacts of each spit at Péntènga 89/1. Spits 1–3 excluded.

65th and 55th centuries cal BC. But it cannot be decided whether the predominance of these types is a typical feature of this period in the area. The ecological setting would contradict the assumption by Shaw (1981: 96) connecting microlithic industries to "non forested country carrying a heavier animal biomass". While Shaw bases his concept on a map of actual vegetation zones (1981: 120, Fig. 3), archaeobotanical and archaeozoological data from Péntènga 89/1 and palaeoclimatical research in Western Africa give good reasons to drop this theory.

The small amount of non-microlithic stone tools will be presented here for documentary reasons only (Fig. 34).

Finally, 11 other stone artefacts have to be mentioned. Hematite nodules with traces of intentional abrasion, a partly polished quartzite pebble, hammering stones of quartzite and quartz and a pebble tool of alkaline intrusive

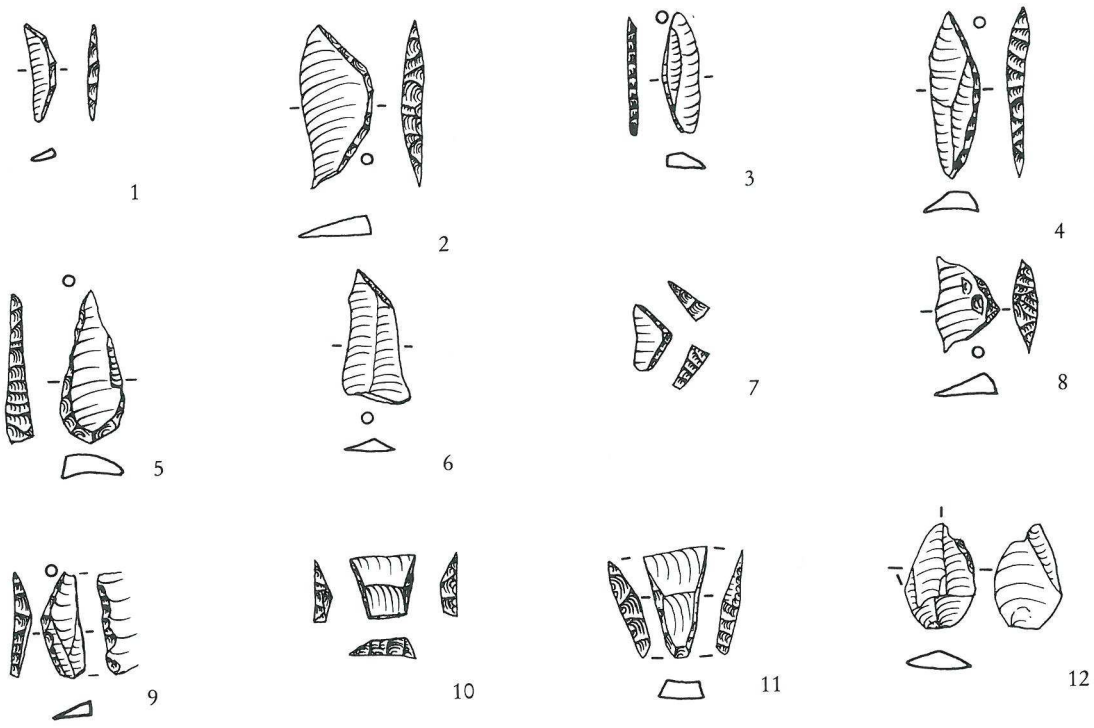

Fig. 32. Péntènga 89/1. Microlithic tools. Scale 1:1.

spit	cm below surface	non-microlithic types 1	2a	2b	3	4	5	6a	6b	7	8	9	10	11	12	13	14	15	sums	%
*1	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0
*2	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0
*3	15	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	1.1
4	25	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	1.1
5	30	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	2.2
6	40	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0
7	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0
8	60	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0
9	65	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0
10	75	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0
11	▶ 80	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	1	3	3.2
12	85	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0
13	95	.	.	.	.	.	.	.	.	.	1	.	.	.	1	3	.	1	6	6.5
14	105	1	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	2	6	6.5
15	115	.	.	.	.	1	.	.	.	.	1	2	.	1	2	3	.	3	13	14.0
16	125	.	.	1	.	.	1	.	2	.	.	.	.	.	.	1	.	.	5	5.4
17	135	2	2	.	.	.	1	1	.	1	.	5	.	.	8	6	1	3	30	32.3
18	145	5	1	.	1	.	.	.	.	.	.	.	2	.	2	.	2	.	13	14.0
19	155	.	.	.	.	.	.	.	.	1	.	.	.	.	1	1	.	1	4	4.3
20	165	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.	2	4	4.3
21	180	.	.	.	.	.	.	.	.	.	.	.	.	1	3	1	.	.	5	5.4
	186	huge slab, end of excavation																		
	total	8	3	3	1	1	2	1	2	2	3	11	2	2	19	16	3	14	93	
	%	8.6	3.2	3.2	1.1	1.1	2.2	1.1	2.2	2.2	3.2	11.8	2.2	2.2	20.4	17.2	3.2	15.1		

Fig. 33. Distribution of non-microlithic types at Péntènga 89/1. *Data of spits 1–3 are not reliable since spit 1 equalized the natural surface with differences up to 16 cm; ▶ = stone layer. Type-list in Fig. 35.

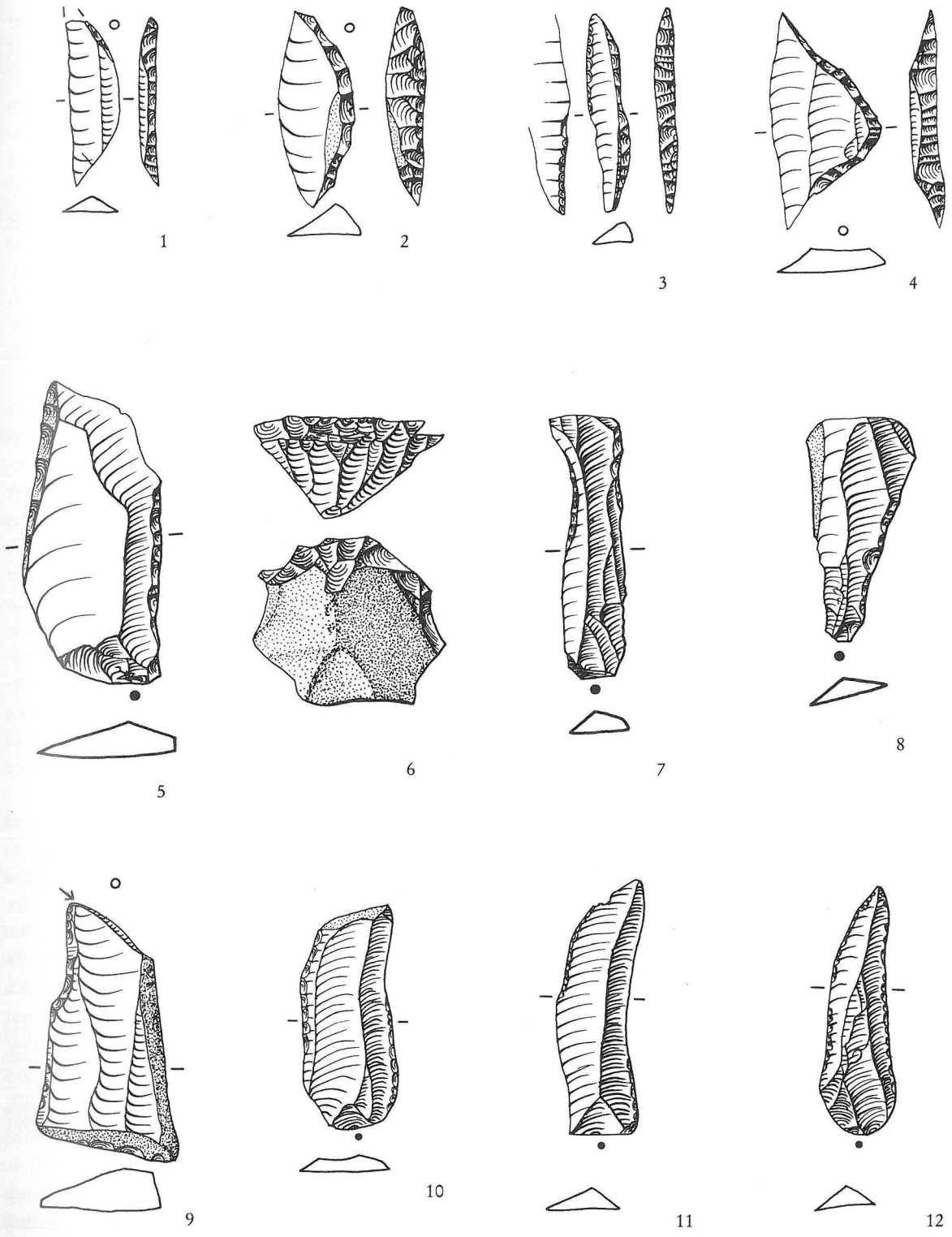

Fig. 34. Péntènga 89/1. Non-microlithic tools. Scale 1:1.

type	type name	example on Fig.
1	big crescent (>25 mm)	34, 1
2a	backed point, short	34, 2
2b	backed point, narrow	34, 3
3	big isosceles triangle, obtuse-angled	34, 4
4	sidescraper	34, 5
5	nucleiform endscraper (~ nucleus for bladelets)	34, 6
6a	terminally retouched tool, straight	
6b	terminally retouched tool, oblique	
7	denticulated tool	
8	notched tool/blade	34, 7
9	outil écaillé	
10	borer	34, 8
11	burin	34, 9
12	blade with partially marginal retouched edge	34, 10–12
13	flake with marginal retouched edge	
14	blade with partially or continuously retouched edge	
15	flake with irregularly retouched edge, partly broken	

Fig. 35. Non-microlithic tools at Péntènga 89/1 (after Breunig/Wotzka 1993: 168–169).

rock. Seven polished fragments are made from basic intrusive rock. They could belong to the same polished stone axe. In this case their distribution from a spit close to the surface down to the deepest spits would be another indicator for the perturbation of the sediment.

Th.F.

3.3.2. Ceramics

212 fragments of pottery were found, 207 of them allocable to spits. Ceramics appear throughout the sequence, but only two potsherds occur in the lowest spits. This may be an effect of the sloping profile walls, making the excavated area a bit smaller from spit to spit. The phenomenon of shrinking quantities in spits 19 to 21 was already visible in the distribution of unretouched pieces/nuclei and non-microlithic types (Fig. 26 and 33).

The preservation of the material is good and permits a distinct identification of the broad spectrum of formal, ornamental and technological variations. This spectrum certainly represents several periods of ceramic evolution. However, the potsherds seem to be mixed across the spits since pottery fragments definitely belonging together come from vertical ranges of up to 65 cm (Fig. 36). But the stone layer evidently formed a barrier, penetrated in only two cases. The pattern shows a neat separation of the two stratigraphic units but also considerable scattering within the units of potsherds belonging together.

Perturbation of the sediment and remains was already pointed out in the above discussion of the mismatch between radiocarbon and thermoluminescence dates. But in fact, in the lower unit the pottery is associated with microliths and ^{14}C-dates of the 7th and 6th millennia cal BC. Comparing this association to other sites in western Africa makes it very dubious that such an early pottery would exist in the south-east of Burkina Faso (Wotzka/Goedicke, this volume). So the chronological association of pottery and dated charcoals is doubtful. This is not to say that ceramics and microlithic stone tool assemblages may not have been coeval in more recent periods.

On the basis of stylistic and technological traits observed on the ceramics found so far in south-eastern Burkina Faso Wotzka defined a number of pottery groups ten of which are present at Péntènga 89/1 (Breunig/Wotzka 1993: 170–171, 181, 184; Ballouche *et al.* 1993: 17–22). For six of these (Groups 1, 2, 31, 41, 4 and 42, in chronological order starting with the earliest ware), described and illustrated in Wotzka/Goedicke (this volume), thermoluminescence dates are available. The remaining, as yet undated, pottery groups relevant to Péntènga 89/1 may be characterized as follows:

Group 3 (Fig. 37 and 38). Ceramics of this group are distinguished by twisted string rouletting which generally covers most of the vessel, leaving rims and lower bodies plain. Twisted strip roulettes, appliqué bosses, grooving and

Fig. 36. Distribution of potsherds (n = 84) belonging to 20 individual vessels at Péntènga 89/1. *Data of spits 1–3 are not reliable since spit 1 equalized the natural surface with differences up to 16 cm; ▶ = stone layer.

spit	cm below surface	number of potsherds belonging to 20 vessel units
*1 to 3		2 1
*1 to 5		. . 1 1
*3	15	 1
4	25	1 . 3 . . 1
5	30	. . . 1 2 . 1 1
6	40	1 1 2 . 1 . 1 1 1 1
7	50	. . 1 . 1 1 1 . 4 .
8	60	. . . 1 2
9	65	. . . . . 1 1 .
10 ▶	75	 3
11	80	. . . . . 1 7 1 1
12	85	. . . . . 2 . . 1 1 1
13	95	. . . . . 6 2 . 1 . .
14	105	. . . . . 1 . . . . . 1 1
15	115	. . . . . 1 . . . 3 . .
16	125	. . . . . 1 5 1 .
17	135	. . . . . 1 . . . . .
18	145	. . . . . 1 1
19	155	. . . . . 1 1
20	165	. . . . .
21	180	. . . . .
	186	huge slab, end of excavation

finger impressions add to the poor decorative repertoire. Besides typical bell-shaped beakers with round bases (Fig. 37, 3. 4), globular pots with everted rims (Fig. 37, 2) as well as various types of bowls and dishes (Fig. 37, 1; 38, 2. 10. 11) are attested. The pottery is coarsely made and mainly tempered with feldspar.

Group 5 (Fig. 39). This group bears striking similarities, notably carved rouletting (Fig. 39, 5. 10. 14), red slipping, incised triangles filled with punctates (Fig. 39, 7. 8), and certain vessel and rim forms, with the recent Gulmance pottery of the region (Geis-Tronich 1989; 1991) and is therefore assumed to be subrecent in date. Round-based, globular pots with long everted rim-necks are characteristic and occur in various sizes (Fig. 39, 11–14). Several bowl types are known (Fig. 39, 1. 3. 4). The fabric contains feldspar or quartz as tempering materials while the slip frequently shows an admixture of mica.

Group 7 (Fig. 40). Vessel shoulders are characteristically decorated by twisted string rouletting which occurs in single or multiple horizontal bands. Single bands may be accompanied by multiple wavy-lines created by horizontal knotted string rouletting (Fig. 40, 3. 5). Rims tend to be sharply everted, with interior thickening and a horizontal or oblique, slightly concave upper side. Pots seem to have been of globular or ovoid shapes. The paste is generally tempered with quartz or feldspar.

Group 17 (Fig. 41). This is a provisional group, originally defined by flat disk or ring bases. Rim fragments of similar ware fabric have also been allocated, including a faceted specimen with an

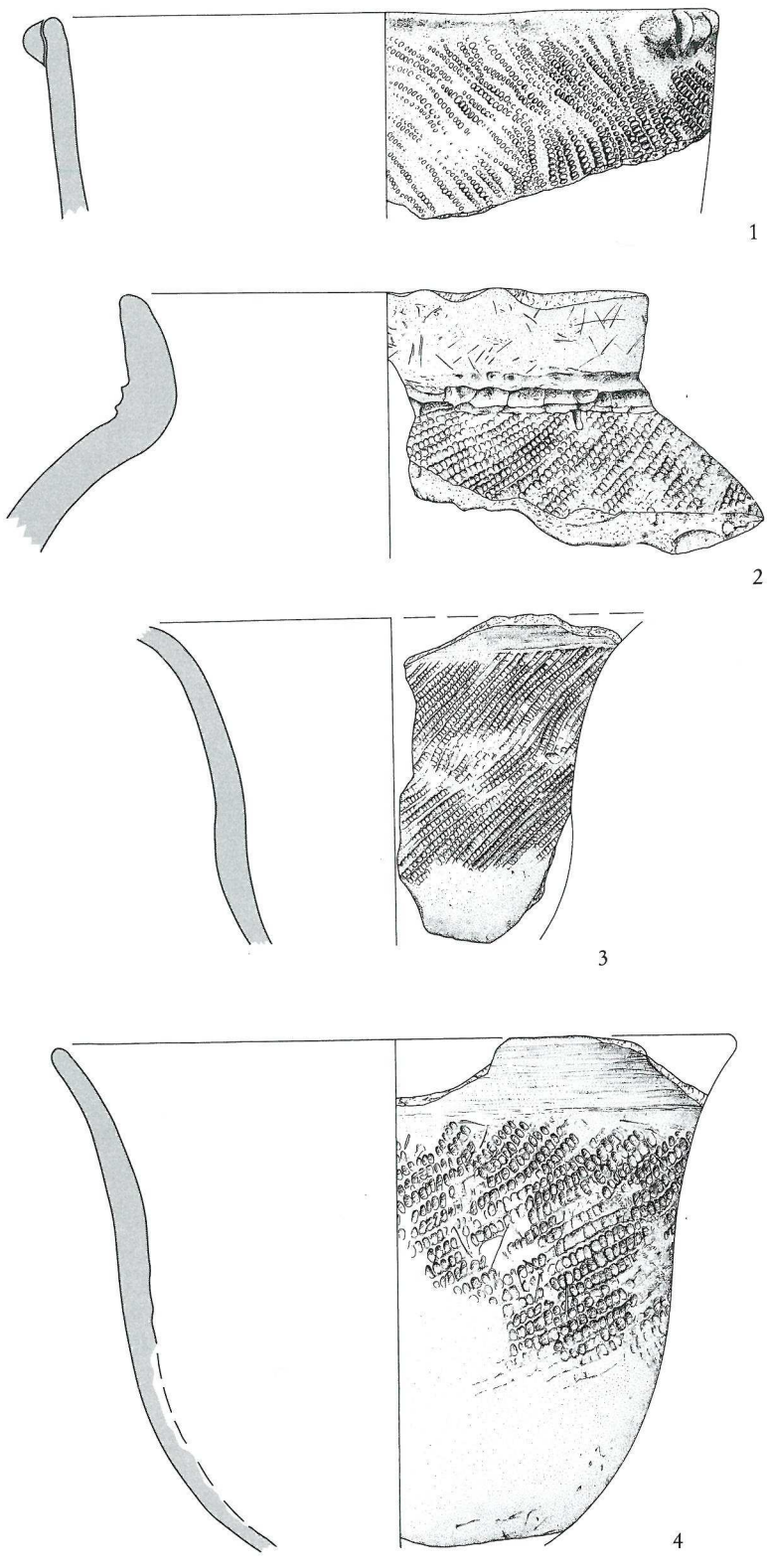

Fig. 37. Group 3 pottery (Scale 33.33%).

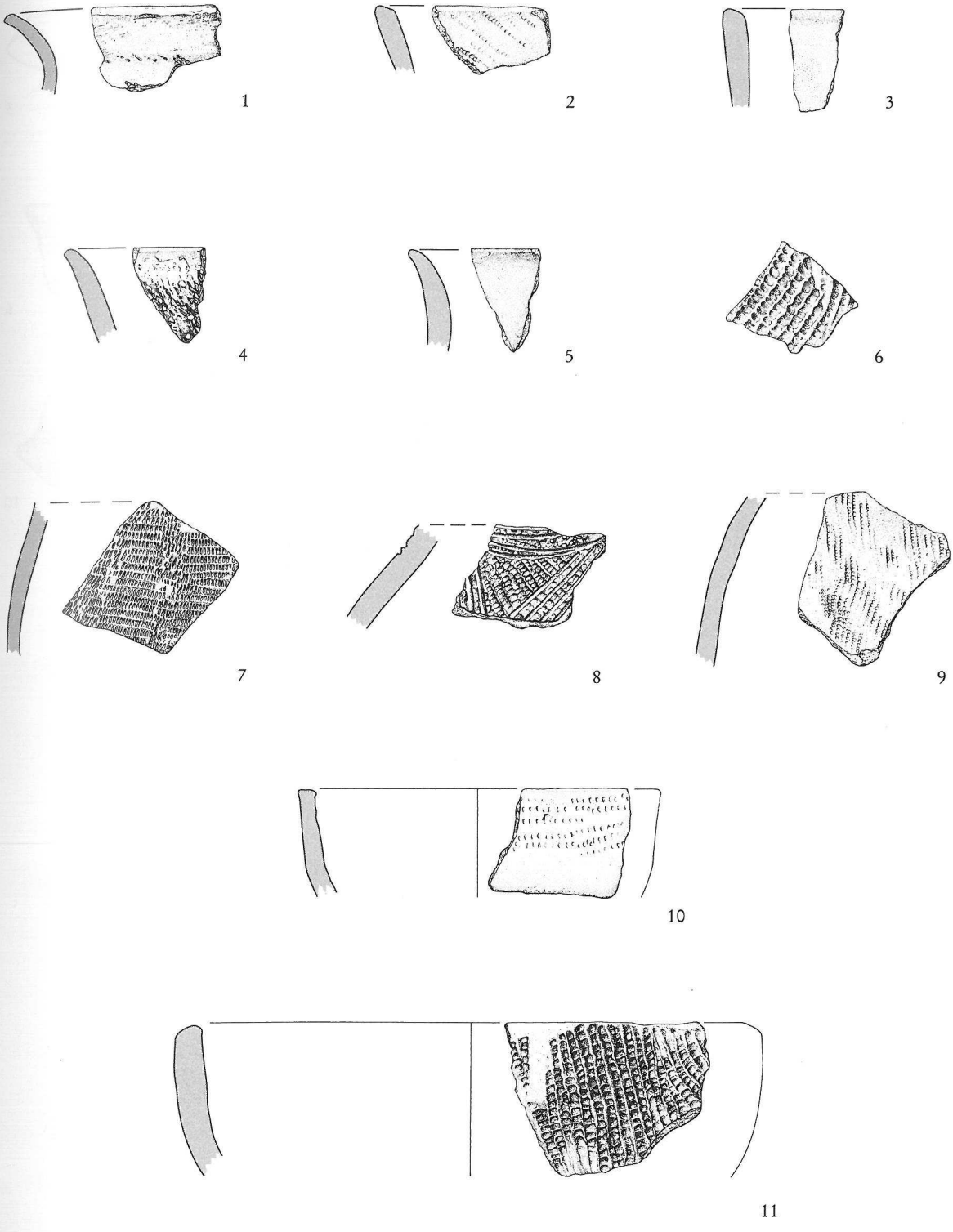

Fig. 38. Group 3 pottery (Scale 33.33%).

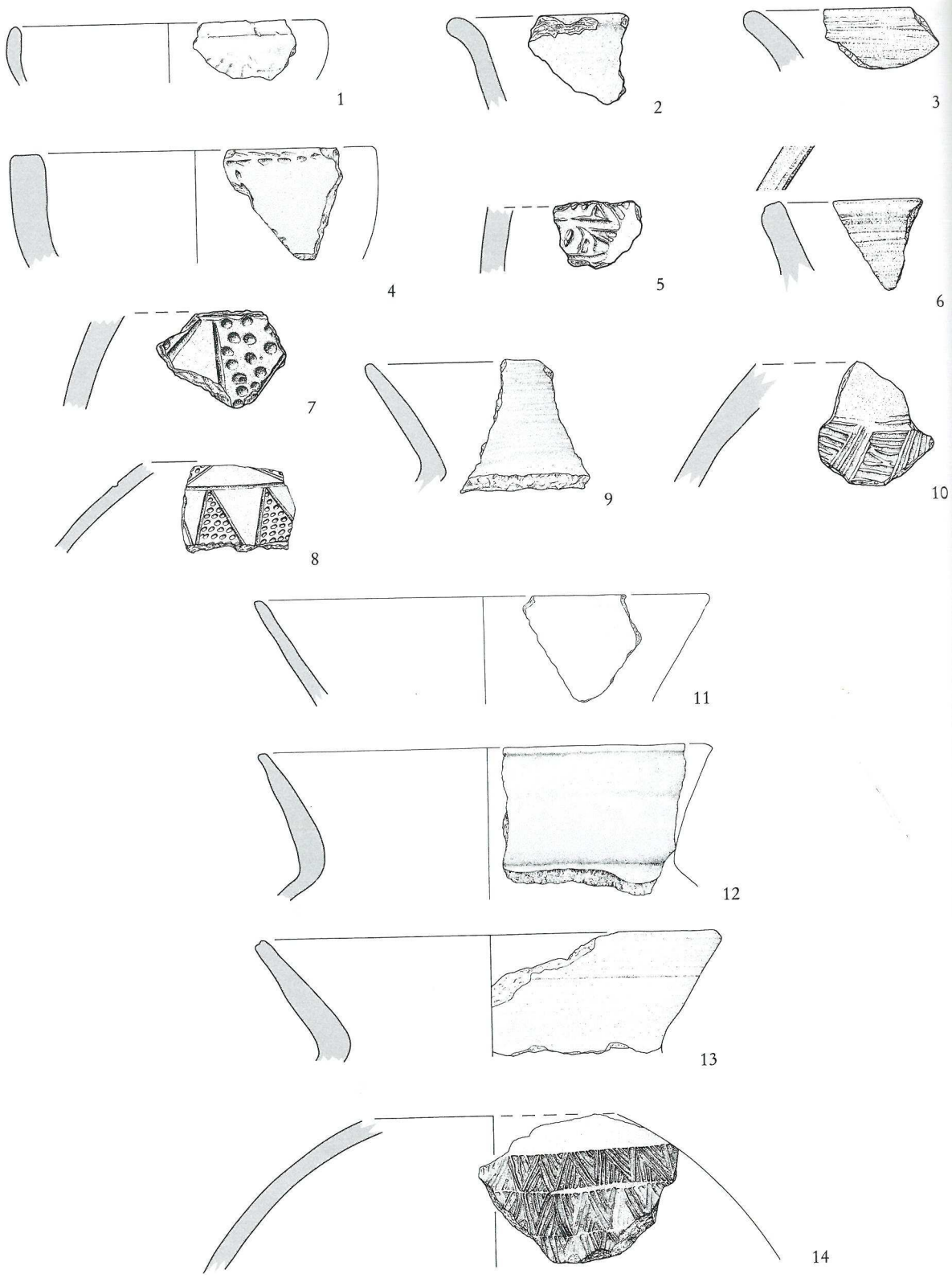

Fig. 39. Group 5 pottery (1.4.8.9.13.14: Scale 33.33%; 2.3.5–7.10: Scale 50%; 11.12: Scale 25%).

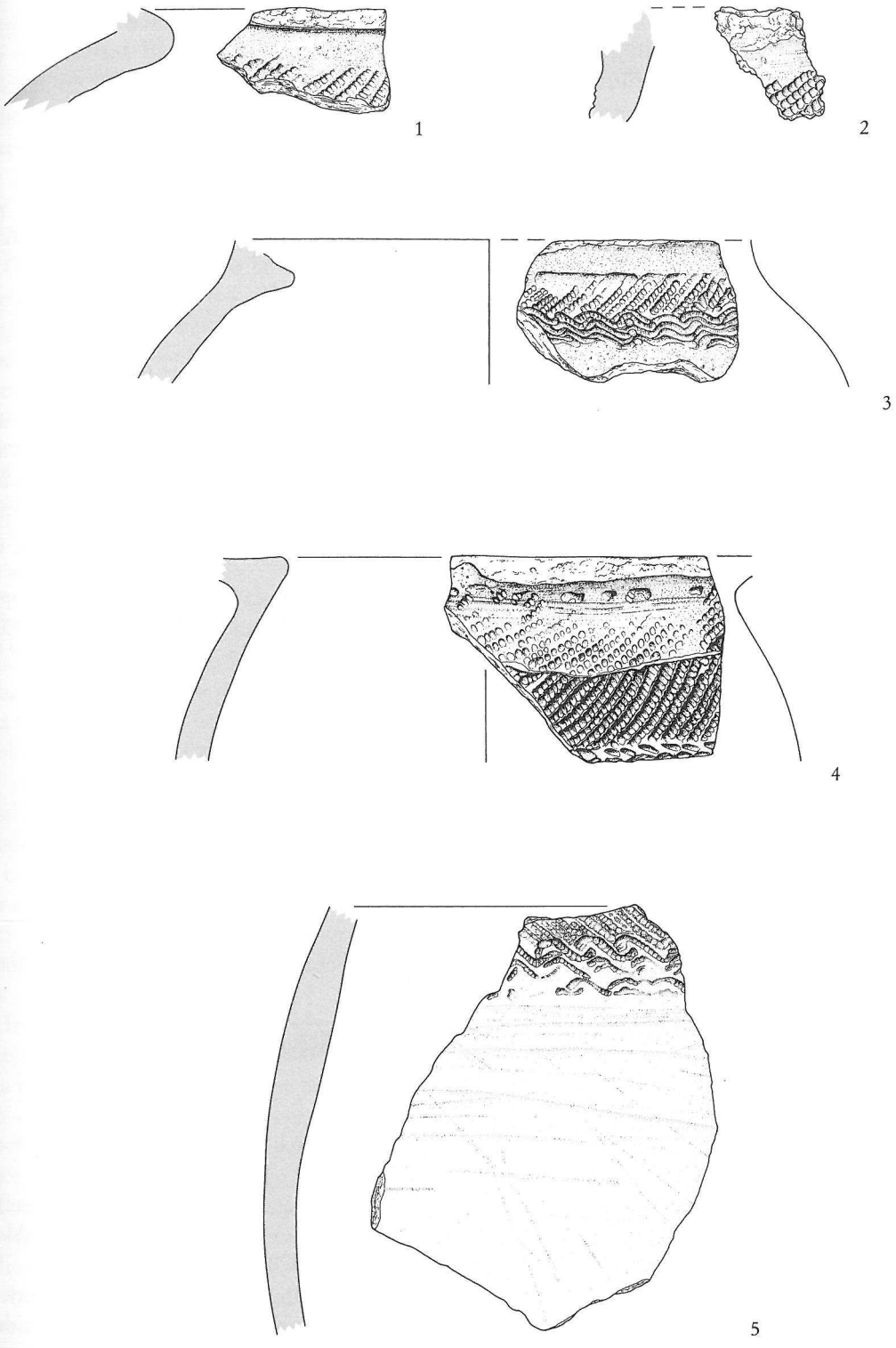

Fig. 40. Group 7 pottery (Scale 50%).

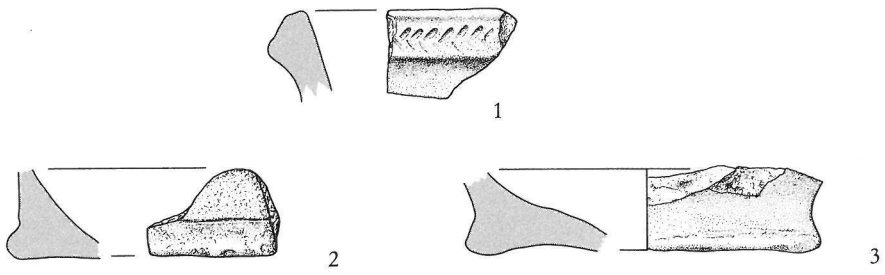

Fig. 41. Group 17 pottery (Scale 50%).

spit	cm below surface	ceramic style group 1	2	31	41	4	42	3	7	5	17	99	sum	%
*1 to 3		1	1	.	.	1	.	2	.	.	.	3	8	3.9
*1 to 5		1	.	1	.	5	1	5	.	1	1	3	18	8.7
*3	15	.	.	.	.	1	.	.	.	.	.	1	2	1.0
4	25	.	.	.	.	2	.	3	.	1	.	5	11	5.3
5	30	.	.	.	.	2	1	1	1	1	.	1	7	3.4
6	40	.	.	.	1	2	.	4	.	.	.	7	14	6.8
7	50	.	.	.	.	3	1	.	.	1	.	6	11	5.3
8	60	.	.	.	1	.	2	3	.	.	.	3	9	4.3
9	65	.	.	.	1	1	.	2	.	.	.	1	5	2.4
10	75	2	.	.	.	3	.	1	.	.	.	4	10	4.8
▶ 11	80	7	.	.	1	.	.	.	.	.	.	7	15	7.2
12	85	7	2	.	.	.	.	.	.	.	.	5	14	6.8
13	95	7	1	.	.	.	.	1	.	.	.	8	17	8.2
14	105	5	.	.	.	.	.	.	.	.	.	3	8	3.9
15	115	8	1	.	.	.	.	.	.	.	.	6	15	7.2
16	125	1	3	.	.	.	.	.	.	.	.	12	16	7.7
17	135	1	.	.	.	.	.	.	.	.	.	5	6	2.9
18	145	4	.	.	.	.	.	.	.	.	.	3	7	3.4
19	155	8	.	.	.	.	.	.	.	.	.	4	12	5.8
20	165	.	.	.	.	.	.	.	.	.	.	1	1	0.5
21	180	.	.	.	.	.	.	.	.	.	.	1	1	0.5
	186	huge slab, end of excavation												
	total	52	8	1	4	20	5	22	1	4	1	89	207	
	%	25.1	3.9	0.5	1.9	9.7	2.4	10.6	0.5	1.9	0.5	43.0		

Fig. 42. Vertical distribution of ceramic style group quantities at Péntènga 89/1 (style groups according to Breunig/Wotzka 1993: 170–171; Wotzka/Goedicke, this volume). *Data of spits 1–3 are not reliable since spit 1 equalized the natural surface with differences up to 16 cm; ▶ = stone layer.

impressed herring-bone pattern (Fig. 41, 1). Judging from their overall appearance Group 17 ceramics should be quite recent in date.

Although no direct dating evidence is as yet available, the general impression emerging from a consideration of their ornamental, morphological and technological variability against the background of the regional sequence of dated style groups (Wotzka/Goedicke, this volume) is that the four groups described above should all belong in the AD time range.

All ceramic finds not attributable to any of the pottery groups were assigned to a residual Group 99.

The vertical distribution of the style groups shows a distinct pattern (Fig. 42). Groups 1 and 2 are clearly associated with the lower strati-

graphic unit while all other groups, except for the unclassified fragments (Group 99), are restricted to the upper unit. A few "outliers" indicate that the stone layer was not a perfect barrier to bioturbation. However, the appropriate quantities show that this does not constitute any serious problem for interpretation.

An important fact is that ceramics pertaining to Groups 1 or 2 have so far only been found at rockshelter sites in the Chaîne de Gobnangou range. The large assemblage of ceramics recovered in the course of surveys and test excavations in the plains does not contain a single sherd of these early wares. While the latter constitute the oldest ceramics currently known from the region their evolved style and technology imply predecessors not yet identified.

H.-P.W., Th.F.

3.3.3. Genesis and use of the rockshelter

Two models can be set up to reconstruct the genesis of the site. Model **A** assumes that an intact shelter existed at the edge of the plateau and was already used by humans before its roof broke off the edge of the plateau and fell down on the slope. After that event the new but smaller shelter was used to a lesser extent. Model **B** assumes that the huge rock was already in its present place when people started to use the small sheltered area. In this latter model the rock may be broken off the plateau (like in model **A**) or be part of the bedrock eroded *in situ*.

In either model the stone layer which separates spits 1 to 10 from spits 11 to 21 is part of a block stream that came into being only after the rock had found its present position. The block stream evidently postdates that period since it abuts on the backward wall of the shelter and no hints were found to support the assumption it had been pressed down into the sediment for more than one metre by the impact of the falling boulder suggested in model **A**. Of course a constant erosion of stones from both the edge of the plateau and the sheltering rock can be supposed. But the dimension of this block stream marks an event which occurred only once in the history of the site.

As to model **A** four phases (a to d) can be hypothetically reconstructed, giving a diachronic impression of the shelter's supposed genesis. According to the radiocarbon dates available, an intact rockshelter was settled for the first time around 6,100 cal BC when the climate was supposedly more humid than today but more dry then in the centuries before (Fig. 43a). The huge mass of stone artefacts, the production of microliths and the high diversity of exploited animal resources suggest the site was a long-term hunter-gatherer dwelling place used for about one millennium. According to experiences relating to European rockshelter sites it can be assumed that human activities did not only take place in the sheltered area but also on the surrounding slopes. Moreover, it is likely that materials which accumulated on the floor inside the shelter were moved to the outside by the inhabitants walking in and out. So there are good reasons to suppose anthropogenic layers also on the hillside, exposed to erosion particularly during the rainy seasons. Consequently, remains from various periods will already have been mixed on slope during the time of settlement.

After the middle of the 6th millennium a hiatus of at least 20 centuries is implied by the dating evidence, lasting until after the mid-4th millennium judging from the radiocarbon dates. Neither do we know whether there was a real interruption of occupation nor did we find reasons to explain a discontinuity. Of course, it appears likely that the fall of the shelter's roof could have caused such a hiatus. However, the assumption of that event having occurred at a very early date within the site's history is not easily reconciled with the stratigraphical situation. The most striking argument is that an accumulation of boulders, which would have accompanied such an event, was not observed in the appropriate spits 13 to 21. Instead it seems that the roof of the shelter broke off between 3,600 (spit 13) and 600 cal BC (spit 11). The vagueness implied by this broad span can be somewhat reduced by making use of the context ages calculated from consistent individual thermoluminescence dates on Group 1 and

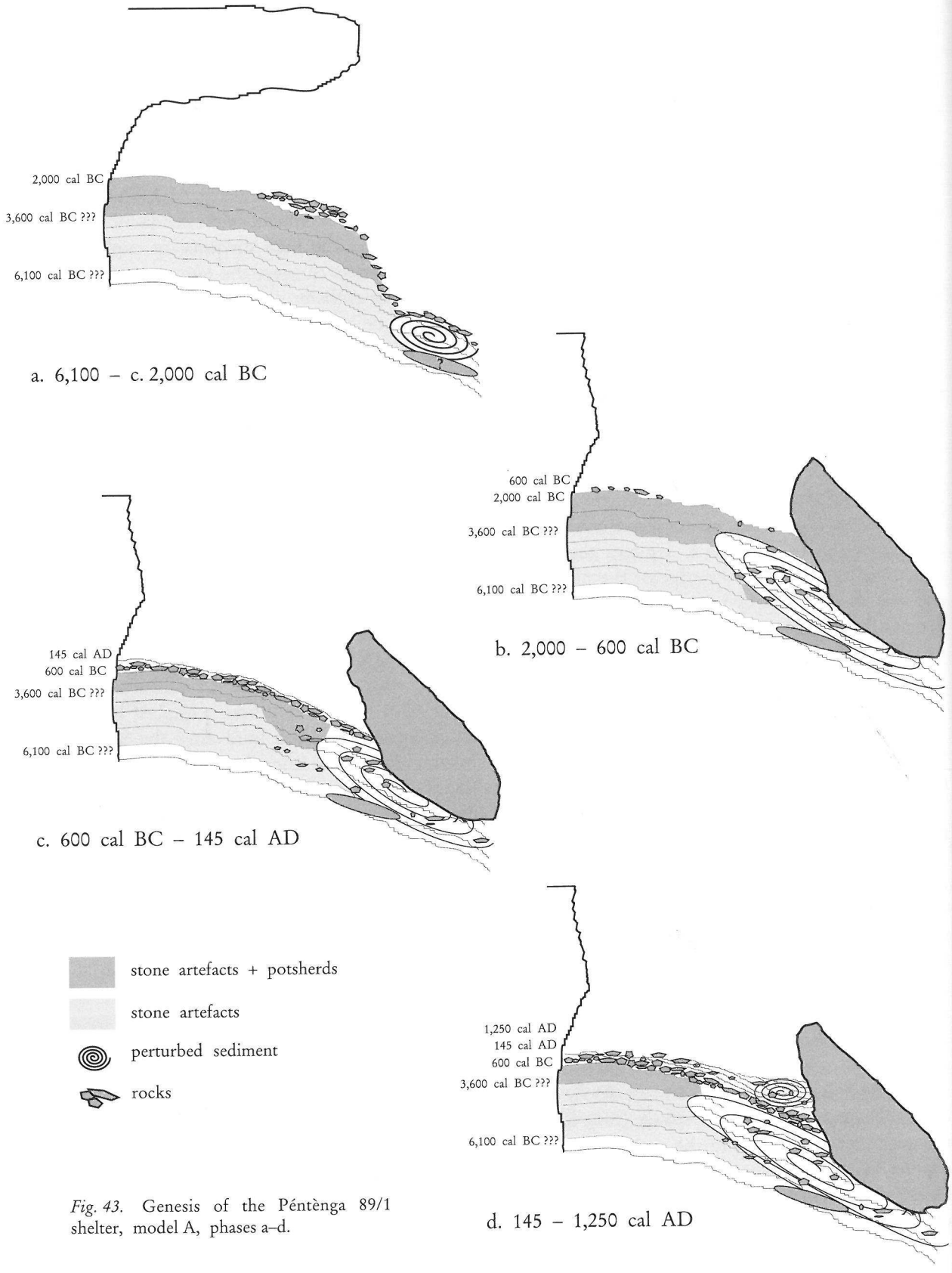

Fig. 43. Genesis of the Péntènga 89/1 shelter, model A, phases a–d.

Group 2 pottery as occurring in the lower stratigraphic unit. In good accord the two appropriate context dates point to *c.* 2,000 BC (Wotzka/Goedicke, this volume), suggesting the roof collapsed somewhen between 2,000 BC and 600 BC. The impact tore parts of the anthropogenic layers downhill and caused further perturbation of the sediment (Fig. 43b). This would also explain the artefacts found beneath the downhill end of the rock. After the event the sediment in the area formerly protected by the roof would have been exposed to erosion. The deposits of several millennia were washed downhill yet withheld in part by the huge block which had formed the roof of the original shelter and now constituted a sediment trap. Apart from subsequent bioturbation, the stratification of the sediment was inverted to some degree by this erosion. At first younger materials from the top layers of the former shelter were washed into older layers on the slope which had already been mixed by the impact of the falling rock. As erosion progressed, older materials from the subsequent layers of the former shelter followed. Comparison of the sequence of calibrated radiocarbon dates relating to spits 11–21 with that of the corresponding thermoluminescence dates (Wotzka/Goedicke, this volume, Fig. 17) illustrates this effect. It is likely that at the onset of erosion the layers accumulating against the uphill side of the fallen rock were deposited parallel to the slope of the hillside. It probably took some time until the entire width of this sediment trap was filled up horizontally. Thus one, if not the only, reason for the observed mixture at the same level of finds from different periods may be that excavation was carried out by artificial horizontal spits potentially cutting through sloping layers in the deeper parts of the deposit.

Apart from these technical reflections one must consider the consequences for the inhabitants of the supposed crash of the shelter's roof. We have no indications of personal human catastrophes caused by the supposed event. But one could imagine that it might have made the place uninhabitable for some time. Perhaps people interpreted this incident as a token of supernatural forces to avoid the place and moved away. However, radiocarbon dates indicate a hiatus of at least six hundred years between spits 11 and 10.

The most plausible explanation for the stone layer that sealed spits 11 to 21 is that it resulted from the fall of the shelter roof. At this incident a lot of boulders will have fallen down, some of them sliding into the angle between the former roof and the hill. Perhaps the huge slab at 186 cm below surface which stopped the excavation originates from that event. Of course it is possible that the slab covers remains even older than 6,100 cal BC. However, it might as well have been before human occupation of the site started. Judging from the radiocarbon dates the stone layer must originate from between 600 cal BC and 145 cal AD (Fig. 43c). This in turn would place the roof's fall closer to 600 cal BC than to 2,000 cal BC. After such a daunting event an interruption of occupation, as seems to be indicated by the radiocarbon dates revealing a gap of at least 600 years between spits 11 and 10, would appear plausible.

The earliest date for a reoccupation is 145 cal AD when a new phase of use began, lasting at least until 1,250 cal AD (Fig. 43d). The intensity of use will have decreased after the fall of the rock. The sheltered area was now much smaller than before and probably the economy had already shifted to agro-pastoralism focused on the plains in the last millennium cal BC. The powdery sediment was now poorly protected against the annual rainy seasons and animal activities will also have contributed to perturbation (cp. vertical distribution of vessel units in Fig. 36). The small number of potsherds of the supposedly subrecent ceramic style Group 5 emphasizes that the importance of the site diminished (cp. Fig. 42). Since hardly any recent remains were found we can conclude that today the site is of no importance to the present population.

Model **B** is much simpler yet fails to accommodate some observations. It assumes that the huge rock was already in its present place when people started using the small sheltered area. The rock may be broken off from the plateau

Age (cal)	Model A	Model B
1,250 AD	Latest (?) use of the site	
145 AD	Latest *terminus ante quem* for the origin of the stone layer and earliest date for the start of accumulation of spits 10 to 1	
600 BC	Latest *terminus post quem* for the fall of the shelter roof and earliest *terminus post quem* for the origin of the stone layer	Earliest *terminus post quem* for the origin of the stone layer
c. 2,000 BC	Earliest *terminus post quem* for the fall of the shelter roof	?
6,100 BC	Earliest date for human occupation in the intact shelter	Earliest date for human occupation in the small shelter as it appears today

Fig. 44. Table of events for models A and B at Péntènga 89/1.

at times before human occupation or it is part of the ground rock eroded *in situ*. The history of the site is similar to that of model **A**. The difference is that we have to find another explanation for the genesis of the stone layer which under this hypothesis cannot be interpreted as resulting from the fall of a shelter roof. The time marks remain the same. Sometime between 600 cal BC and 145 cal AD the stone layer originated from a natural event not to be determined at present. It may have been a consequence of the aridification process from 800 cal BC onwards pointed out by archaeobotanical analysis (see contribution K. Neumann below). The contrast between dry and rainy seasons may have grown since that time, causing a higher intensity of erosion. After a relatively short span of time, some centuries we suggest, erosion slowed down as most of the material loosened during the more humid millennia had been washed downhill.

Fig. 44 summarizes the differences between the models A and B. It appears difficult to tie in with model **B** the notion of a hunter-gatherer dwelling site intensively used for about one millennium as indicated by the archaeological and archaeozoological results. Altogether model **A** would seem to come closer to historical reality.

Th.F.

4. Archaeobotany

Introduction

At Péntènga 89/1, the archaeobotanical work concentrated on charred wood and uncharred fruits and seeds. Sediment samples from this site, as well as from other archaeological excavations in the Chaîne de Gobnangou contain almost no pollen material. Pollen was only found in peaty sediments at the slopes of the escarpment deposited by small brooks running down the Chaîne (Neumann/Ballouche 1992: 63–66; Ballouche *et al.* 1993: 25–27). However, radiocarbon dates revealed that those sediments have been deposited only recently. Thus the pollen diagrams only reflect the vegetation changes during the 20th century and give no information on the plant cover in older times. In contrast, the macro-remains of Péntènga 89/1, especially charred wood, cover a time-span of more than 7,000 years and thus illustrate the vegetation history through larger parts of the Holocene.

Preliminary results of the fruits/seeds and charcoal analyses have been published earlier (Neumann/Ballouche 1992; Ballouche *et al.* 1993). They were based on identification with a small reference collection and limited knowledge of the modern vegetation in the Chaîne de Gobnangou and its surroundings. In the meantime, our identifications have been checked with a larger reference collection, and in the

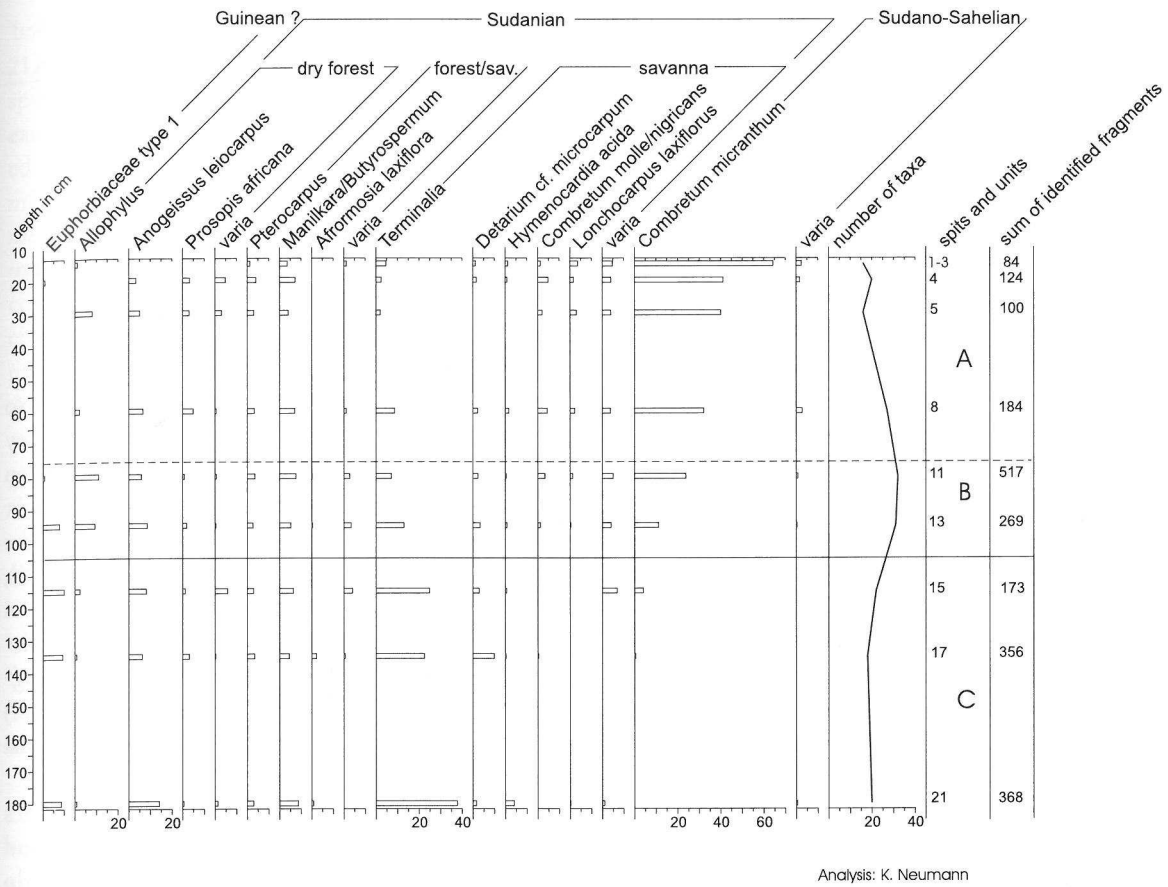

Fig. 45. Taxa of charcoal samples from Péntènga 89/1.

light of recent phytosociological and palynological studies (Hahn-Hadjali 1998; Kéré 1998; Küppers 1996; Neumann/Müller-Haude 1999; Salzmann 1999, 2000; Wittig *et al.* 2000) we present in the following a revised and modified interpretation.

Charred wood

Identification of more than 2,000 charcoal fragments from nine spits of a single square at Péntènga 89/1 yielded around 50 taxa, of which the most common ones are shown in the diagram (Fig. 45). The diagram has been drawn with the computer program TILIA 2.0 b5 and TILIA *GRAPH 2.0 b5 (Grimm 1991). Taxa which could not be identified below family level, and indeterminate charcoal fragments are not shown.

The high number of taxa in each charcoal sample (between 16 and 32) makes it improbable that the presence of charred wood at the site is due to natural processes, i. e. bush fires and subsequent washing down into the shelter. Rather the charcoal assemblages seem to result from several "hearth events" which would allow a representative reconstruction of the vegetation directly surrounding the site where firewood was collected (Badal-Garcia 1992). Even though the number of identified fragments seems to be rather high for a profile of only 180 cm, the results should still be regarded as preliminary. In a species-rich environment like the Chaîne de Gobnangou, a sample size of 300–400 fragments is necessary to allow a representative reconstruction of the vegetation from which the wood was gathered (Neumann 1999a). Within smaller samples (spits 1–3, 4, 5, 8 and 15) rare

species are under-represented, leading to a distortion of the results. This shortcoming might be compensated by identification of a larger number of samples, if possible from all spits of the sequence. This work is in progress for Péntènga 89/1 and the results will be presented elsewhere.

The most important revision of identification concerns *Manilkara multinervis* and *Detarium senegalense* mentioned in our former papers (Neumann/Ballouche 1992; Ballouche *et al.* 1993). *Manilkara multinervis* belongs to the Sapotaceae family with several species whose wood anatomical separation is difficult. Checking with new reference material revealed some overlapping anatomical features in *Manilkara multinervis* and *Butyrospermum paradoxum* (the *shea* butter tree). Most probably the samples contain a mixture of both species which cannot be separated from each other so far. For *Detarium* the reference slides have shown that wood anatomical distinction between *D. senegalense* and *D. microcarpum* is impossible. Hence the charcoal fragments identified as *D. senegalense* rather come from *D. microcarpum* which is a common species in the modern savannas of the Chaîne de Gobnangou.

The identified taxa have been arranged into three phytogeographical units of Guinean, Sudanian and Sudano-Sahelian elements. Euphorbiaceae type 1 is tentatively attributed to the Guinean unit because it shows no similarities with any Sudanian Euphorbiaceae present in the reference collection. Among the Sudanian unit, three ecological groups are recognised according to their present affinity for different vegetation types: forest, forest/savanna and savanna (Aubréville 1950; Terrible 1984; Guinko 1984; Hahn-Hadjali 1998; Kéré 1998; Küppers 1996; Hovestadt 1997; Neumann/Müller-Haude 1999). In the Sudanian zone many forest species can also grow in savanna because they belong to the same floristic stock, and in some cases assignment of a species to a definite ecological group is not easy. Among the common taxa only *Allophylus* can be defined as a distinct forest plant and hence as an indicator for Sudanian dry forest (see Neumann/Müller-Haude 1999). *Prosopis africana* and *Anogeissus leiocarpus* are also cited among the forest species because they usually show a preference for dry forest even though sometimes appearing in savanna. For *Afrormosia laxiflora,* today absent from the Chaîne de Gobnangou flora (Küppers 1996), Aubréville (1950: 306) suggests that it was an important element of the formerly widely distributed Sudano-Guinean dry forests. Yet vegetation studies in Ivory Coast (Hovestadt 1997) have shown that today *Afrormosia* is a savanna rather than a forest species.

spits	cm below surface	^{14}C-dates	botanical unit
1–10	0–75	1,650–890 bp (145–1,250 cal AD)	A
11–14	75–105	4,825–2,580 bp (3,597–566 cal BC)	B
15–21	105–180	7,590–6,990 bp (6,600–5,445 cal BC)	C

Fig. 46. Botanical units at Péntènga 89/1.

Even though some of the dry forest species also can grow in gallery forest along rivers and ponds, as described by Küppers (1996), we do not assume that firewood was collected there, as appropriate habitats would have been too remote or inaccessible (for example in gorges). The dominance of aquatic fauna in the archaeozoological material of spits 15–21 suggests that semi-permanent waterbodies were present in a distance of a few kilometres from the site. But in contrast to fish and other aquatic resources which might have been transported over some distance, firewood is usually collected in the immediate vicinity of the site, especially when trees and shrubs are abundant.

In contrast to our former division of the sequence into two units, the present interpretation recognises three units (Fig. 46): (A) spits 1–10, from the surface to 75 cm; (B) spits 11–14, from 75 cm to 105 cm; (C) spits 15–21, from 105 to 180 cm). As perturbation of the sediments has affected the whole sequence, only significant changes of presence and quantity occurring simultaneously for several species in the units will be discussed.

In the lower unit C, especially in spits 17 and 21, the number of taxa is remarkably low in spite of the high amount of charcoal fragments examined. Dry forest species are well represented whereas among the savanna taxa only *Terminalia, Detarium* cf. *microcarpum* and *Hymenocardia acida* are continuously present. This indicates a landscape of little diversity and a correspondingly uniform vegetation in the vicinity of the site around 6,100 cal BC. Most probably dry forest with *Anogeissus leiocarpus, Allophylus, Prosopis africana, Pterocarpus* cf. *erinaceus* and *Manilkara/Butyrospermum* was growing on the deep sandy soils at the base of the slope whereas the slopes themselves were covered with savannas dominated by *Terminalia* and *Detarium microcarpum*. The dominance of *Terminalia*, increasing to 40% at the bottom of the profile, was probably caused by the former inhabitants collecting firewood from *Terminalia* bushes in the direct vicinity of the shelter.

In unit B a distinct change of the species composition can be observed. Differences in comparison to unit C are already visible in spit 15 and to a lesser extent in spit 17, probably due to perturbation. But it is only from spit 13 upwards that these changes become significant. There is a clearly remarkable increase of species number in the samples due to the appearance of some taxa which are absent in unit C: *Combretum micranthum*, *Combretum* type *molle/nigricans*, *Lonchocarpus laxiflorus* and others which are common constituents of the modern savannas in the Chaîne de Gobnangou. The increase in species number indicates that the landscape became more open and new microhabitats developed. The most significant changes did not occur in the forest whose floristic composition remained more or less stable, but in the savanna.

Development towards the modern savanna types started during this period around 3,600 cal BC or at some time before, but there is no doubt that dry forest continued to exist. High percentages of *Allophylus* in spits 11 and 13 indicate that dense woody formations still were present in the immediate vicinity of the site. But it seems that at least parts of the forest were transformed into savanna. The high percentages of *Combretum micranthum* in the uppermost spits are more likely to have been caused by the inhabitants than by its dominance in the vegetation. People simply collected the mass of firewood from the immediate surroundings of the shelter. Even today *Combretum micranthum* grows close to the site and a plant community with this species as the main constituent is mentioned by Küppers (1996: 92). Altogether three types of vegetation are represented by the charcoal samples from spit 13 upwards: dry forest, highly diversified savannas and a *Combretum micranthum* bush.

The species composition in unit A, above the stone layer and covering spits 1–8, is similar to unit B. Only a few of the common taxa disappear (e. g. *Afrormosia laxiflora* and Euphorbiaceae type 1), indicating a slight change in the species spectrum of the savanna probably due to continuous aridification processes. Those taxa which are present in unit B with only a few fragments and absent in unit A, might be underrepresented due to small sample size.

Vegetation change, palaeoclimate and human impact

After revision of the identifications and inclusion of the rarer species into the interpretation, we have to re-think the roles of forest and savanna for the Middle Holocene. In our 1992 paper (Neumann/Ballouche 1992), we followed Walter (1979) who considers dry forest to be the natural vegetation of the Sudanian zone which would only become transformed into savanna under heavy human impact. But in the Péntènga charcoal samples, savanna species such as *Hymenocardia acida* and *Terminalia* are present throughout the sequence. In 1992, we found it difficult to explain the presence of the Guinean forest tree *Detarium senegalense* which did not seem to fit into the general Sudanian character of the species spectrum. If the identified wood, as we now suggest, belongs to *Detarium microcarpum* which is a very common species in the modern vegetation of the

Chaîne de Gobnangou, savannas must have existed in the area from the Middle Holocene onwards. Similar results have been obtained in the Sudanian zone of Nigeria where a pollen profile from Lake Tilla shows the unexpected continuous presence of savannas throughout the Holocene (Salzmann 1999, 2000). The vegetation changes through time rather concern the quantitative relation between forest and savanna and the floristic composition of the savanna itself. In contrast to a pollen diagram which illustrates the regional vegetation, a charcoal assemblage from a single archaeological site only represents the local flora in the immediate vicinity. The present data do not allow to decide whether forests covered larger areas in the Chaîne de Gobnangou or only occurred as small islands comparable to the Lake Tilla region. However, the presence of *Afrormosia laxiflora* with its special ecological requirements (Terrible 1984) indicates a quite high density of the woody plant cover and weak to non-existing human impact around 6,100 BC.

For the Middle Holocene, several studies (e. g. Lézine 1989; Maley 1981; Schulz 1991; Neumann 1992; Salzmann/Waller 1998; Salzmann 1999, 2000) point to a moister climate than today in the west African savanna belt, and a general northward shift of southern floristic elements. In the Chaîne de Gobnangou, however, elements from more southerly regions have not been found so far. The only exception is probably the unidentified Euphobiaceae type 1 present in the lower part of the profile and absent in its upper part. The composition of the Sudanian forest in the Chaîne de Gobnangou, as represented by taxa like *Allophylus, Anogeissus leiocarpus, Prosopis africana, Pterocarpus* cf. *erinaceus* and *Manilkara/Butyrospermum*, remained more or less stable throughout seven millennia. The species composition of the ancient forest formation remarkably parallels that of modern relict dry forests in the Sudanian zone of Burkina Faso under an annual precipitation of 900–1,200 mm (Hahn-Hadjali 1998; Kéré 1998; Neumann/Müller-Haude 1999) which would be comparable with the actual climate in the Chaîne de Gobnangou. Obviously the increase in precipitation was not sufficient to allow the immigration of southern species.

With the onset of dryer conditions towards the end of the Middle Holocene, detectable in many palaeoecological data sets (Hassan 1997), Sahelian elements started to immigrate from the north into the Sudanian zone. In the pollen diagram of Lake Tilla (Nigeria), Sahelian taxa appear after 2,500 cal BC (Salzmann 1999, 2000). At Péntènga 89/1 there is evidence for aridification from 3,600 cal BC onwards, mainly indicated by the appearance of *Combretum micranthum* and other Sudano-Sahelian elements. Human impact might also have been responsible for some vegetation changes, but there is no unequivocal evidence. *Lonchocarpus laxiflorus* is very resistant to fire, and we conclude that increased fire frequency contributed to the diversification of the savanna. The forest must also have been affected by fire, as some of the *Allophylus* fragments show traumatic rings typically produced in the wood after damage by fire. Yet it is difficult to decide if these fires were anthropogenic or simply resulted from an increase of the grass biomass taking advantage of the drier conditions at the expense of woody plants.

Even though there is a close floristic relation between the savanna taxa in the charcoal samples and the modern savannas of the Chaîne de Gobnangou, the vegetation changes from 6,100 cal BC up to modern times have been considerable. The dry forest which existed at least up to 1,100 cal AD, has completely vanished from the area today. Some of the dry forest species such as *Manilkara multinervis* and *Allophylus africanus*, still grow in relict riverine and gallery forests (Küppers 1996: 97 ff.), but these are only found at some distance from the site. The modern savanna on the slopes and on the foot of the escarpment as described by Küppers (1996: 77 ff.), shows striking similarities with the inventory of the forest/savanna and the savanna groups from spit 13 upwards, with the exception of a few species such as *Burkea africana, Afzelia africana* and *Daniella oliveri*, quite common today but missing in the charcoal samples. However, as the charcoal assemblage

Fig. 47. Fruits and seeds at Péntènga 89/1.

spits	4	5	6	7	8	9	10	11	12	13	15
Ziziphus cf. *mauritiana*	●	●	.	●	●	●	●	.	.	.	.
Balanites aegyptiaca	●	.	.	.	.	.	.	.	.	.	.
cf. *Adansonia digitata*	●	●	.	●	●	.	.	.	●	.	.
Gardenia sp.	●	.	●	●	●	.	●	●	.	.	.
Tamarindus indica	●	●	●	.	.	.	.	.	.	.	.
Lannea microcarpa	●	●	●	.	.	●	.	●	.	●	.
Ficus sp.	●	.	.	.	.	.	.	.	.	.	.
Combretum sp.	●	●	.	●	●	.	●	●	.	.	.
Vitex sp.	●	.	.	●	.	.	.	cf.	.	.	.
Strychnos spinosa	.	●	.	.	.	.	.	.	.	.	.
Diospyros mespiliformis	●	●	●	●	●	.	.	.	●	.	.
Ziziphus cf. *abyssinica*	.	.	.	.	.	●	.	●	.	.	.
Parkia biglobosa	.	.	.	.	●	●	.	.	.	●	.
cf. *Hibiscus* sp.	●	.	.	.	.	.	.	.	.	.	.
Sclerocarya birrea	●	●	●	●	.	●	●	●	.	●	.
Detarium microcarpum	.	.	.	.	.	.	.	.	.	●	●

only represents the very local vegetation, it cannot be concluded that they were generally absent in the Chaîne de Gobnangou.

One of the most distinct changes concerns the development of anthropogenic plant communities under the influence of agriculture and pastoralism. The absence of *Combretum glutinosum* in the uppermost spits is remarkable, as today this species is one of the most abundant woody plants in the Chaîne de Gobnangou and its foreland, especially on fallows. *Combretum glutinosum* furnishes good firewood (Neumann 1999a), so its absence in the charcoal samples can be related to its rarity in the former vegetation. Other plants that would point to agriculture or fallow lands such as *Guiera senegalensis*, *Annona senegalensis* or *Piliostigma* spp. (see Hahn-Hadjali 1998) are equally absent. This may be explained by assuming that firewood was collected from the hillsides close to the shelter where cultivation is not possible. But if firewood was gathered from the *acrisols* at the base of the slope, no fields and fallow lands could have been present there. This would mean that the agricultural landscape in the neighbourhood of the site only developed after 1,100 cal AD.

Fruits and seeds

Non-carbonised seeds and fruits of 16 taxa were identified down to a depth of 100 cm, crossing the barrier of the stone layer (Fig. 47). They come mostly from species with edible fruits still collected today in the forelands of the Chaîne de Gobnangou and partly sold on the markets. Among these *Tamarindus indica*, *Lannea microcarpa*, *Parkia biglobosa* and *Adansonia digitata* are interesting. They are appreciated fruit-trees excluded from clearing and left on the fields. However, there is no need to interpret the seeds and fruits exclusively as human food waste. Some of the fruits show gnaw marks from rodents, indicating that at least a part of them could have been brought into the site by animals. Uncharred fruits and seeds have also been found on the surface of the site. This suggests a mixture of recent seeds and fruits with the fossil charcoal samples by bioturbation favoured by the dusty and extremely loose sediment. The suggestion is enhanced by a fruitstone of *Lannea microcarpa* found at a depth of 80 cm that gave a recent ^{14}C-date. However, we cannot exclude that some of the uncharred

seeds and fruits are older[3], as associated charcoal from the same species also occurs in the samples (e. g. *Diospyros* cf. *mespiliformis*, *Lannea/Sclerocarya*, cf. *Adansonia digitata*, *Tamarindus* type, *Parkia* type), indicating that these species were growing nearby. Species such as *Ziziphus* cf. *mauritiana* and *Balanites aegyptiaca* obviously arrived in the Chaîne de Gobnangou only recently, as they are absent in the charcoal samples.

The mosaic of forest and savanna which existed around the site for seven millennia, offered rich environmental resources for its inhabitants. In the 7th millennium cal BC, food procurement concentrated on freshwater habitats (see archaeozoological contribution by Van Neer), firewood was collected from a limited number of tree species, and there is no evidence for collecting of fruits. It seems that exploitation of plants and animals became more diversified during the Late Holocene.

Evidence for the use of edible tree fruits from at least 2,000 cal BC onwards has been reported from several sites in the West African savanna, e. g. Karkarichinkat/Mali (Smith 1974), Ti-n-Akof/Burkina Faso (Vogelsang/Albert/Kahlheber 1999), Kintampo/Ghana (Stahl 1993) and others. The charcoal data indicate that fruit bearing trees such as *Diospyros mespiliformis*, *Lannea microcarpa*, *Sclerocarya birrea* and *Tamarindus indica* were present in the immediate vicinity from at least 800 cal BC onwards, and in spite of the doubtful age of the uncharred fruit remains, it is highly probable that they contributed to the prehistoric diet.

K.N.

[3] Non-carbonised botanical macro-remains need not necessarily be recent. Samples from a site in Namibia have shown surprising results: 20 cm below surface, beneath a potsherd, many non-carbonised corn husks of *Lapeirousia* sp. were found and dated to 1,252 ± 36 bp (UtC-5945) resp. 697–819 cal AD. Charcoal sticking to the outside of the overlaying potsherd was dated to 1,194 ± 32 bp (UtC-5943) resp. 791–893 cal AD. At the same site non-carbonised fruit stones of *Scelerocarya birrea* ssp. *caffra*, the marula-plum, found at 15 cm depth, date from 1,178 ± 32 BP (UtC-5586) resp. 811–939 cal AD (Barbara Eichhorn, SFB 389, University of Cologne, pers. comm.).

5. Archaeozoology

The excavations at Péntènga 89/1 yielded abundant faunal remains but due to the high degree of fragmentation the proportion of identifiable remains is rather low. The vertical distribution of the identified material is given in Fig. 48. The fieldwork carried out in Burkina Faso has thus far yielded very few faunal remains as a result of the poor chances for preservation of such organic material in open air sites. Rockshelters like Péntènga 89/1 are more favourable for faunal preservation but the disadvantage of such deposits is their polygenetic character (Brain 1981). The nature of the finds and the analysis of the traces show that several taphonomic agents other than man have contributed to the faunal assemblage of the site. The faunal remains from Péntènga 89/1 have been deposited mainly by human inhabitants but evidence is available that also jackal, leopard, hyena and raptory birds have contributed. In addition, it appears that certain animals died naturally in the rock shelter. To the latter category belong the terrestrial molluscs, the frogs or toads, and part of the small rodents. The fact that the small rodents are not exclusively deposited as pellets of raptory birds is shown by at least three more or less complete individuals, one of which was completely mummified. Small burrowing rodents living at the site may have been responsible for bioturbation of the sediment. The frog or toad remains probably represent individuals that buried themselves into the sediment with the onset of the dry season but which did not survive this period. The remains of small lizards, of a small snake and the small passeriform birds may also represent animals that died naturally in the rock shelter. However, given the wide variety of species exploited by the human inhabitants of the site it is not excluded that some of the aforementioned species served occasionally as food. Several carnivores, especially hyenas, are known to deposit skeletal remains in caves and rock shelters. Evidence for the presence of carnivores is available in the form of bone finds, gnaw marks and coprolithes. A few canid bones were found but due

spits	2	3	4	5	6	7	8	9	10	11	12	13	14	Σ spits 2 to 14	15	16	17	18	19	20	Σ spits 15 to 20
FRESHWATER MOLLUSCS																					
Lanistes varicus	.	.	.	1	.	.	1	.	.	2	3	5	5	17	10	16	37	4	.	.	67
Aspatharia dahomeyensis	.	.	.	.	.	.	.	.	.	.	1	3	1	5	2	2	5	2	.	.	11
TERRESTRIAL MOLLUSCS																					
large gastropod (*Limicolaria* sp.)	.	.	1	1	.	1	2	1	.	2	3	1	3	15	11	1	5	1	.	.	18
mediumsized gastropod	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	1	.	.	1
small gastropod	.	.	.	.	.	.	.	.	.	.	.	1	1	2	1	.	.	.	.	.	1
FISH																					
lungfish (*Protopterus* sp.)	.	.	.	.	.	.	1	.	.	.	.	1	1	3	5	3	4	3	3	8	26
Polypterus sp.	.	.	.	.	.	.	.	.	.	2	.	.	.	2	.	1	.	1	.	1	3
Gymnarchus niloticus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1
catfish 1 (*Clarias* sp.)	.	.	1	.	.	.	.	.	1	.	.	4	3	9	11	9	2	1	3	5	31
catfish 2 (*Synodontis* sp.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	2
tilapia (Tilapiini)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1
AMPHIBIANS																					
frog/toad (Anura)	.	.	.	.	.	.	.	.	.	.	1	2	2	5	7	12	.	1	.	1	21
REPTILES																					
monitor lizard (*Varanus* sp.)	.	.	.	.	.	.	.	.	.	2	.	.	.	2	.	1	.	2	1	3	7
small lizard	.	.	.	.	.	.	1	.	.	1	.	.	.	2	2	.	2	.	.	2	6
crocodile (Crocodylidae)	.	.	.	.	.	.	.	.	.	.	.	2	2	4	1	1	.	3	.	.	5
terrapin (*Pelusios* sp.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	1	.	3
unidentified turtle	.	.	3	.	.	.	1	.	.	.	1	4	.	9	2	9	3	.	3	8	25
python (*Python* sp.)	.	.	.	.	.	2	1	.	.	2	.	.	.	5	8	7	2	3	2	2	24
unidentified snake	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1
BIRDS																					
small Passeriformes	.	.	.	.	.	.	1	1	.	.	.	.	.	2	1	.	.	.	.	.	1
WILD MAMMALS																					
gerbil (*Gerbillus* sp.)	.	.	2	.	1	1	1	.	1	3	.	.	.	9	.	.	.	.	.	.	.
taterine gerbil (*Tatera* sp.)	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
spiny mouse (*Acomys cahirinus*)	.	.	.	.	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.
small rodent	.	.	.	.	1	1	.	1	2	5	.	1	.	11	.	2	1	.	.	.	3
cane rat (*Thryonomys swinderianus*)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	.	.	1	4
giant rat (*Cricetomys gambianus*)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	2	4
leopard (*Panthera pardus*)	.	.	.	.	.	1C	.	.	.	.	.	.	.	1C	.	.	.	.	.	.	.
jackal (*Canis* sp.)	.	.	1C	1C	1C	1C	1C	.	.	.	.	1C	.	6C	.	.	.	.	.	.	.
unidentified hyena	.	.	.	2C	.	.	.	.	.	.	.	1C	.	3C	.	.	.	.	.	.	.
rock dassie (*Procavia capensis*)	.	.	.	.	.	.	.	.	.	.	.	2	3	5	1	.	.	.	.	1	2
warthog (*Phacochoerus aethiopicus*)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	2
oribi (*Ourebia ourebi*)	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	.	.	.	.	.	1
kob (*Kobus kob*)	.	.	.	.	.	1	.	.	1	.	.	.	.	2	.	.	.	.	.	.	.
hartebeest (Alcelaphini)	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.	1	1	.	2
small bovid (oribi size)	.	.	1	.	.	.	.	.	.	3	.	4	3	11	3	2	1	1	.	2	9
mediumsized bovid (kob size)	1	.	.	1	.	.	.	.	.	4	1	.	.	7	.	1	.	.	.	.	1
large bovid (hartebeest size)	.	1	.	.	.	.	.	.	.	.	.	1	1	3	2	.	.	.	1	.	3
DOMESTIC OR WILD MAMMALS																					
dog or jackal (*Canis* sp.)	.	.	1	.	.	.	.	.	.	1	.	.	1	3	.	.	.	.	.	1	1
total identified	1	1	9	3	3	6	9	3	6	28	10	32	27	138	71	71	67	24	15	39	287

Fig. 48. Number of identified animal specimens at Péntènga 89/1 (C = coprolithe).

to their limited diagnostic character it was impossible to attribute them with certainty to jackal or domestic dog. It is more likely that they represent a jackal species since no other domestic species were found and because some of the canid coprolithes contain insects known to form part of their diet (Smithers 1983: 422). Three large coprolithes can be safely attributed

spits	1–14	15–21
animal taxa		
freshwater molluscs	15.9	27.2
fish	10.1	22.4
amphibians	3.6	7.3
aquatic reptiles	9.4	11.4
total aquatic	39.1	68.3
terrestrial molluscs	13.0	6.9
terrestrial reptiles	6.5	13.2
birds and mammals	41.4	11.6
total terrestrial	60.9	31.7

Fig. 49. Percentage distribution of aquatic and terrestrial animals at Péntènga 89/1.

to hyena on the basis of shape and size, whereas at least one fossilized dropping is from leopard. This leopard coprolithe contains bone remains of dassies *(Procavia capensis)* which is the favourite prey of this species in rocky environments (Stuart/Stuart 1993). The few loose bone finds of dassie in the site are considered as human food waste although it is not excluded that some of them come from coprolithes of which the matrix has disappeared over time. Alternatively, these dassie bones may also represent the remains of animals that died naturally in the rock shelter. Gnaw marks of carnivores have been found in a few instances only indicating that their contribution to the total fauna was limited. In shelters inhabited by hyenas up to 80% of the remains show traces of gnawing (Maguire *et al.* 1980). No evidence was available at Péntènga 89/1 that porcupine would have contributed to the bone assemblage. This species is also a reputed bone collector in caves but, again, their deposits also show a high incidence of gnawed material (Maguire *et al.* 1980).

The faunal remains can be used for an environmental reconstruction although, as usual with vertebrate and molluscan material, the precision is less than with botanical remains. The sample sizes per spit are very limited making it necessary to lump the material in larger units. It was decided to divide the material in an upper and a lower unit. If the stone layer at 75 cm (spits 10/11) is taken as a boundary, the sample size of the upper unit is very low (only 41 identified specimens). However, when the boundary is taken at 105 cm (spits 14/15), as was done for the botanical samples, the number of identifiable remains increases significantly. This approach, moreover, allows a better comparison of the archaeobotanical and archaeozoological results. The analysis of the plant remains suggests for the lower unit a Sudanian dry forest which is in agreement with the more humid climate demonstrated around the 7th millennium cal BC by former palaeoclimatological research. The archaeobotanical analysis also demonstrates aridification between the 1st millennium cal BC and the 1st millennium cal AD, resulting in a change of the vegetation from dry forest to savanna. The drier conditions indicated by the plant remains are not clearly reflected in the terrestrial fauna, probably because of small sample size and because the represented species have a broad ecological tolerance. The exclusive occurrence of *Gerbillus*, *Tatera* and *Acomys* in the upper unit may be significant but since no small rodents are preserved in the lower unit this cannot be verified. However, the proportion of aquatic animals differs significantly between the upper and lower unit (Fig. 49) and is in accordance with the postulated aridification of the region.

The overall decrease of aquatic animals is not accompanied by a significant change in the species spectrum. The ichthyofauna in both assemblages is predominated by the lungfish *Protopterus* and the catfish *Clarias*, showing that shallow water habitats were available near the rockshelter throughout its occupation. The mochocid catfish *Synodontis* is the only indicator of permanent and rather deep water. It was found exclusively in the oldest layers where it is represented by two bones. Given the rarity of these finds in the lower unit and the small size of the fish bone sample in the upper unit it is not sure this difference is significant. Similar remarks are valid for the exclusive occurrence in the lower unit of *Gymnarchus niloticus*, a large eel-like fish that prefers marshy environments with abundant aquatic vegetation. Today, permanent open water is available at a distance

spits	1–14	15–21
activities		
collecting of freshwater molluscs	25.6	33.3
fishing	16.3	27.4
capturing of aquatic reptiles	15.1	14.1
hunting and snaring	43.0	25.2
Sample size	86	234

Fig. 50. Percentage contribution of food procurement strategies calculated on the basis of the number of identified specimens at Péntènga 89/1.

of several kilometres. During the rainy season, however, large areas of flat country closer to the site are covered by floodwaters. It is likely that during the more humid phase, corresponding to the lower excavation unit, shallow waters were available closer to the site than today. All the species recorded in the samples can still be found in the area today, but the large mammals have become less common due to human disturbance, overhunting and habitat destruction.

The animal remains deposited by anthropic activities inform us about the food procurement strategies practised during the two phases (Fig. 50). As could be expected from the foregoing palaeoecological reconstruction, the exploitation of freshwater habitats was more pronounced in the oldest phase. Collecting of freshwater molluscs and fishing were more intensively practised whereas hunting and snaring were less frequently carried out. The capturing of aquatic reptiles (crocodile and turtles) remained of similar importance in both periods. The figures given in Fig. 50 reflect the frequency with which the different food procurement strategies were carried out. In terms of meat yield, however, the antelopes and warthog were the major resources. It is striking that in both units a wide variety of taxa was exploited. The difference in number – 13 in the upper, 19 in the lower unit – is probably related to the smaller sample size of the upper assemblage. Domestic animals were not found. This is in agreement with the archaeobotanical analyses which point to a late introduction of domestic plants and cattle-breeding, after 1,000 cal AD.

W.v.N.

6. Conclusion

The sites introduced here have been studied in detail by different disciplines and different methods. They throw light on the prehistory of an area archaeologically unknown before.

Péntènga provides the most extensive Holocene sequence with a rich microlithic industry and numerous of well-studied ecofacts. Especially, the environmental considerations by K. Neumann are of particular importance for the reconstruction of the history of the savanna and might serve as reference far beyond the Chaîne de Gobnangou. The interpretation of the stratigraphy of Péntènga was a methodological challenge as the association of potsherds and more than 8,000 years old charcoal appeared incompatible. Th. Frank has proposed models to reconstruct the genesis of the site (chapter 3.3.3) and explain the sedimentological inconsistency. In the meantime, a similar age for pottery has been claimed for the Malien site of Oundjougou (Huysecom 1996: 66; Huysecom, Mayor/Robert 1998: 199). But in the case of Péntènga our reservation against such an early date for pottery in the West African savanna has been justified by a detailed study based on an extensive set of thermoluminescence dates (Wotzka/Goedicke, this volume). One might draw the conclusion to be careful with assertions of serious consequences, because charcoal not necessarily has the same age as associated archaeological finds.

Despite its problematic stratigraphy Péntènga is an important site as it is among the rare evidence for the pre-ceramic early and mid-Holocene peopling of West Africa (summary see MacDonald 1998). The nearest site for a comparison with Péntènga is the Abri Vialettes in the North of Togo, which has deposits very rich in stone artefacts dated to about 3,000–1,000 cal BC (Eiwanger/Kuevi 1992; Eiwanger 1999). Unfortunately the organic preservation seems to be poor which prevents an economic and environmental comparison of both sites, in particular how far the evidence of food production differs or not.

While the Maadaga Rockshelter (chapter 3.1) is of significance regarding its stratified Middle Stone Age layer, Kidikanbou (chapter 3.2) remains somewhat marginal because of its indeterminable age. The fact that even hundreds of formal tools are not sufficient to assign the inventory into a typological sequence reflects a crisis in West African Stone Age archaeology. Typology is out of fashion. As a result we cannot distinguish stone assemblages of the 3rd millennium BC from those of the 9th millennium BC without radiocarbon dating. Pottery makes no exception. Already in 1988 Susan and Roderick McIntosh have complained about our "fear of or inability to do pottery analysis and description", which causes a "pan-West African malaise that threatens our ability to say anything meaningful about change through time or interaction across space" (McIntosh/McIntosh 1988: 90). Not much has changed in the meantime. But the definition of pottery groups by H.-P. Wotzka (chapter 3.3.2, Wotzka/Goedicke, this volume) demonstrates that even small inventories from problematic contexts provide a useful subdivision, which forms a sensible base for further considerations.

The research we have carried out in the Chaîne de Gobnangou failed to accomplish a central item of the original programme. Up to now we do not know precisely when and how the shift from hunters and gatherers to farmers and pastoralists took place in the region. Seen in a West African context there is plenty of evidence that the new economy commenced in the 2nd millennium BC. Especially in the Sahel zone the introduction of plant cultivation and domesticated animals is well documented for this period (Amblard/Pernès 1989; Amblard 1996; Breunig, Neumann/Van Neer 1996; Breunig/Neumann, in press; Holl 1985; MacDonald/MacDonald 2000; Munson 1971; 1976; Neumann 1999b). The Kintampo Culture in Ghana demonstrates the simultaneous occurrence of similar changes in more humid regions further south (Anquandah 1993; Carter/Flight 1972; Davies 1962; Flight 1980; Stahl 1985; 1986). Apparently the Chaîne de Gobnangou did not belong to these regions affected by economic innovations at the end of the Later Stone Age. Referring to botanical determinations of plant remains from Péntènga, K. Neumann concluded that "the agricultural landscape in the neighbourhood of the site developed after 1,100 cal AD" (chapter 4). If Péntènga reflects the general situation in the area, we may claim that farming was not practised in the Chaîne de Gobnangou until late Iron Age times. W. Van Neer's study of the faunal remains from the same site (chapter 5) seems to support the hypothesis of the late introduction of food producing economy in the region. Bones of domesticated animals are absent.

These are hard facts which cannot be denied. Although there is no reason to assume that the whole of West Africa was affected by economic changes as found in the Sahel or in Ghana, it is hard to believe that the Chaîne de Gobnangou was excluded completely from these developments for more than two millennia until 1,100 AD. From the archaeological viewpoint an alternative explanation can be formulated for the lack of cultivated crops and domesticated stock. As shown by many investigations all over West Africa and beyond, rockshelters usually do not have these remains, because neither farmers nor pastoralists do live in such places regularly. But where did they live? We have surveyed the whole area so extensively that former settlements of sedentary farming communities cannot have been overlooked. Herders' sites are generally hard to identify as long as the pastoralists' mobility is high. If the late introduction of food production is not confirmed by further studies, it seems more reasonable that the Chaîne de Gobnangou was among those areas, where pastoralism is absent or invisible and cultivation appeared on a low level similar to the situation in the North of Burkina Faso (Neumann/Breunig/Kahlheber 2000). While in the Sahel at least some botanical remains can be found in the sandy soils of open-air sites, the soils of the Gourma area were less favourable for the preservation of organic materials. The sensitive traces of incipient small-scale farming activities simply might have gone

lost. They might exist in small sites with rather low densities of stone artefacts and some potsherds found all over the area. Similar sites have been studied in the Sahel zone of Burkina Faso (Kühltrunk 2000; Vogelsang 2000). Without the rare finds of carbonised millet seeds these sites had to be classified as hunters and gatherers camps.

Today, after a decade of experience with archaeological evidence in the West African savanna and detailed analysis of recovered archaeological materials one might conclude that the Gourma area was not the best choice to decipher the beginning of food production. In this respect studies carried out later in other areas, like the mentioned Sahelian North of Burkina Faso or the Chad Basin of Nigeria, have proved to be much more productive (Breunig/Neumann 1999). Cave sites and rockshelters are no suitable places for food producing communities. The rare occasions, when those people did hide there for certain reasons, are no solid base for characterising fundamental changes in prehistory. But a well known fact in archaeological fieldwork has been confirmed: the harder you look the more you find, although you may not find what you are looking for. The evidence we found and present here provide a first insight into the prehistory of the region and will serve to compare data from periods extremely rare in a West African context.

How to go on in the Chaîne de Gobnangou? Concerning early and mid-Holocene or even Middle Stone Age stratigraphies the region surely bears more suitable rockshelters. Péntènga and Maadaga are very promising in this respect. Many more similar sites can be expected, as our surveys only covered the eastern part of the escarpment and even here did not include all potential areas. However, further investigations into the beginning of food production appear less predictable. The attempt to discover traces of farmers or herders in rockshelters is like an archaeology of exceptions and might be a waste of time and efforts. To a certain extent this is also valid for open-air sites. It is rather sure that the Chaîne de Gobnangou and its foreland have no settlement mounds or large flat sites dated to the transition period from hunting and gathering to food production. Even Iron Age sites are small and apparently do not show any signs of mound formation. If the hypothesis of incipient small-scale farming is correct, the affiliated sites all might have been destroyed except for their less informative inorganic components.

P.B.

Addresses:

Prof. Dr. Peter Breunig
Johann Wolfgang Goethe-Universität
Seminar für Vor- und Frühgeschichte
Archäologie und Archäobotanik Afrikas
Grüneburgplatz 1
D–60323 Frankfurt am Main
breunig@em.uni-frankfurt.de

Dr. Thomas Frank
Klespe 2
D–51789 Lindlar
th.frank@uni-koeln.de

Dr. Peter Müller-Haude
Stresemannstr. 14
D–61462 Königstein
pmh@webdirekt.de

Dr. Katharina Neumann
Johann Wolfgang Goethe-Universität
Seminar für Vor- und Frühgeschichte
Archäologie und Archäobotanik Afrikas
Grüneburgplatz 1
D–60323 Frankfurt am Main
k.neumann@em.uni-frankfurt.de

Dr. Wim Van Neer
IUAP P4/12
Royal Museum of Central Africa
B–3080 Tervuren
vanneer@africamuseum.be

Dr. Ralf Vogelsang
Heinrich-Barth-Institut
Jennerstr. 8
D–50823 Köln
R.Vogelsang@uni-koeln.de

Dr. Hans-Peter Wotzka
Johann Wolfgang Goethe-Universität
Seminar für Vor- und Frühgeschichte
Grüneburgplatz 1
D–60323 Frankfurt am Main
wotzka@em.uni-frankfurt.de

Zusammenfassung

Die *Chaîne de Gobnangou* im Südosten von Burkina Faso: archäologische, archäobotanische, archäozoologische und geomorphologische Studien

Der vorliegende Beitrag faßt die archäologischen, archäobotanischen, archäozoologischen und geographischen Arbeiten zusammen, die der Sonderforschungsbereich 268 (Kulturentwicklung und Sprachgeschichte im Naturraum der westafrikanischen Savanne) mit Unterstützung der Deutschen Forschungsgemeinschaft (DFG) und der J. W. Goethe-Universität Frankfurt/Main zwischen 1988 und 1991 in der Chaîne de Gobnangou (Südosten von Burkina Faso) durchführte. Ziel der interdisziplinären Feldarbeit war es, Etappen der holozänen Kulturentwicklung und den wechselseitigen Einfluß der Umwelt zu erfassen. Der Schwerpunkt lag hierbei auf dem Beginn der nahrungsproduzierenden Wirtschaftsweise.

Die Chaîne de Gobangou ist ein in SW-NE Richtung verlaufender Sandsteinkomplex. Er ist etwa 100 km lang und erhebt sich ca. 100 m über die umgebenden Ebenen (Fig. 1 und 2). Nach den Niederschlagsmengen, der Temperatur und den saisonalen Schwankungen ist die Region vom Savannenklima geprägt (Fig. 3) und gehört aus Sicht der Vegetation zur nördlichen Sudan-Zone. Im Quartär führten Lösungsprozesse am Sandsteins der Chaîne de Gobnangou zur Ausbildung von Felsdächern. Die archäologischen Ablagerungen in zwei solcher Felsdächer (Maadaga und Péntènga) sind Gegenstand der vorliegenden Untersuchungen. Eine Freilandfundstelle (Kidikanbou) wurde in unmittelbarer Nähe des Steilrandes der Chaîne de Gobnangou entdeckt und ausgegraben. Neben diesen Fundstellen wurden viele andere archäologische Plätze im Rahmen von Prospektionen im weitläufigen Umland der *falaise* erfaßt und vereinzelt durch Testgrabungen untersucht. In den meisten Fällen handelte es sich um kleine Fundkonzentrationen an der Oberfläche, deren Ausgrabung nur wenig zum vorgesehenen Programm beizutragen versprach.

Die umfangreichste archäologische Sequenz wurde im Felsdach von Maadaga (Fig. 6) am Südrand der *falaise* angetroffen. Von besonderer Bedeutung sind hier Schichten mit Steinartefakten aus dem „Middle Stone Age" (Schicht 5 in Fig. 8, Funde siehe Fig. 10), weil stratifizierte *Middle Stone Age*-Inventare in West Afrika bislang nur in ganz wenigen Fällen bekannt sind. Das Holozän war auf die dünne und offenbar völlig durchmischte Deckschicht beschränkt. Deshalb erwies sich Maadaga als weniger relevant für die eigentlichen Ziele des Projektes.

Die zweite behandelte Fundstelle ist Kidikanbou. Der Platz liegt in der Nähe von Maadaga, etwa 300 m vom Rand der *falaise* entfernt (Fig. 12). Kidikanbou wurde entdeckt durch eine dichte Oberflächenkonzentration an Steinartefakten, unter denen Mikrolithen die nahezu einzige Geräteform sind. Die Stratigraphie sowie die Zusammensetzung des Fundstoffs und seine räumliche Verteilung lassen annehmen, daß es sich um einen durch Erosion leicht verlagerten Platz handelt, an dem wahrscheinlich Jagdausrüstung hergestellt und ausgebessert wurde. Dafür sprechen die geringe Variation der gefunden Mikrospitzen und eine große Menge zerbrochener Mikrolithen (Fig. 18). Organisches Material hat sich nicht erhalten. Aus dem Grund wissen wir auch nicht, wie alt die Stelle ist. Die deutlich ausgeprägte jägerische Komponente könnte auf einen vor-keramischen und vor Einführung der produzierenden Wirtschaftsweise liegenden Abschnitt des *Later Stone Age* hindeuten.

Die wichtigste Fundstelle ist Péntènga. Sie liegt am nördlichen Rand der Chaîne de Gobnangou und besteht aus einem Abri, das ein mächtiger, vermutlich vom Rand der Chaîne abgebrochener und talwärts gerutschter Felsblock bildet (Fig. 22). Ausgrabungen deckten eine 1,90 m mächtige und nahezu völlig homogene Sedimentabfolge auf. Der geborgene Fundstoff besteht aus Keramik, einer von Mikrolithen dominierten Steingerät-Industrie sowie Pflanzen- und Faunenreste. Die einzige sedimentologische Unterteilung bildet eine Steinlage, die zwischen dem 1. Jahrtausend cal BC und der Mitte des 1. Jahrtausend cal AD entstanden sein muß. Nach ^{14}C-Datierungen beginnt die Sequenz in der Mitte des 7. Jahrtausends cal BC und endet im 11.–13. Jahrhundert cal AD (Fig. 23). Allerdings gibt es Sprünge, die annehmen lassen, daß der Zeitraum nicht vollständig in den Abfolge vertreten ist. Die Entstehung des Abris und seiner Kulturschichten ist nicht eindeutig zu klären. Es kommen zwei Modelle in Frage (Fig. 44).

Keramik tritt in nahezu allen Niveaus auf und wurde anhand der Form, Verzierung und Technik in verschiedene Gruppen eingeteilt (Fig. 37–41). Eine umfangreiche Serie an Thermolumineszenz-Datierungen hat gezeigt, daß die Keramik teilweise erheblich jünger als die vergesellschaftete Holzkohle ist (siehe Wotzka/Goedicke, in diesem Band). Dies deutet auf beträchtliche Durchmischungen hin, von denen auch das Steinartefakt-Inventar betroffen sein kann. Unter den Steingeräten dominieren mikrolithische Formen (Fig. 28 und 32). Daneben gibt es verschiedene nicht-mikrolithische Geräte (Fig. 34 und 35).

2000 identifizierte Fragmente und 50 Taxa aus den reichen Holzkohlefunden von Péntènga illustrieren die Entwicklung der Vegetation im mittleren und späten Holozän. Das Holzkohleprofil wird in drei Einheiten A, B und C eingeteilt, die mit Daten um 1000 cal AD, 800 cal BC und 6000 cal BC korreliert sind (Fig. 45 und 46). Um 6000 cal BC wuchsen in der Nähe des Abris Trockenwälder und Savannen. Flächendeckende Wälder konnten für diese Zeit nicht nachgewiesen werden, auch wanderten kaum anspruchsvolle Arten aus feuchteren südlichen Klimazonen ein. Im ersten Jahrtausend cal BC änderte sich das Artenspektrum der Savannen durch Einwanderung von nördlichen, trockenheitsresistenteren Arten wie etwa *Combretum micranthum*, und es entstanden Savannen, die mit den heutigen in der Chaîne de Gobnangou vergleichbar sind. Dies könnte sowohl mit einem trockeneren Klima als auch mit menschlichem Einfluß zusammenhängen. In den Holzkohleproben fanden sich aber keine typischen Brache- und Beweidungszeiger, woraus man ableiten kann, daß die durch intensiven Bodenbau geprägte Kulturlandschaft im Bereich der Chaîne de Gobnangou erst nach 1000 cal AD

entstanden ist. Trockenwälder, die im gesamten Profil gut vertreten sind, wachsen heute in der Region nicht mehr. Neben den Holzkohlen wurden z. T. unverkohlte Früchte und Samen gefunden, zum großen Teil von eßbaren Arten, wie z. B. *Lannea microcarpa* oder *Diospyros mespiliformis*, die aber auch rezente Beimischungen sein können.

Die Anzahl der Faunenreste ist groß, wegen der starken Fragmentierung läßt sich aber nur ein kleiner Teil bestimmen. Das vertretene Artenspektrum (Fig. 48) gibt Hinweise auf Umweltverhältnisse und erlaubt die Rekonstruktion der Wirtschaftsweise. Haustiere fehlen vollständig – bis auf nicht sicher bestimmbare Belege des Hundes. Dies unterstützt die von archäobotanischer Seite geschlossene Ansicht, daß Nahrungsproduktion sehr spät, vermutlich erst um 1000 cal AD, aufkam. Allerdings mag dies damit zusammenhängen, daß Felsdächer kein regulärer Aufenthaltsort für Pastoralisten und Bauern sind. Da sich in der Chaîne de Gobnangou die Felsdächer als einzig zuverlässiger Ort datierbarer Stratigraphien erwiesen haben, dürfte auch zukünftig wenig Aussicht bestehen, den Übergang von Jägern und Sammlern zu nahrungsproduzierenden Gemeinschaften in dieser Region klar zu fassen. Wir sehen den Wert der hier vorgelegten Studien deshalb eher in dem Beitrag, die Geschichte der Umwelt und der prähistorischen Besiedlung einer bislang unerforschten Gegend der westafrikanischen Savanne erstmals in Umrissen erfaßt zu haben.

P.B./K.N.

Résumé

La *Chaîne de Gobnangou* dans le sud-est du Burkina Faso: études archéologiques, archéobotaniques, archéozoologiques et géomorphologiques

La présente contribution résume les travaux archéologiques, archéobotaniques, archéozoologiques et géographiques menés par le S.F.B. 268, avec le soutien de la Deutsche Forschungsgemeinschaft et de l'Université J. W. Goethe de Francfort/Main, entre 1988 et 1991, dans la Chaîne de Gobnangou (S.E. du Burkina Faso). L'objectif de ces recherches interdisciplinaires était de comprendre les différentes étapes de l'évolution holocène des cultures et ses interactions avec le milieu. Le thème central tournait autour de la question du début des économies de production.

La Chaîne de Gobnangou est un complexe gréseux à orientation SW-NE, d'une longueur d'environ 100 km et d'une centaine de mètres de commandement par rapport à la plaine environnante (Fig. 1 et 2). D'après les précipitations et les températures ainsi que leur répartition saisonnière, la région est soumise à un climat soudanien (de savane) (Fig. 3) et se rattache par sa végétation au domaine soudanien septentrional. Les processus de dissolution des grès au Quaternaire ont conduit à la mise en place d'abris sous roche. Ce sont les remplissages archéologiques de deux d'entre eux (Maadaga et Péntènga) qui ont fait l'objet des recherches présentées ici.

Un site de plein air (Kidikanbou) découvert à proximité de l'escarpement de la Chaîne a également été fouillé. En outre, de nombreux autres sites ont été révélés par des prospections tout autour de la Chaîne et étudiés par des sondages. Dans la plupart des cas, il s'agissait de concentrations superficielles de matériel sans apport majeur au programme initial.

La séquence archéologique majeure a été rencontrée à Maadaga (Fig. 6), abri sous roche du versant sud de la Chaîne. Les couches à matériel lithique du "Middle Stone Age" (couche 5 dans Fig. 8, objets lithique voyez Fig. 10)

sont celles qui présentent le plus grand intérêt car les sites stratifiés de cette époque sont assez rares en Afrique de l'Ouest. L'Holocène se limitait à une couche de faible épaisseur largement remaniée, ce qui en réduisait l'intérêt dans la problématique initiale du projet.

Le second site traité est celui de Kidikanbou, situé non loin de Maadaga, à environ 300 m. de la bordure de la "falaise" (Fig. 12). Il a été révélé par une forte concentration superficielle d'artefacts lithiques, parmi lesquels les microlithes sont presque entièrement constitués d'outils. La stratigraphie comme la composition et la disposition du matériel laissent à penser qu'il s'agit d'un site légèrement remanié par l'érosion, sur lequel des outils de chasse ont pu être fabriqués et retouchés. La faible variabilité des micropointes et le grand nombre de microlithes cassés plaident en ce sens (Fig. 18). Le matériel organique n'a pas été conservé, ce qui ne permet pas de datation. La nette influence d'une pratique de la chasse pourrait laisser penser à une phase pré-céramique et antérieure à l'apparition d'un mode de production du *Late Stone Age*.

Le site le plus important est Péntènga, situé sur le versant nord de la Chaîne. Il s'agit d'un abri dû à la chute d'un gros bloc rocheux détaché de la paroi (Fig. 22). La fouille a porté sur un dépôt sédimentaire presque totalement homogène sur une épaisseur de 1,9 m. Le matériel exhumé est constitué de céramique, d'une industrie lithique dominée par les microlithes ainsi que de restes de faune et de flore. La seule discontinuité sédimentaire est représentée par un lit caillouteux qui a du se mettre en place entre le deuxième millénaire cal. BC et le milieu du premier millénaire cal. AD. D'après les dates C14, la séquence débute au milieu du VIIème millénaire cal. BC et se termine aux XI–XIIIèmes siècles cal. AD (Fig. 23). De toute évidence, la tranche de temps ne semble pas être entièrement représentée dans le dépôts. La mise en place de l'abri et de son remplissage ne sont pas connus avec certitude; deux modèles peuvent être envisagés (Fig. 44).

La céramique est présente dans presque tous les niveaux et a été rassemblée en différents groupes d'après la forme, les décors et la technique (Fig. 37–41). Une multitude de datations en thermoluminescence a montré que la céramique est en partie nettement plus jeune que les charbons associés (voir Wotzka/Goedicke, dans ce volume). Cela dénote un net remaniement qui peut avoir aussi touché les artefacts lithiques. Parmi l'outillage lithique, les formes microlithiques dominent (Fig. 28 et 32), accompagnées de différents outils non-microlithiques (Fig. 34 et 35).

L'évolution de la végétation à l'Holocène moyen et supérieur est rendu par 2000 fragments de charbon identifiés en 50 taxa, à Péntènga. Le profil montre trois unités A, B et C rapportés à environ 1000 cal. AD., 800 cal. BC et 6000 cal. BC (Fig. 45 et 46). Vers 6000 cal. BC, poussaient autour de l'abri des forêts sèches et des savanes. On ne peut pas en déduire pour cette époque des forêts de grande extension, ni la migration d'espèces typiques des zones climatiques plus humides méridionales. Au Ier millénaire cal. BC, le spectre des espèces de savane change, avec l'émergence d'espèces septentrionales résistant à la sécheresse comme *Combretum micranthum* et on voit apparaître des savanes du type de celles que l'on rencontre aujourd'hui dans la Chaîne de Gobnangou. Cela peut s'expliquer tant par un assèchement du climat que par une influence anthropique. On ne trouve cependant dans les charbons aucune espèce typique de jachère ou indicatrice de pâturage, ce qui ne permet pas de dire que des paysages culturels façonnés par l'agriculture se seraient développés autour de la Chaîne avant 1000 cal. AD. Les forêts sèches représentées tout au long du profil n'existent plus dans la région. Outre les charbons, l'étude des fruits et graines a montré une grosse quantité d'espèces comestibles, comme *Lannea microcarpa* ou *Diospyros mespiliformis* qui peuvent aussi être des remaniements récents.

Les restes faunistiques sont nombreux, mais seul un petit nombre a pu être identifié en raison d'une forte fragmentation. Le spectre faunistique (Fig. 48) permet d'avoir des indications sur les conditions environnementales et de reconstituer les pratiques économiques. Les animaux

domestiques sont totalement absents, sauf peut-être des restes difficilement identifiables de chien. Cela va dans le sens des hypothèses archéobotaniques selon lesquelles la production alimentaire n'est apparue que tardivement, vers 1000 cal. AD. Sans doute, les abris n'étaient-ils pas des habitats réguliers de pasteurs ou de cultivateurs. Comme les abris ont été les seuls à fournir des stratigraphies chronologiquement datables, il paraît difficile d'envisager de mieux connaître le passage des chasseurs-cueilleurs aux économies de production dans la région. C'est pourquoi, nous voyons la valeur du présent travail plutôt comme une contribution à l'histoire de l'environnement et du peuplement préhistorique d'une zone de la savane ouest-africaine, jusque-là inconnue et ébauchée ici pour la première fois.

References

Affaton, P.
1975 Étude géologique et structurale du nord-ouest Dahomey, du nord Togo et du sud-est de la Haute-Volta. Trav. Lab. Sci. Terre 10, Marseille.

Amblard, S./J. Pernès
1989 The identification of cultivated pearl millet *(Pennisetum)* amongst plant impressions on pottery from Oued Chebbi (Dhar Oualata, Mauritania). Afr. Arch. Rev. 7, 117–126.

Amblard, S.
1996 Agricultural evidence and its interpretation on the Dhars Tichitt and Oualata, south-eastern Mauritania. In: G. Pwiti/R. Soper (eds.), Aspects of African Archaeology. Papers from the 10th Congress of the PanAfrican Association for Prehistory and Related Studies, Harare, 421–427.

Anquandah, J.
1993 The Kintampo complex: a case study of early sedentism and food production in sub-Sahelian west Africa. In: T. Shaw/P. Sinclair/B. Andah *et al.* (eds.), The Archaeology of Africa. Routledge, London/New York, 255–260.

Aubréville, A.
1950 Flore forestiére soudano-guinéenne. Société d'editions géographiques, maritimes et coloniales, Paris.

Badal-Garcia, E.
1992 L'anthracologie préhistorique: à propos de certains problèmes méthodologiques. In: J.-L. Vernet (ed.), Les charbons de bois, les anciens écosystèmes et le rôle de l'homme. Colloque organisé à Montpellier du 10 au 13 septembre 1991. Bull. Soc. bot. France 139, Actualités botaniques 2/3/4, 167–189.

Ballouche, A./K. Küppers/K. Neumann/H.-P. Wotzka
1993 Aspects de l'occupation humaine et de l'histoire de la végétation au cours de l'Holocène dans la région de la Châine de Gobnangou, S.E. Burkina Faso. Berichte des Sonderforschungsbereichs 268 1, 13–31.

Beaudet, G./R. Coque
1986 Les modelés cuirassés des savanes du Burkina Faso. Rev. géol. dyn. géogr. phys. 27, 213–224.

Boulet, R./J. C. Leprun
1969 Étude pédologique de la Haute-Volta, region Est. ORSTOM, Paris.

Brain, C. K.
1981 The hunters or the hunted? An introduction to African cave taphonomy. The University of Chicago Press, Chicago/London.

Breunig, P./K. Neumann/W. Van Neer
1996 New Research on the Holocene Settlement and Environment of the Chad Basin in Nigeria. Afr. Arch. Rev. 13, 2, 111–145.

Breunig, P./K. Neumann
1999 Archäologische und archäobotanische Forschung in Westafrika. Archäologisches Nachrichtenblatt 4/1999, 336–357.
In press From hunters and gatherers to food producers: new archaeological and archaeobotanical evidence from the West African Sahel. In: F. Hassan (ed.), Ecological Change and Food Security in Africa's Later Prehistory. Plenum Press.

Breunig, P./H.-P. Wotzka
1993 Archäologische Forschungen im Südosten Burkina Fasos 1989/90: Vorbericht über die erste Grabungskampagne des Frankfurter Sonderforschungsbereiches 268 „Westafrikanische Savanne". Beiträge zur Allgemeinen und Vergleichenden Archäologie 11, 1991 (1993), 145–187 (résumé: 180–184; summary: 184–186).

Carter, P. L./C. Flight
1972 A report on the fauna from the sites of Ntereso and Kintampo Rock Shelter Six in Ghana with evidence for the practice of animal husbandry during the second millennium B.C. Man 7, 277–282.

Cornelissen, E.
1996 Shum Laka (Cameroon): Late Pleistocene and early Holocene deposits. In: G. Pwiti/R. Soper (eds.): Aspects of African archaeology. Papers from the 10th Congress of the PanAfrican Association for Prehistory and Related Studies, Harare, 257–263.

Davies, O.
1962 Neolithic cultures of Ghana. In: G. Mortelmans/J. Nenquin (eds.), Actes du quatrième Congrès de préhistoire et de l'étude du Quaternaire Tervuren. Musée Royal de l'Afrique Centrale, 291–302.

Drouet, J. J.
1986 Le cycle sédimentaire et les milieux de dèpôt du précambrien supérieur infratillitique dans le bassins des Volta au Nord-Togo. J. Afr. Earth Sci. 5, 455–464.

Drouet, J. J./P. Affaton/K. F. Seddoh/K. S. Godonou/L. T. Lawson
1984 Synthèse lithostratigraphique du Précambrien superieur infratillitique du bassin du Volta au Nord-Togo. In: J. Klerkx/J. Michot (eds.), Géologie Africaine, 217–225, Tervuren.

Eiwanger, J./D. A. Kuevi
1992 Recherches archéologiques au Togo: étude préliminaire. Beiträge zur Allgemeinen und Vergleichenden Archäologie 12, 155–174.

Eiwanger, J.
1999 Sites de l'âge de pierre dans le Nord du Togo. Beiträge zur Allgemeinen und Vergleichenden Archäologie 19, 151–218.

Fleming, St. J.
1978 Thermoluminescent dating: MASCA date-list I. Quotation of results. MASCA Journal 1, 12f.

Flight, C.
1980 The Kintampo Culture and its place in the economic prehistory of West Africa. In: B. K. Swartz/R. E. Dumett (eds.), West African Culture Dynamics: Archaeological and Historical Perspectives. The Hague, Paris, New York, 91–100.

Geis-Tronich, G.
1989 Les métiers traditionnels des Gulmance in Burkina Faso. Sonderschriften des Frobenius-Instituts 6; Stuttgart.

1991 Materielle Kultur der Gulmance in Burkina Faso. Stud. z. Kulturkde. 98, Stuttgart.

Grimm, E. C.
1991 TILIA and TILIA*GRAPH. Springfield, Illinois State Museum.

Guinko, S.
1984 Végétation de la Haute Volta. Thèse, Université de Bordeaux III, Bordeaux.

Haberland, E.
1989 Der Sonderforschungsbereich 268 der Johann Wolfgang Goethe-Universität Frankfurt/Main: „Naturraum, Kulturentwicklung und Sprachgeschichte in der westafrikanischen Savanne". Frankfurter Afrikanistische Blätter 1, 155–167.

Hahn-Hadjali, K.
1998 Pflanzensoziologische Studien der sudanischen Savannen im Südosten Burkina Fasos (Westafrika). Etudes de la flore et de la végétation du Burkina Faso 3, 3–79.

Hassan, F. A.
1997 Holocene palaeoclimates of Africa. Afr. Arch. Rev. 14 (4), 214–230.

Holl, A. F. C.
1985 Subsistance patterns of the Dhar Tichitt Neolithic, Mauretania. Afr. Arch. Rev. 3, 151–162.

Hovestadt, T.
1997 Fruchtmerkmale, endozoochore Samenausbreitung und ihre Bedeutung für die Zusammensetzung der Pflanzengemeinschaft. Untersuchungen im Wald-Savanne-Mosaik des Comoé-Nationalparks, Elfenbeinküste. Wissenschaft und Technik Verlag, Berlin.

Huysecom, E.
1996 Découverte récente d'un site stratifié holocène à Oundjougou, Mali: résultat des deux missions préliminaires. Nyame Akuma 46, 59–71.

Huysecom, E./A. Mayor/A. Robert
1998 Rapport préliminaire de la mission de recherches 1997–98 sur le gisement d'Oundjougou (Mali). Schweizerisch-Liechtensteinische Stiftung für archäologische Forschungen im Ausland, Jahresbericht 1997, 190–214.

Jöris, O./B. Weninger
2000 Radiocarbon calibration and the absolute chronology of the Late Glacial. L'Europe Centrale et Septentrionale au Tardiglaciaire, Table-ronde de Nemours, 13–16 mai 1997. Mémoires du Musée de Préhistoire d'Ile de France 7, 19–54.

Kéré, U.
1998 Vegetation und Wildpflanzennutzung in der Region Tenkodogo (Burkina Faso). Etudes de la flore et de la végétation du Burkina Faso 4: 3–55.

Kessler, J. J./J. Boni
1991 L'agroforesterie au Burkina Faso, bilan et analyse de la situation actuelle. Tropical Resource Management Papers 1, Ouagadougou.

Kleinfeller, U.
1993 Die Silexartefakte der Freilandfundstellen BF 89/10, BF 89/10/I, BF 89/10/II, BF 90/5, BF 90/6, BF 90/7, BF 90/10 im südöstlichen Vorland der Chaîne de Gobnangou, Dep. Tapoa, Burkina Faso. Stratigraphische und typologische Untersuchungen. Unpubl. Manuskript, Frankfurt/M.

Kühltrunk, P.
2000 Taphonomische und typologische Keramikanalyse des steinzeitlichen Fundplatzes Tin-Akoff im Norden Burkina Fasos. Magister-Arbeit, J. W. Goethe-Universität Frankfurt/M.

Küppers, K.
1996 Die Vegetation der Châine de Gobnangou. Dissertation, Universität Frankfurt, Frankfurt/M.

Laclavère, G.
1993 Atlas du Burkina Faso. Paris.

Lavachery, Ph.
1996 Shum Laka rock shelter late Holocene deposits: from stone to metal (North Western Cameroon). In: G. Pwiti/R. Soper (eds.): Aspects of African archaeology. Papers from the 10th Congress of the PanAfrican Association for Prehistory and Related Studies, Harare, 265–274.

Leprun, J. C./R. Trompette
1969 Subdivision du Voltaïen du Massif de Gobnangou (République de Haute-Volta) en deux séries discordantes séparée par une tillite d'âge éocambrien probable. C. R. Acad. Sci. Paris D 269, 2187–2190.

Lézine, A. M.
1989 Late Quaternary vegetation and climate of the Sahel. Quat. Res. 32, 317–334.

Lezine, A. M./J. Casanova
1989 Pollen and hydrological evidence for the interpretation of past climates in tropical West Africa during the Holocene. Quat. Sci. Rev. 8, 45–55.

MacDonald, K./Ph. Allsworth-Jones
1994 A reconsideration of the West African macrolithic conundrum: new factory sites and an associated settlement in the Vallée du Serpent, Mali. Afr. Arch. Rev. 12, 73–104.

MacDonald, K.
1998 Archaeology, language and the peopling of West Africa: a consideration of the evidence. In: R. Blench/M. Spiggs (eds.), Archaeology and Language II. One World Archaeology 29. London/New York, 34–66.

MacDonald, K./R. H. MacDonald
2000 The origins and development of domesticated animals in arid West Africa. In: R. Blench/K. MacDonald (eds.), The Origins and Development of African Livestock: archaeology, genetics, linguistics and ethnography. UCL Press, London, 127–162.

Maguire, J. M./D. Pemberton/M. H. Collett
1980 The Makapansgat Limeworks grey breccia: hominids, hyaenas, hystricids or hillwash? Palaeontologia Africana 23, 75–98.

Maley, J.
1981 Études palynologiques dans le bassin du Tchad et paléoclimatologie de l'Afrique nord-tropicale de 30000 ans à l'époque actuelle. Palaeoecol. Africa 13, 45–52.

McIntosh, S./R. McIntosh
1988 From Stone to Metal: New Perspectives on the Later Prehistory of West Africa. World Arch. 2,1, 89–133.

Michel, P.
1977 Reliefgenerationen in Westafrika. Würzburger geogr. Arb. 45, 111–130.

Mischung, R./P. Müller-Haude
1995 Geschichte und naturräumliche Grundlagen der Gulmance-Siedlungen südlich der Chaîne de Gobnangou. Berichte des Sonderforschungsbereichs 268, 5, 93–104.

Müller-Haude, P.
1995 Landschaftsökologie und traditionelle Bodennutzung in Gobnangou (SE-Burkina Faso, Westafrika). Frankfurter geowiss. Arb. D 19, Frankfurt/M.

Munson, P. J.
1971 The Tichitt Tradition: A Late Prehistoric Occupation of the Southwestern Sahara. Ph.D. Dissertation, University of Illinois at Urbana-Champaign.

1976 Archaeological data on the origins of cultivation in the southwestern Sahara and their implications for West Africa. In: J. R. Harlan/J. M. J. de Wet/A. B. L. Stemler (eds.), Origins of African Plant Domestication. Mouton, The Hague, 187–210.

Neumann, K.
1992 Une flore soudanienne au Sahara central vers 7000 B.P.: les charbons de bois de Fachi/Niger. In: J. L. Vernet (ed.), Les charbons de bois, les anciens écosystèmes et le rôle de l'homme. Colloque organisé à Montpellier du 10 au 13 septembre 1991. Bull. Soc. bot. France 139, Actualités botaniques 2/3/4, 565–570.
1999a Charcoal from West African savanna sites. Questions of identification and interpretation. In: M. Van der Veen (ed.), The Exploitation of Plant Resources in Ancient Africa. Kluwer/Plenum Publishers, New York, 205–219.
1999b Early plant food production in the West African Sahel. New evidence. In: M. Van der Veen (ed.), The Exploitation of Plant Resources in Ancient Africa. Kluwer/Plenum Publishers, New York, 73–80.

Neumann, K./A. Ballouche
1992 Die Chaîne de Gobnangou in SE Burkina Faso – Ein Beitrag zur Vegetationsgeschichte der Sudanzone W-Afrikas. Geobotanische Kolloquien 8, 53–68.

Neumann, K./P. Breunig/S. Kahlheber
2000 Early food production in the Sahel of Burkina Faso. Berichte des Sonderforschungsbereichs 268, 14 (2001), 327–334.

Neumann, K./P. Müller-Haude
1999 Forêts sèches au sud-ouest du Burkina Faso: végétation – sols – action de l'homme. Phytocoenologia 29 (1), 53–85.

Petit, M.
1994 Carte géomorphologique du Burkina Faso au 1/1.000.000. Ouagadougou.

Richter, J.
1984 Messum 1: A Later Stone Age Pattern of mobility in the Namib desert. In: J. Kinahan (ed.): Recent archaeological research between the Orange and the Kavango Rivers in southwestern Africa. Cimbebasia (B) 4, 1–11.

Rudloff, W.
1981 World Climates. Stuttgart.

Runge, J.
1990 Morphogenese und Morphodynamik in Nord-Togo (9°–11°N) unter dem Einfluß spätquartären Klimawandels. Göttinger geogr. Abh. 90.

Salzmann, U.
1999 Zur holozänen Vegetations- und Klimaentwicklung der westafrikanischen Savannen. Paläoökologische Untersuchungen in der Sahel- und Sudanzone NO-Nigerias. Berichte des Sonderforschungsbereichs 268, 13, Frankfurt/M.
2000 Are modern savannas degraded forests? A Holocene pollen record from the Sudanian zone of NE-Nigeria. Veget. Hist. Archaeobot. 9, 1–15.

Salzmann, U./M. Waller
1998 The Holocene vegetational history of the Nigerian Sahel based on multiple pollen profiles. Rev. Palaeobot. Palynol. 100, 39–72.

Schulz, E.
1991 Paléoenvironnement dans le Sahara central pendant l'Holocène. Palaeoecol. Africa 22, 191–201.

Shaw, Th.
1981 The Late Stone Age in West Africa. In: J. A. Allan (ed.), The Sahara: Ecological change and early economic history. Menas monograph number one. School of Oriental and African Studies. University of London, 93–130.

Smith, A. B.
1974 Preliminary report of excavations at Karkarichinkat, Mali, 1972. West Afr. J. Arch. 4, 33–55.

Smithers, R. H. N.
1983 The mammals of the Southern African subregion. University of Pretoria, Pretoria.

Sougy, J.
1971 Remarques sur la stratgraphie du Protérozoïque supérieur du bassin voltaïen; influence de la paléosurface d'erosion glaciaire de la base du groupe de l'Oti sur la tracé sinueux des Volta et des certains affluents. C. R. Acad. Sci. Paris D 272, 800–803.

Sponholz, B.
1989 Karsterscheinungen in nichtkarbonatischen Gesteinen der östlichen Republik Niger. Würzburger geogr. Arb. 75, Würzburg.

Stahl, A. B.
1985 The Kintampo Culture: Subsistence and settlement in Ghana during the Mid-Second Millenium B.C. Diss. Univ. of California, Berkeley.
1986 Early food production in West Africa: Rethinking the role of the Kintampo Culture. Curr. Anthropol. 27 (5), 532–536.

1993 Intensification in the west African Late Stone Age: a view from central Ghana. In: Th. Shaw/P. Sinclair/B. Andah/A. Okpogo (eds.), The Archaeology of Africa: Food, Metals and Towns. Routledge, London/New York, 261–273.

Stuart, C. T./T. D. Stuart
1993 Prey of leopards in western Soutpansberg, South Africa. J. Afr. Zool. 107, 135–137.

Terrible, P. B. M.
1984 Essai sur l'écologie et la sociologie d'arbres et arbustes de Haute-Volta. Librairie de la Savane, Bobo-Dioulasso.

Troll, C./K. Paffen
1964 Karte der Jahreszeitenklimate der Erde. Erdkunde 18, 5–28.

Van Neer, W./H. Bocoum
1991 Etude archéozoologique de Tulel-Fobo, site protohistorique (IVe–Xe siècle) de la moyenne vallée du Fleuve Sénégal (République du Sénégal). Archaeozoologia 4 (1), 93–114.

Vogelsang, R.
2000 Archäologische Forschungen in der Sahel-Region Burkina Faso – Ergebnisse der Grabungskampagnen 1994, 1995 und 1996. Beiträge zur Allgemeinen und Vergleichenden Archäologie 20, 173–203.

Vogelsang, R./K.-D. Albert/S. Kahlheber
1999 Le sable savant: les cordons dunaires sahéliens au Burkina Faso comme archives archéologiques et paléoécologiques pour l'Holocène. Sahara 11, 51–68.

Walter, H.
1979 Vegetation und Klimazonen: Grundriß der globalen Ökologie. Ulmer, Stuttgart.

Wendorf, F./R. Schild
1992 The Middle Palaeolithic of North Africa: a status report. In: F. Klees/R. Kuper (eds.), New light on the Northeast African past. Africa Praehistorica 5. Köln, 39–78.

Wittig, R./K. Hahn-Hadjali/M. Ataholo
2000 Besonderheiten von Flora und Vegetation der Chaîne de Gobnangou im Südosten Burkina Fasos. Études sur la flore et la végétation du Burkina Faso et des pays avoisinants 5, 49–64.

Wotzka, H.-P./C. Goedicke
this volume Thermoluminescence dates on *Late Stone Age* and later ceramics from Tapoa Province (southeastern Burkina Faso) and Konduga (Borno, northeastern Nigeria), 75–126.

INHALT

B. Vogt, Editorial 1

A. Reinecke/Lê Duy Sơn/Lê Đình Phúc, Ausgrabung auf dem spätsteinzeitlichen Siedlungsplatz von Cồn Nền, Provinz Quảng Bình, im nördlichen Mittelvietnam .. 3

Khai quật di chỉ thời đại đồ đá mới hậu kỳ Cồn Nền, tỉnh Quảng Bình ở Bắc Trung Bộ Việt Nam 38

Excavation at the Late Stone Age Settlement Site of Cồn Nền in Quảng Bình Province in the Northern Part of Central Vietnam 53

N. Gutschow/R. J. Vasavada, Temples of Jagannāth in Puri and Ranpur – Orissa, India: A Preliminary Typological Comparison 59

H.-P. Wotzka/C. Goedicke, Thermoluminescence dates on *Late Stone Age* and later ceramics from Tapoa Province (southeastern Burkina Faso) and Konduga (Borno, northeastern Nigeria) 75

Thermolumineszenz-Datierungen an Keramik des *Later Stone Age* und jüngerer Perioden aus der Tapoa-Provinz (südöstliches Burkina Faso) und aus Konduga (Borno, Nordost-Nigeria) 114

Datations par thermoluminescence de céramiques *Late Stone Age* et plus récentes provenant de la Province de la Tapoa (Burkina Faso du sud est) et de Konduga (Borno, Nigéria du nord est) 118

T. Frank/P. Breunig/P. Müller-Haude/K. Neumann/W. Van Neer/R. Vogelsang/H.-P. Wotzka, The *Chaîne de Gobnangou*, SE Burkina Faso: archaeological, archaeobotanical, archaeozoological and geomorphological studies 127

Die *Chaîne de Gobnangou* im Südosten von Burkina Faso: archäologische, archäobotanische, archäozoologische and geomorphologische Studien 182

La *Chaîne de Gobnangou* dans le sud-est du Burkina Faso: études archéologiques, archéobotaniques, archéozoologiques et géomorphologiques 184

R.Noriega/H. Galindo, Protección de edificaciones Maya por reposición de volúmenes 191

W. W. Wurster, Denkmalpflege an massiven Maya-Pyramiden: Wiederherstellung von zerstörten Außenböschungen durch Stampflehm mit Pflanzenarmierung 201

J. Isla C., Una tumba Nasca en Puente Gentil, valle de Santa Cruz, Perú 207
Ein Grab der Nasca-Kultur in Puente Gentil, Santa Cruz-Tal, Peru 233

M. Reindel/J. Isla C., Los Molinos und La Muña. Zwei Siedlungszentren der Nasca-Kultur in Palpa, Südperu 241
Los Molinos y La Muña. Dos centros administrativos de la cultura Nasca en Palpa, costa sur del Perú 289

Bericht über die Tätigkeit der Kommission für Allgemeine und Vergleichende Archäologie des Deutschen Archäologischen Instituts im Jahr 2000 321

VI, 336 Seiten mit 210 Abbildungen, Karten und Tabellen

© Kommission für Allgemeine und Vergleichende Archäologie
des Deutschen Archäologischen Instituts, Bonn, 2001

ISSN 0170-9518
ISBN 3-8053-2840-0