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# **From one camp to another. First results of a comparative techno-economic analysis of the Federmesser-Gruppen lithic industries from the Central Rhineland**

Ludovic Mevel, Sonja Grimm

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The Final Palaeolithic of Northern Eurasia  
Proceedings of the Amersfoort, Schleswig and  
Burgos UISPP Commission Meetings

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# The Final Palaeolithic of Northern Eurasia

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Burgos UISPP Commission Meetings

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Berit Valentin Eriksen, Eelco Rensink and Susan Harris

Ludwig

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# From one camp to another. First results of a comparative techno-economic analysis of the *Federmesser-Gruppen* lithic industries from the Central Rhineland

By Ludovic Mevel and Sonja B. Grimm

*Keywords:* Azilianisation, Central Rhineland, lithic economy, typo-technology, behavioural change, Palaeoethnology, Federmesser-Gruppen, Magdalenian

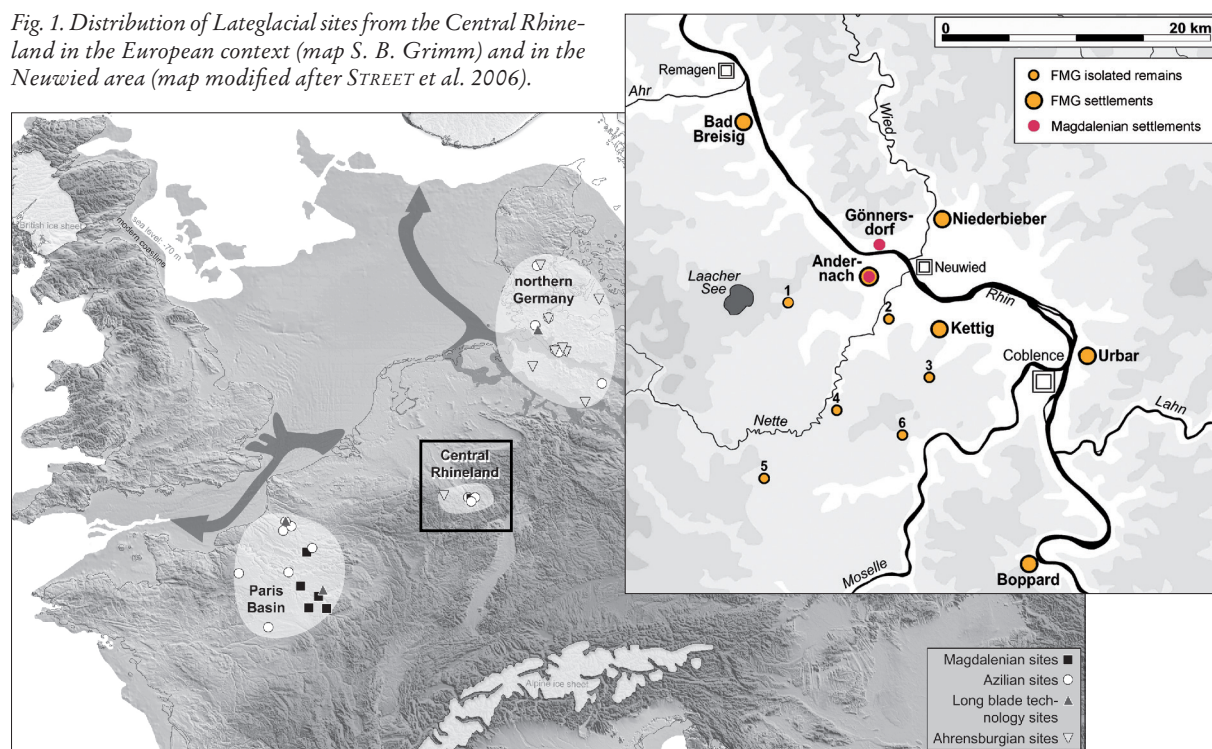
*Abstract:* A comparative technological analysis of lithic industries provides a means to assess the behavioural evolution of prehistoric societies at different scales of space and time. Furthermore, based on this, behaviour can be considered in an anthropological perspective. The objective of this approach is to evaluate the transformation processes of human societies, taking into account the dynamics of natural factors, and to discuss the degree of variability between human groups at intra-site, intra-regional, and inter-regional levels. The Lateglacial sites from the Central Rhineland constitute an exceptional record in quality and detailed preservation (STREET et al. 2006; 2012), and make possible a major contribution to the discussion about the important transformation of the technical and economic behaviour. The technological analysis of several sites (Gönnersdorf SW, Andernach-Martinsberg AN2-FMG and AN3-FMG, Kettig, Niederbieber concentrations 1, 4, 5, 6, 7, and Bad Breisig) dated between 12,500 and 10,800 <sup>14</sup>C-BP provides a basis for discussing the variability of the lithic industries dated to the end of the Magdalenian and to the Federmesser-Gruppen phase. This paper will question behavioural homogeneity during this period according to typological, technological, and economic data. Based on the large time span covered by the dated settlements, we are able to present arguments with reference to a diachronic axis and to discuss the relevance of behavioural evolution of the Federmesser-Gruppen industries of the Central Rhineland, as this is documented for other geographic areas (VALENTIN 2008a; MEVEL 2017). First results of the technological analyses have highlighted variations between sites in the patterns of blank production, the categories of lithic projectile implements made and used as well as in economic behaviour. The significance of these variations and their chronological and cultural value will be assessed. Finally, the homogeneity of the “Azilianisation” process will be discussed at a European scale based on a comparison with data from neighbouring areas.

## 1 INTRODUCTION

The 13<sup>th</sup> millennium calBC is marked in large parts of Europe by the end of the Magdalenian civilization and its epigones (Creswellian, Hamburgian). It also represents the beginning of the so-called process of “Azilianisation”, common to most of the human societies of North-West Europe. The differences in denomination between the western Azilian (Paris basin, South-Western France, Northern French Alps and Jura) and the northern *Federmesser-Gruppen* (FMG; Great Britain, Belgium,

the Netherlands, Germany, Denmark, Poland) are essentially historical (see BODU/VALENTIN 1997). Indeed, the Azilianisation process marks an important, progressive and finally irreversible break with the technical, economic, social, and symbolic traditions of the Magdalenian and led everywhere to the beginning of Mesolithic societies. By the extent and the multiplicity of these changes, the Azilianisation process can undoubtedly be regarded as the most important change of prehistoric societies since the arrival of modern humans in Europe and before Neolithisation. The Lateglacial sites from the Central Rhineland constitute an exceptional record in quality and detailed preservation (STREET et al. 2006; 2012; Fig. 1), and make a major contribution to the discussion on this cultural phenomena possible.

Fig. 1. Distribution of Lateglacial sites from the Central Rhineland in the European context (map S. B. Grimm) and in the Newwied area (map modified after STREET et al. 2006).



The covering of a large part of the Newwied Basin by the pumice of the Laacher See eruption clearly favoured the high preservation of the Magdalenian and FMG camps. Except for Andernach 1, discovered and excavated by Hermann Schaaffhausen at the end of the 19<sup>th</sup> century, the other Lateglacial settlements were discovered during the last quarter of the 20<sup>th</sup> century (STREET et al. 2006). Most of these settlements were already published in several monographs and/or university dissertations presenting the different categories of artefacts discovered during the excavations (BOLUS 1992; STREET 1993; BAALES 2002; HOLZKÄMPER 2006; GELHAUSEN 2011).

This paper presents preliminary results to make a first assessment of a compared technological analysis carried out on ten lithic inventories belonging to the FMG from the Central Rhineland. Our objective is to provide technical elements of characterization in order to evaluate the homogeneity or the diversity of the behaviour of these human groups throughout the entire FMG phase from this geographical area and to compare it on a European scale.

## 2 THE STUDIED ASSEMBLAGES

Despite the synthetic format of this paper, it will be necessary to carry out a more detailed review of several of the units taken into account here in order to reach a better level of analysis that is essential

in order to specify the social and economic organization of these populations and also to highlight some specific variability (e.g. palaeoethnographical analysis).

The ten different lithic assemblages that we will focus on are:

- Niederbieber (Nibi) concentrations (K) 1, 4, 5, 6, 7 (BOLUS 1992; GELHAUSEN 2011) that are generally attributed to a mid-Allerød period (GI-1b; ANDERSEN et al. 2004) before the eruption of the Laacher See Volcano (LSE).
- The two FMG settlements from Andernach-Martinsberg: AN2-FMG and AN3-FMG (BOLUS 1984; KEGLER 2002; STREET et al. 2006) probably represent different periods. AN2-FMG is possibly one of the oldest FMG sites (approximately GI-1c3), whereas AN3-FMG seems to be comparable in age to Niederbieber.
- Kettig (KETT, BAALLES 2002) that might be a bit older than Niederbieber and AN3-FMG (GI-1c<sub>1</sub>).
- Bad Breisig (BB, GRIMM 2003; 2004) found on top of the LSE deposits is generally attributed to a late Allerød (GI-1a).
- The south-western concentration of Gönnersdorf (GÖ SW, BUSCHKÄMPER 1993) that yielded a date from the early Lateglacial Interstadial (GI-1e).

The general biostratigraphy of the FMG sites in the Central Rhineland attributes all of them to the Allerød period. Most of them were covered and therefore well preserved by deposits of tephra and pumice originating from the LSE. Despite these good conditions, the number of radiocarbon dates is low in comparison to the intensively dated Upper Magdalenian sites from this region. Moreover, radiometric dating remains difficult because organic material was less abundantly preserved than at the Upper Magdalenian sites and most faunal material is only preserved in a burnt state (cf. LANTING et al. 2001; OLSEN et al. 2008). The chronological relation of some of the sites and concentrations to one another therefore remains a matter of debate (see below).

The inventories presented in this paper include the different significant raw materials exploited and represented in the FMG settlements of this geographical area (Fig. 2). Thus, this sample of sites appears representative for the variability of the raw material procurement strategies known from the FMG from the Central Rhineland.

For Niederbieber, the important refitting work carried out by Frank Gelhausen (GELHAUSEN 2011) indicated a possible contemporaneity of several concentrations from this site, in particular concentrations 1, 4, 5 and 7. Concentration 6 is probably a satellite unit of the major concentration 9-10-10A.

The concentrations 1, 4, and 6 from Niederbieber and Andernach-Martinsberg AN3-FMG yielded mainly chalcedony artefacts (Fig. 2; GELHAUSEN 2011). We can note that the high rate of chalcedony significantly decreases if we are just taking into account the different categories of blanks (blades, bladelets, cores and flakes: Fig. 2) and excluding all the categories of chips. In this case, the Tertiary quartzite dominates the assemblages and, in particular, is the preferably chosen raw material to make tools (Fig. 2b). If a portion of the chalcedony blades and bladelets is assumed to have been exported, the collection does not show any lack in the *chaîne opératoire*.

Niederbieber 5 and 7 presented a quite different raw material spectrum. The Tertiary quartzite is the dominant raw material in concentration 5 (Tab. 1). This settlement unit is connected by refittings with concentration 1. From this point of view, concentration 5 presents affinities with Bad Breisig where the Tertiary quartzite largely dominates. However, we will see that the difference between these two examples are clear from economic and technological points of view (see below). Niederbieber 7 presented a unique spectrum for Niederbieber. Indeed, different categories of flint are composing more than 50 % of the assemblage (40 % if we exclude all the chips category; Fig. 2b). This is the only evidence of a significant proportion of flint in Niederbieber except concentration 8 (GELHAUSEN 2011). Nevertheless, concentration 7 is one of the smallest concentrations of the site and this dominance relates to only a small number of artefacts (Tab. 1) in comparison to the other assemblages where flint was a major or significant part of the assemblages. In fact, this situation only exists in Gönnersdorf SW.

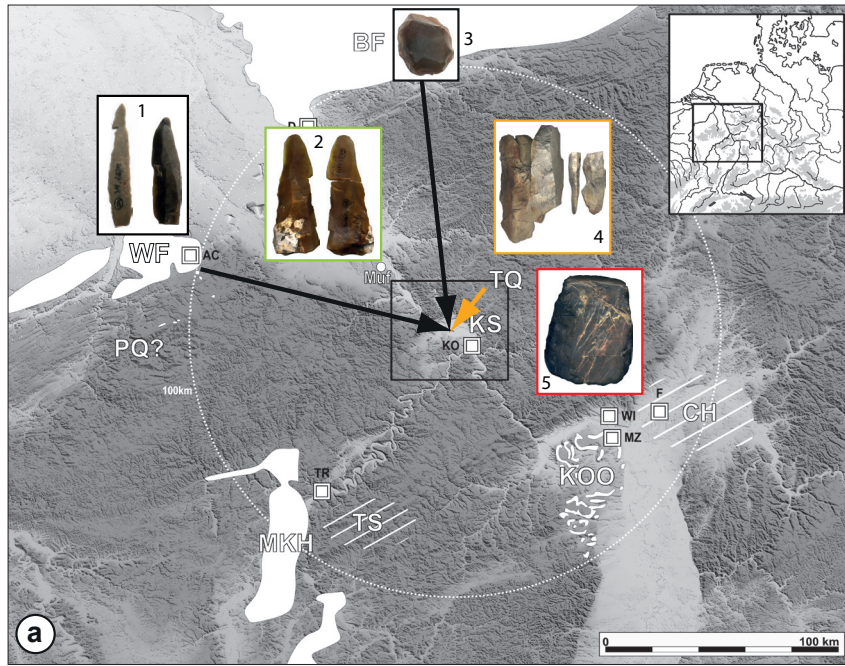
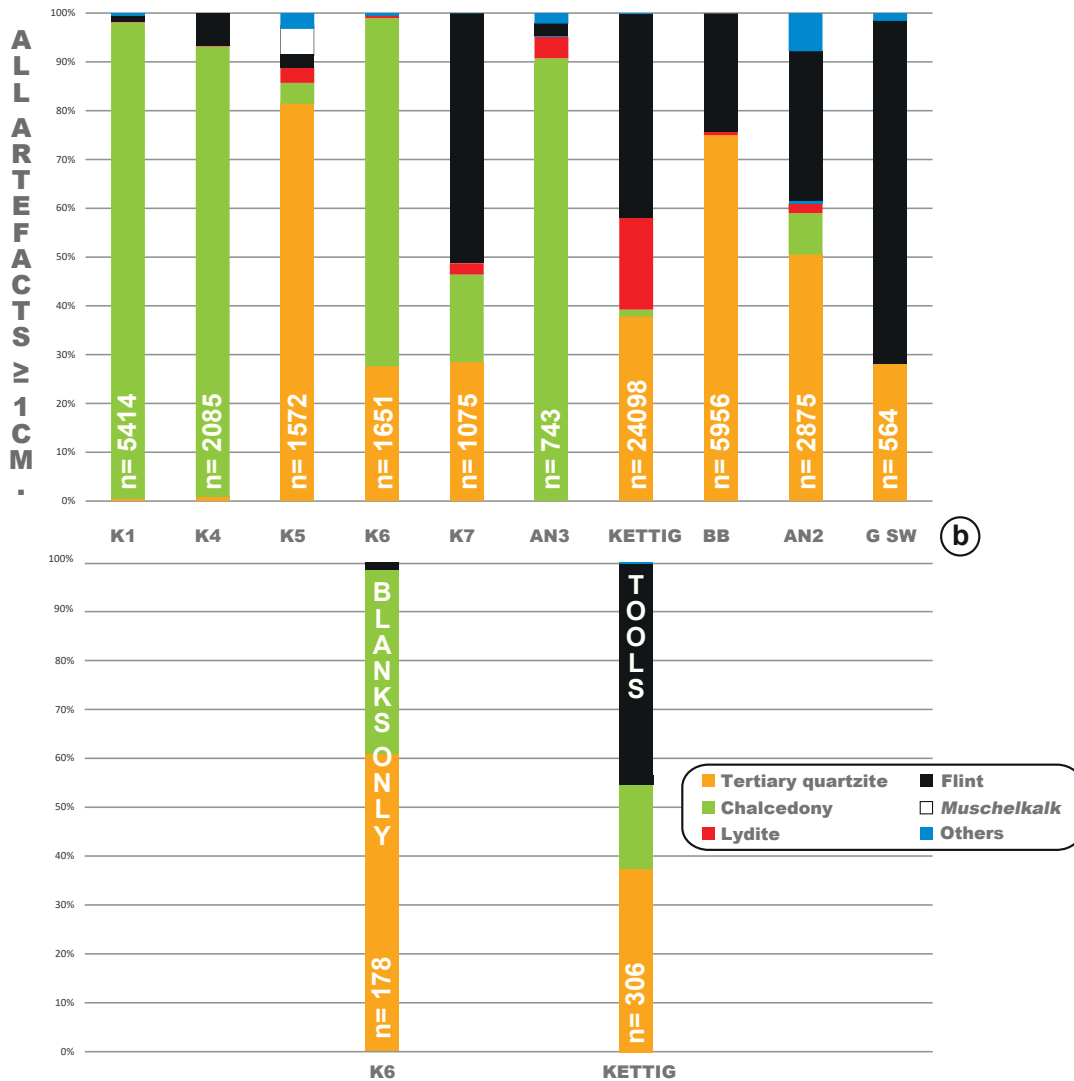


Fig. 2. a Localisation of the main siliceous resources used by the Federmesser-Gruppen from the Newwied area (map modified after STREET et al. 2006); b ratio of each raw material from the published data (see also Tab. 2) and comparison with different samples (exclusion of all categories of chips for Niederbieber 6 and tools only for Kettig).



Tab. 1. Quantity of raw materials in each studied collections.

Sites	Tertiary Quartzite	Chalcedony	Lydite	FLINT (WF/BF)	Muschelkalk	Others	TOTAL	Ref
Niederbieber 1	25	5286	11	86		6	5414	GELHAUSEN 2007
Niederbieber 4	18	1924	5	138			2085	GELHAUSEN 2007
Niederbieber 5	1280	67	51	42	81	51	1572	GELHAUSEN 2007
Niederbieber 6	456	1178	7	5		5	1651	GELHAUSEN 2007
Niederbieber 7	306	193	25	550		1	1075	GELHAUSEN 2007
Andernach 3-FMG	8	666	33	20		16	743	–
Kettig	9112	337	4558	10040		51	24098	BAALES 2002
Bad Breisig	4467		42	1429	18		5956	GRIMM 2004
Andernach 2-FMG	1453	243	59	985		225	2965	BOLUS 1984
Gönnersdorf SW	159			352		9	520	

Kettig and AN2-FMG are relatively similar in the composition of the raw material spectrum. According to Michael Baales' data (2002), Tertiary quartzite and flint are present in equivalent proportions in Kettig (Tab. 1). However, the retouched tools are mainly made of flint (45 %) and 38 % made of Tertiary quartzite. Michael Baales considered Kettig as a multi-settlement site (BAALES 2002), whereas Frank Gelhausen (GELHAUSEN 2011, 171) argued for a possible base camp. He quoted relevant differences between Kettig and Niederbieber from the lithic inventories (common tools more frequent than the backed pieces in Kettig) and the faunal remains (the absence of specific parts of the skeleton possibly indicated economic strategies close to Nunamiut populations; BINFORD 1980). Moreover, Michael Baales and Martin Street suggested a chronological and/or seasonal difference between Kettig, AN2-FMG, and Niederbieber 2 on the one hand and Urbar and the other Niederbieber concentrations, in particular Niederbieber 1 and 4, on the other hand. The former were assumed to be rather widespread summer/early autumn camps that appeared early in the chronology, whereas the latter were small, concentrated late autumn/winter camps that appeared generally to be a younger phenomenon (STREET/BAALES 1996). The youngest FMG site in the Central Rhineland, Bad Breisig, seemed to further support this idea. Nevertheless, Frank Gelhausen meanwhile represented the Niederbieber concentration 2 and interpreted them as three distinct concentrations. Equally, in AN2-FMG with its four hearths a successive settlement might also be possible (STREET et al. 2006). Thus, a main question is whether these two different types of sites in the Central Rhineland represent different types of camps or represent palimpsests of different intensities and whether they fall to different chronological periods.

Hence, projecting the raw material data on a chronological and cultural perspective, we can find further support for the previously made observation (STREET et al. 2006) that the G1b/a, i.e. younger FMG clearly favored the local and regional resources (Niederbieber 1, 4, 5, AN3-FMG, Bad Breisig). Allochthonous resources accounted for a minor part, if they are at all present. Considering the oldest settlements presented in this contribution (Gönnersdorf SW and AN2-FMG), we can note the importance of flint in both cases, in particular for the Gönnersdorf assemblage. As we previously mentioned for AN2-FMG, the importance of flint is there particularly apparent in the proportions of the retouched artefacts. Does this importance of flint in these assemblages reflect a particular behaviour of the groups from the early Lateglacial settlements from the Neuwied basin? If we just consider the Niederbieber 7 assemblage directly connected with the GI-1b/a settlements of Niederbieber we cannot pursue this hypothesis. However, the lack of <sup>14</sup>C dates in Niederbieber poses a significant problem for this discussion (Tab. 2).

The composition of the Kettig assemblage is clearly unique because it is the only example of an equivalent use of flint and Tertiary quartzite in the Neuwied area. Although the <sup>14</sup>C dates are very problematic (see. Tab. 2), Kettig has mostly been considered as contemporary with the GI-1b settlement phase or only seen as slightly older (GI-1c).

Tab. 2. <sup>14</sup>C dates from the FMG settlements from the Neuwied basin (from GRIMM in press, cf. for original publications). ►

Site	Lab. no.	Date <sup>14</sup> C-BP	± <sup>14</sup> C-BP	Material
Andernach 2-FMG	OxA-999	12,500	500	shaft fragments
Andernach 2-FMG	OxA-985	12,300	200	bone
Andernach 2-FMG	OxA-V-2218-39	12,270	50	femur
Andernach 2-FMG	GrA-16987	12,050	70	scapula fragments
Andernach 2-FMG	GrA-16991	12,040	70	shaft fragment
Andernach 2-FMG	GrA-16989	11,960	70	metatarsal fragment
Andernach 2-FMG	OxA-984	11,950	250	shaft fragments
Andernach 2-FMG	OxA-1924	11,890	120	bone
Andernach 2-FMG	GrA-16990	11,820	70	bone
Andernach 2-FMG	OxA-997	11,800	160	bone
Andernach 3-FMG	GrA-16993	11,590	80	bone
Andernach 2-FMG	OxA-998	11,370	160	bone
Andernach 1-FMG	H-85/91	11,300	220	antler protein
Andernach 3-FMG	GrA-16994	11,160	70	bone
Andernach 2-FMG	GrA-16521	10,970	60	calcined bone
Andernach 2-FMG	GrA-16613	9,490	45	calcined bone
Andernach 3-FMG	GrA-16618	7,550	40	calcined bone
Andernach 2-FMG	GrA-16616	7,360	40	calcined bone
Andernach 3-FMG	GrA-16621	5,775	40	calcined bone
Andernach 1?-FMG	H193-178	4,330	360	bone, carbonate fraction
Gönnersdorf SW	OxA-15296	12,385	65	radius
Kettig	GrA-12396	11,960	90	calcined bone
Kettig	GrA-14171	11,720	60	calcined bone
Kettig	GrA-13389	11,710	50	calcined bone
Kettig	Hd-18123	11,314	50	bulked bone sample
Kettig	GrA-14762	11,210	60	calcined metacarpal
Niederbieber 9	GrA-16622	11,290	40	calcined bone
Niederbieber 3	OxA-1135	11,130	130	astralagus
Niederbieber 2 (19)	OxA-2066	11,110	110	bone
Niederbieber 1	OxA-1132	10,700	130	bone
Niederbieber 4	OxA-1136	10,480	130	shaft fragment
Niederbieber 17	GrA-18672	10,420	110	bone
Niederbieber 7	OxA-2067	10,390	100	bone
Niederbieber 17	GrA-18881	10,390	80	bone
Niederbieber 2 (19)	OxA-1133	9,750	240	bone
Niederbieber 2 (19)	OxA-1134	6,250	130	tooth
Boppard	KIA-26644	11,095	55	metapodial
Bad Breisig	GrA-17493	10,840	60	charcoal
Bad Breisig	GrA-17642	10,480	80	charcoal
Bad Breisig	GrA-17716	10,220	60	calcined bone

### 3 METHODOLOGICAL STATEMENT

Since they are the most durable artefact category and one of the mainstays of the prehistoric hunter-gatherer economy, the lithic industries are the best vector for analysing social changes on a diachronic level: the quest “for the intentions of prehistoric artisans” (TIXIER 1967, 773) that permits researchers “to highlight cultural choices” (PERLÈS 1980, 11). As they involve imparted knowledge, the technical aspects of lithic production make it possible “to address a very rich cultural identification of cultural options” (PERLÈS 1991, 9). Since they are central elements of the *chaîne opératoire*, lithic tools and weapon implements will be central in this debate (LEROI-GOURHAN 1965). The technological analysis makes it possible to discuss the lithic tool kits from an anthropological point of view and can highlight human behaviours and interpret them in their context (PELEGRIN 1995; GAMBLE 1999). The

Species	Comment
<i>Cervus elaphus</i>	REJECT: re-dating available
<i>Rupicapra rupicapra?</i>	PROBLEMATIC: large standard deviation
<i>Equus</i> sp.	
<i>Castor fiber</i>	
<i>Bos</i> sp./ <i>Bison</i> sp.	
<i>Cervus elaphus</i>	
<i>Cervus elaphus</i>	re-dating of OxA-999
<i>Cervus elaphus</i> artiodactyl	
<i>Cervus elaphus</i>	
	northern concentration
<i>Bos</i> sp./ <i>Bison</i> sp.	
<i>Cervidae</i>	REJECT: pretreatment, protein, material, uncertain association
	southern concentration
	REJECT: calcined bone
	REJECT: calcined bone
	REJECT: calcined bone
	REJECT: calcined bone
	REJECT: calcined bone
	REJECT: carbonate fraction
<i>Alces alces</i>	PROBLEMATIC: uncertain association
	REJECT: calcined bone
	REJECT: calcined bone
	REJECT: calcined bone
cf. <i>Cervus elaphus</i>	PROBLEMATIC: bulked material
<i>Capreolus capreolus</i>	REJECT: calcined bone
	REJECT: calcined bone
<i>Equus</i> sp.	PROBLEMATIC: uncertain association
<i>Alces alces</i>	
<i>Cervus elaphus</i>	REJECT: post-LSE date
<i>Cervus elaphus</i>	REJECT: post-LSE date
	REJECT: poor carbon quality; post-LSE date
<i>Cervus elaphus?</i>	REJECT: post-LSE date
	REJECT: poor carbon quality; post-LSE date
<i>Alces alces?</i>	REJECT: post-LSE date
<i>Equus</i> sp.	REJECT: post-LSE date
<i>Cervus elaphus</i>	
<i>Pinus</i> sp.	
	REJECT: uncertain association
	REJECT: calcined bone

acquisition of techno-economic data, linking them with spatial and previously published data, will be the basis for a comparative palaeoethnological analysis of the Lateglacial societies in the Central Rhineland. These results obtained on each of the campsites are the prerequisite for understanding the archaeological variability and for discussing its meaning.

In order to discuss about the diversity or homogeneity of FMG behaviours, we will present the backed pieces of these collections in order to elucidate the typo-technological aspects of this artefact category. Then we will focus on blank production before considering, briefly, the economic aspects already largely explored, in particular by Harald Floss (FLOSS 1994; 2000).

Furthermore, we begin with presenting the results obtained on the sites dated to Greenland Interstadial 1c<sub>1</sub> to the beginning of Greenland Stadial 1 (concentrations from Niederbieber, Andernach-Martinsberg AN3-FMG, Kettig, and Bad Breisig). They represent the most important part of

our corpus, and since they potentially cover the entire chronological period considered here, they will enable us to highlight variability in typological, technological, and economic features.

This basis of knowledge will also help us to identify the convergences and divergences with two assemblages – Andernach-Martinsberg AN2-FMG and Gönnersdorf SW – which according to <sup>14</sup>C dates could possibly represent an early Lateglacial occupation phase in the Neuwied Basin (STREET et al. 2006; Tab. 1). To conclude, we will put these results in relation with those currently known for the adjacent areas and appreciate the variability of the “Azilianisation phenomenon” on a larger scale.

Before discussing the possible diversity of the backed pieces from the FMG settlements, a brief presentation of our methodological approach for this category of artefacts is therefore necessary.

## 4 THE LITHIC IMPLEMENTS FROM THE CENTRAL RHINELAND FMG

### 4.1 *A preliminary technological point of view*

In light of recent works about the Final Upper Palaeolithic (PLISSON 1985; BODU 1998; VALENTIN 2005; 2008a), it seemed important to reframe the approach of the backed pieces from a dynamic perspective and not only a morphological classification.

In a first step, we only referred to the backed pieces with characteristic macroscopic impact fractures (FISCHER et al. 1984; SORIANO 1998; CHRISTENSEN/VALENTIN 2004; O’FARRELL 2004) or step fractures (O’FARRELL 2004) which could be identified with a basic technological analysis scheme. Thus, the number of typological categories in each collection is inevitably reduced.

This approach permits us to define a global standard for each type and to reason in terms of concepts of lithic weapons (Fig. 3). Starting from this reduced corpus, it is then possible to document the various aspects related to the selection and the manufacturing of the blanks. Finally, it is possible to eliminate the ‘false types’ which can, on a case-by-case basis, be redefined as waste product, unfinished point, second choice, or an alternative simplified type related to the global norm. Obviously, this kind of approach cannot replace an exhaustive micro-wear analysis of this category of artefacts.

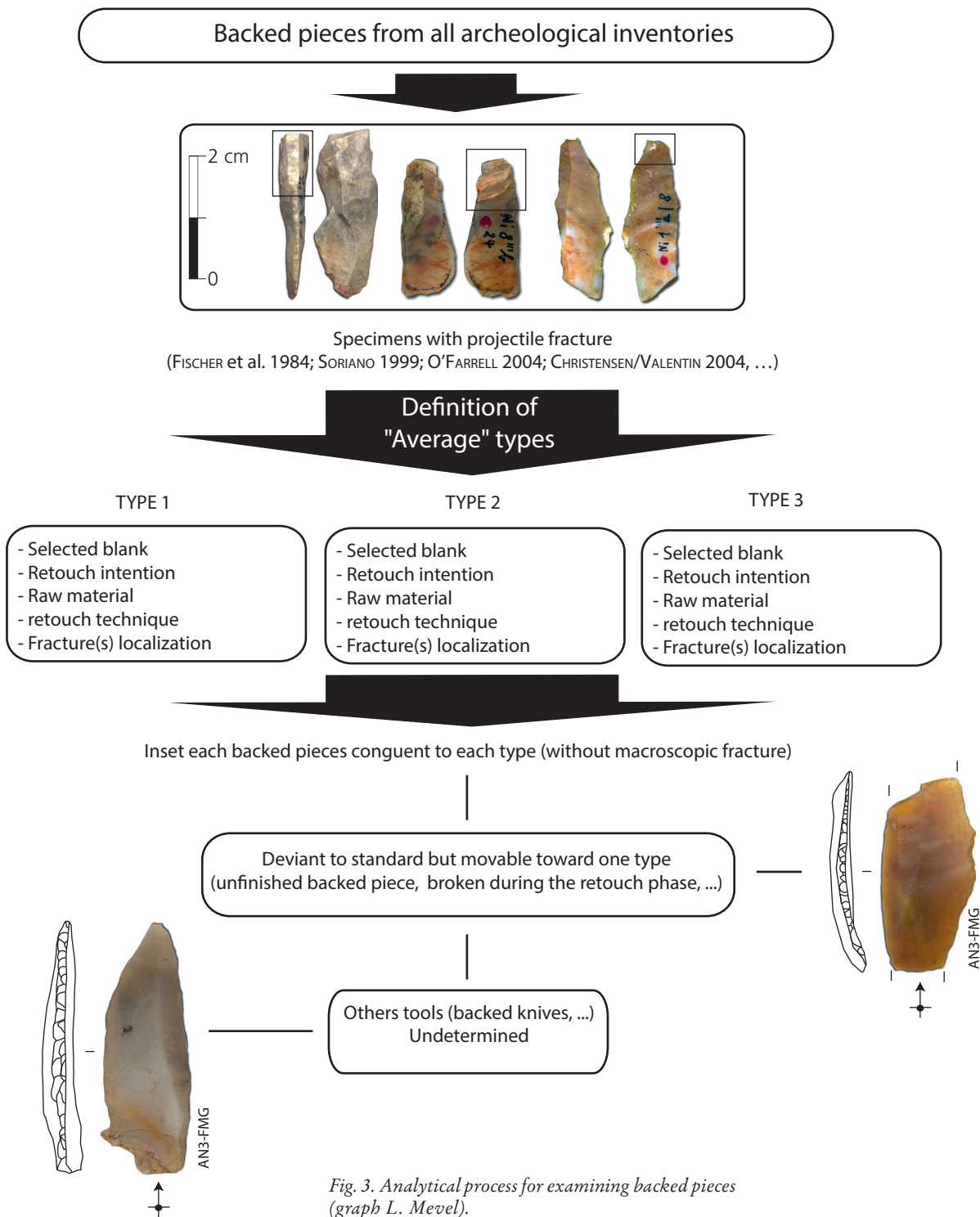
Since our corpus probably represents a long time line, it is necessary to evaluate the homogeneity of this category of artefacts and the possible cultural signification of any variation. For example, could the truncated backed pieces be related to the most recent settlement of the area?

### 4.2 *Preliminary results*

From a typological point of view, the backed pieces from GI-1c<sub>1</sub> to GS-1 are represented by several morphometric categories of potential projectile heads or implements:

- Different sizes of curve-backed points (Fig. 4; Tab. 3);
- Rarer straight backed points including very few truncated bases (Fig. 4; Tab. 3);
- Numerous backed bladelets (Fig. 5; Tab. 3).

If we first take into account the specimens which present a typical projectile fracture, the curve-backed points predominate among the specimens with impact ( $n = 34$ ; 91 % of the projectile implements with impact features; Tab. 4). However, their important morphometric variability could be underlined. Indeed, a representative part of the specimens could be clearly described as *Micro-Federmesser*. The variability is mainly metric because a distinction could be made based on the length of these projectile tips, ranging between 2 and 4 cm in length (Fig. 6). This metric variability of the curve-backed points is certainly linked to the blank production patterns carried out on these sites. The blades are transformed into *Federmesser*, whereas the shortest and narrowest blanks, produced at the end of the core reduction, were transformed into *Micro-Federmesser*. This category of lithic points is common to the whole corpus presented here. A single truncated backed point coming from



Niederbieber 6 and a possible backed bladelet coming from Kettig, which could also be considered as a *Micro-Federmesser*, complete this corpus of backed pieces with impact fractures (Tab. 3).

In addition, a relatively significant number of backed pieces show edge damage (Fig. 7). Without an exhaustive use-wear analysis, we can only suppose that they were used, without any assumption with their function (butchery? hunting activities? taphonomy?).

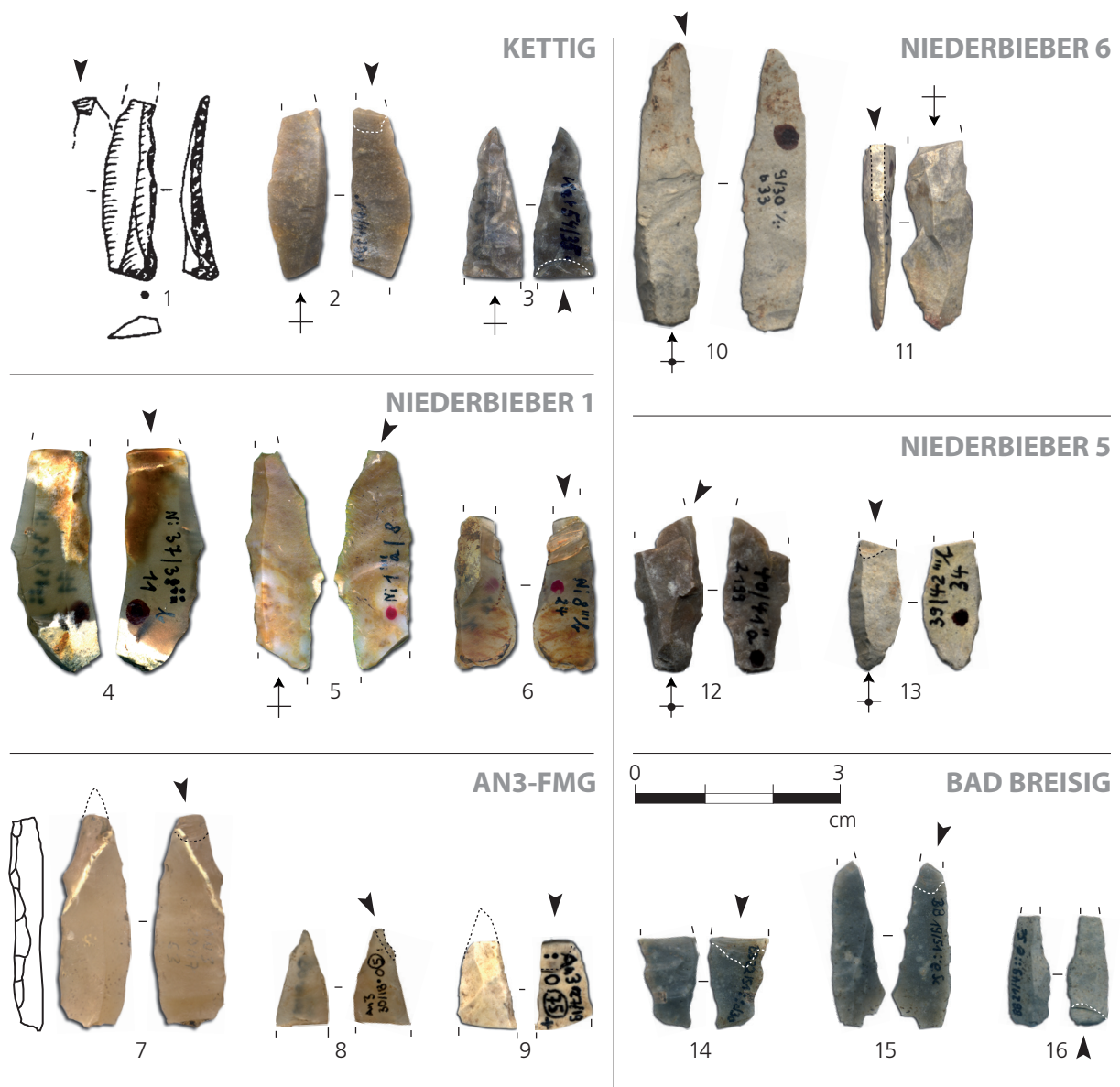
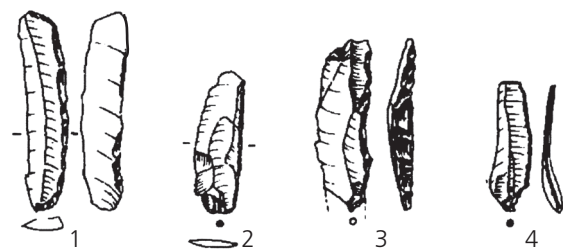


Fig. 4. Backed pieces with impact fractures from Kettig, Niederbieber 1, 5, 6, AN3-FMG, and Bad Breisig (graph L. Mevel).

Tab. 3. Typology of the backed elements from the GI-1c1 to GS 1 sites as recorded by L. Mevel.

Sites	Curve-backed points ( <i>Federmesser</i> )	Backed bladelets	Truncated backed bladelets	Truncated backed points	Rectilinear backed points	Total
Bad Breisig	89	4	2	1	5	101
Niederbieber 6	23			1		24
Niederbieber 4	15	16				31
Andernach 3-FMG	39	9				48
Niederbieber 5	25				1	26
Niederbieber 1	30	11				41
Niederbieber 7	19					19
Kettig	48	4		1		53
<b>Total</b>	<b>288</b>	<b>44</b>	<b>2</b>	<b>3</b>	<b>6</b>	<b>343</b>

## NIEDERBIEBER 4



## AN3-FMG

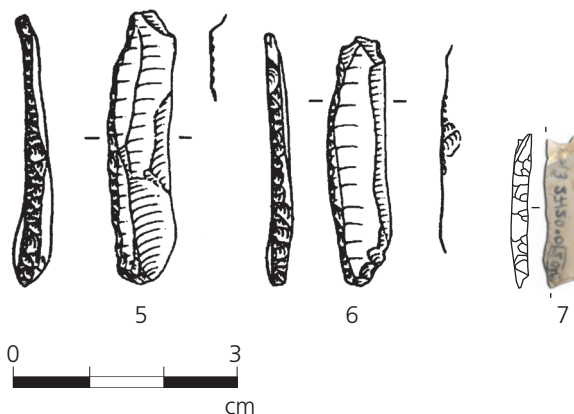


Fig. 5. Examples of backed bladelets from Niederbieber 4 and AN3-FMG (graph L. Mevel; drawings G. Rutkowski, RGZM).

Tab. 4. Macroscopic impact fractures identified on the backed elements from the GI-1 c<sub>1</sub> to GS 1 sites as recorded by L. Mevel.

	Sites	Curve-backed points ( <i>Federmesser</i> )	Backed bladelets	Truncated backed points	Rectilinear backed points	Total
Macroscopic Impact Fractures	Bad Breisig	2				101
	Niederbieber 6	4		1		24
	Niederbieber 4	1				31
	Andernach 3-FMG	5				48
	Niederbieber 5	2				26
	Niederbieber 1	3				41
	Niederbieber 7	4				19
	Kettig	13	1		1	53
	<b>Total</b>	<b>34</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>343</b>

We can simply note that backed knives are prevalent in several western Azilian settlements (see BODU 1998; DE BIE/CASPAR 2000; COUDRET/FAGNART 2015). In our record, we find artefacts which are clearly close to the morphometric variability of the *Federmesser* (n = 38) and *Micro-Federmesser* (n = 7). We also identified eight backed bladelets and two straight backed points. The first is from Kettig and the other one from Bad Breisig.

According to this analysis, it is possible to highlight the following points about backed pieces in general:

- The backed points used by the FMG from the Central Rhineland are predominantly curve-backed points, also known as *Federmesser*. Within this morphological type we could make a distinction based on metric criteria.
- The presence of points with truncated base is rare in the corpus.
- Backed bladelets are present, but we cannot consider them as weapon implements without an exhaustive use-wear analysis. It is also possible that many of these backed bladelets are broken *Micro-Federmesser*. The rate of fracture in this category of objects (approximate 72%) does not facilitate the diagnosis. In addition, the selection of blanks is almost the same for backed bladelets as for *Micro-Federmesser*.

The numerical variations we can note in the proportion of the backed pieces with impact fractures are certainly related to the function or the duration of these occupations. In the context of Frank Gelhausen's suggestion that Kettig represents a base camp (see below), it is relevant but perhaps not surprising to note that Kettig presents a particularly important ratio of used points. In contrast, it is also noteworthy that Bad Breisig shows a very low rate of points with impact fractures (Tab. 3). We

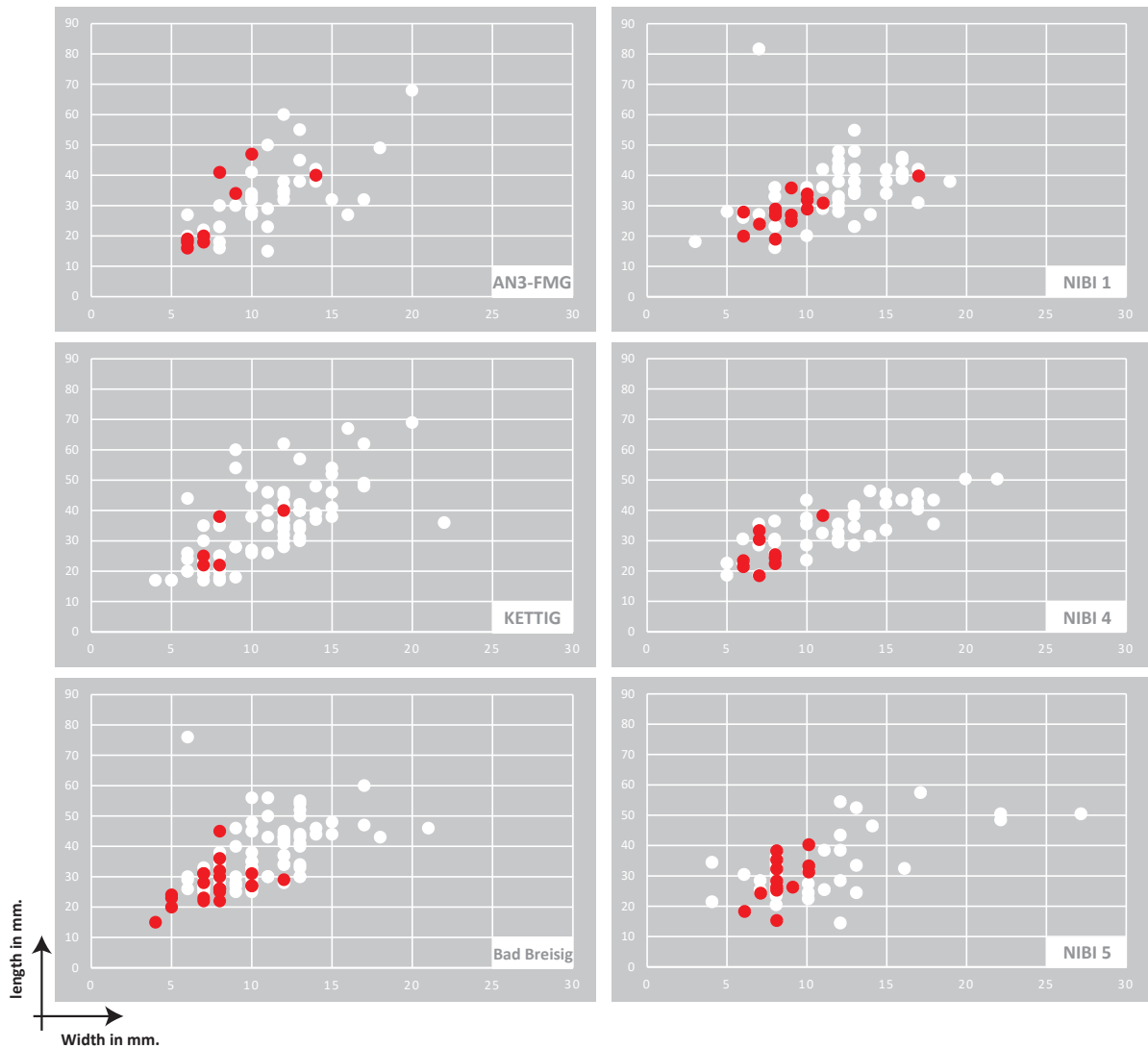


Fig. 6. Length/width ratio from AN3-FMG, Bad Breisig, Kettig, Niederbieber 1, 4, 5 (white dots: complete unretouched blades and bladelets; red dots: complete backed pieces; graph L. Mevel).

will not comment further on the significance of this data because it must be put in perspective with other sources to become relevant (use-wear and spatial analysis) and, in a further step, be compared to sites such as Rekem (DEBIE/CASPAR 2000) or the recently discovered Wesseling (HEINEN 2014) that were equally suggested to represent base camps. However, in the context of similarities of the Kettig and the Bad Breisig assemblage, this difference might also be of some significance (see below).

## 5 WHAT ABOUT THE *CHAÎNE OPÉRATOIRE*?

The backed pieces are mainly made on regular small blades or bladelets. If we take into account the complete specimens, including those that do not show use-wear traces, they are often very short. In the corpus of the complete backed pieces, lengths range between 2 and 3.5 cm and widths between 0.6 and 0.9 cm (Fig. 6). Obviously, the modification by retouch affects the initial morphology of the blank. However, if we include the data from the entire blade and bladelet production we can note that this production is orientated towards the search of elongated blanks ranging between 2 and 5 cm of length.

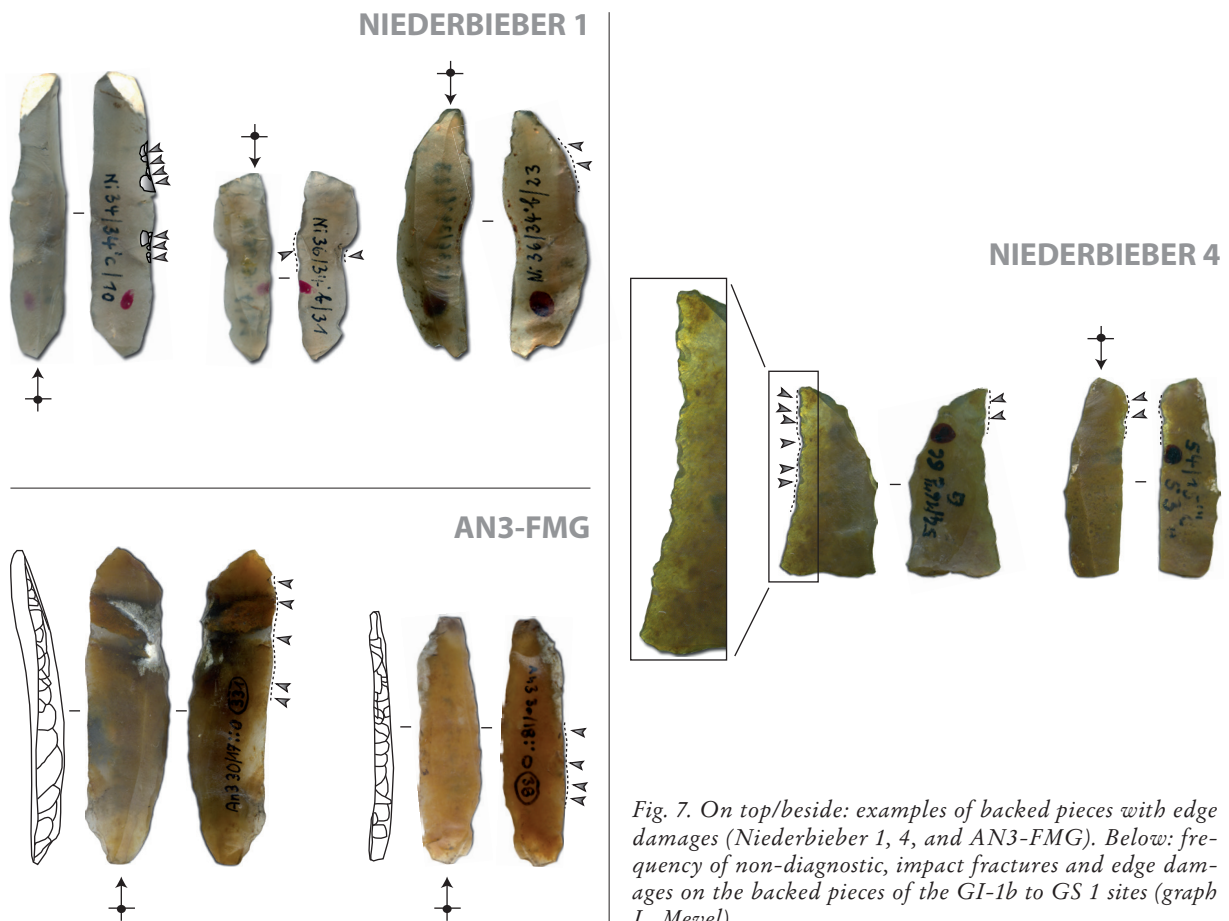
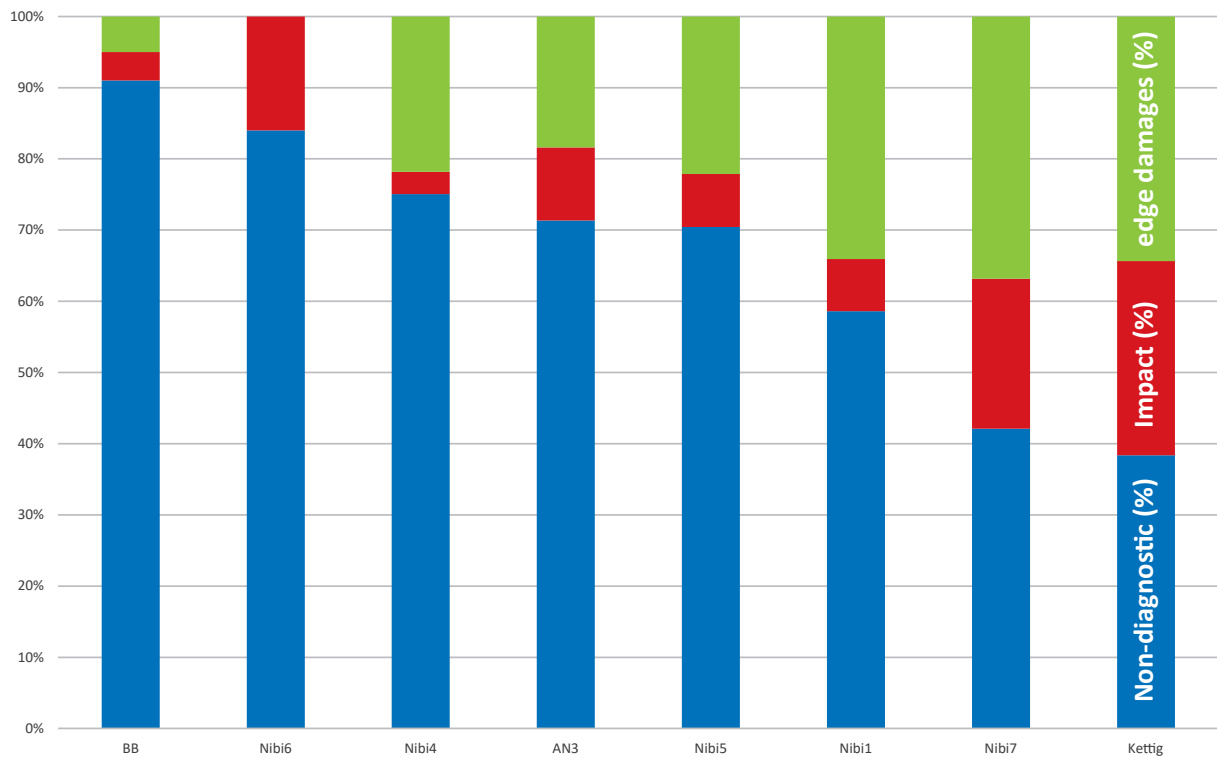


Fig. 7. On top/beside: examples of backed pieces with edge damages (Niederbieber 1, 4, and AN3-FMG). Below: frequency of non-diagnostic, impact fractures and edge damages on the backed pieces of the GI-1b to GS 1 sites (graph L. Mevel).



The blanks used for the manufacture of lithic weapon implements and tools are produced during recurring knapping sequences of small blades and bladelets. These sequences alternate between phases of the “plein débitage” and maintenance sequences with a soft hammerstone used in a tangential way (PELEGRIN 2000; Fig. 8). The butts are generally thin or punctiform and the angulation of the strik-

**NIEDERBIEBER 6**

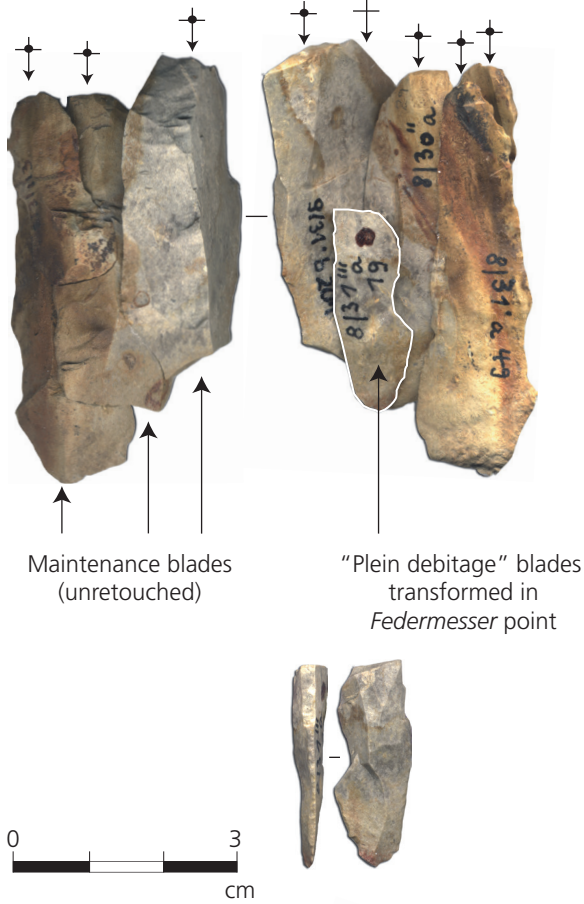
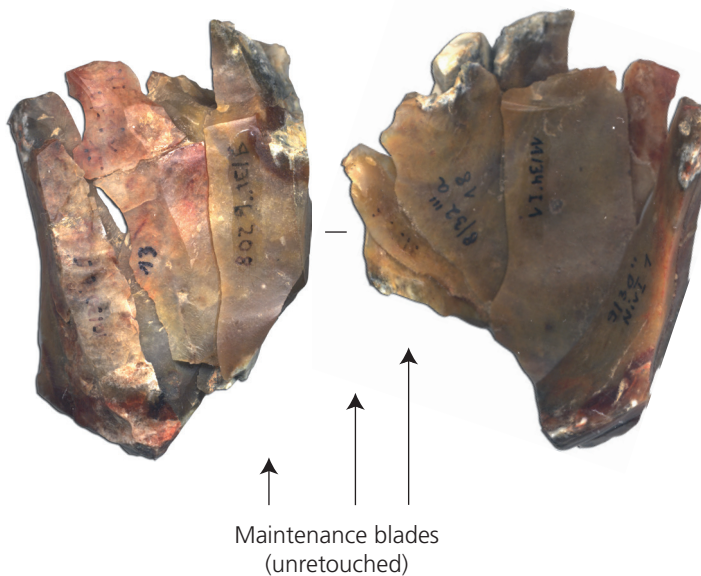
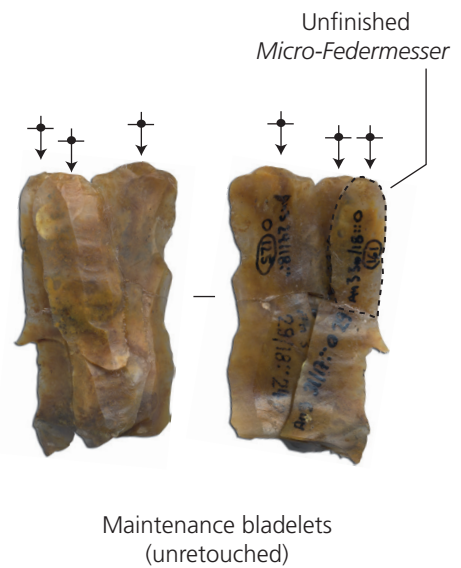
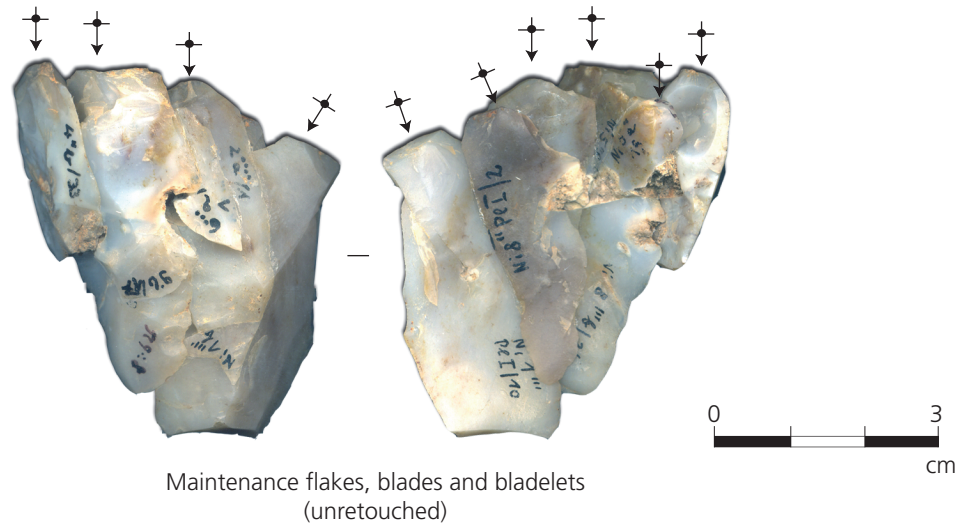


Fig. 8. Examples of refitting from the blades and bladelets showing details of the chaîne opératoire (graph L. Mevel).

**AN3-FMG**



## NIEDERBIEBER 1



ing platform is generally between 80 and 90°. Only the collection from Kettig presented a problem of diagnosis on a small part of the corpus. Indeed, 24 of the 424 observed butts show a lip and half of them present an angulation between 70 and 75°. These kinds of features can be produced by a very soft hammerstone (limestone) but are also compatible with a soft organic hammer. In fact, the organic material from Kettig contained a rare example of a hammer made of red deer antler (BAALES 2002, 185–188). Nevertheless, these values are based on fine-grained flint material and for more coarse grained and inhomogeneous raw materials such as Tertiary quartzite and chalcedony only experiments on the different raw materials involved can provide further data.

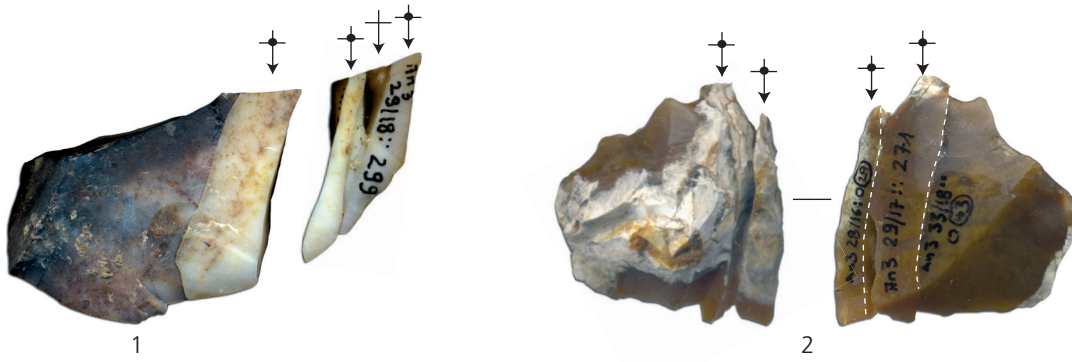
Even if we can qualify the production patterns as “simplified” compared to the Upper Magdalenian lithic production (FLOSS/TERBERGER 2002), the FMG still produced regular blades and bladelets. If we look at the GI-1b Azilian industries from northern or southern France, for example, this is clearly not always the case (BODU 1998; VALENTIN 2008a; FAT CHEUNG et al. 2014; MEVEL et al. 2014; MEVEL 2017).

However, the presence of expedient production sequences is common to all collections. For example, the production of bladelets on flake edges with a minimal preparation is common (Fig. 9). This method is also frequent in the Azilian of western Europe (DE BIE/CASPAR 2000; VALENTIN 2005; FAT CHEUNG et al. 2014; MEVEL et al. 2014; MEVEL 2017). It is an easy and quick method to get regular bladelets. In Bad Breisig, the FMG massively used this method as is shown by the 160 burin spall-like blanks (Fig. 10). They are, sometimes, as long as certain blades of the collection. In this case, it is certainly a choice of the FMG to use narrow natural flakes of Tertiary quartzite (GRIMM 2003; 2004). This selection was perhaps one of the consequences of the Laacher See eruption on the procurement behaviour. More generally, if the knapped volumes do not present any particular preparation before the “plein débitage” phase, it is also because the FMG brought and selected blocks with natural convexities permitting an initialization by cortical blades or flakes. This method constitutes an unquestionable highly economic behaviour when raw material nodules are small-sized (6–7 cm).

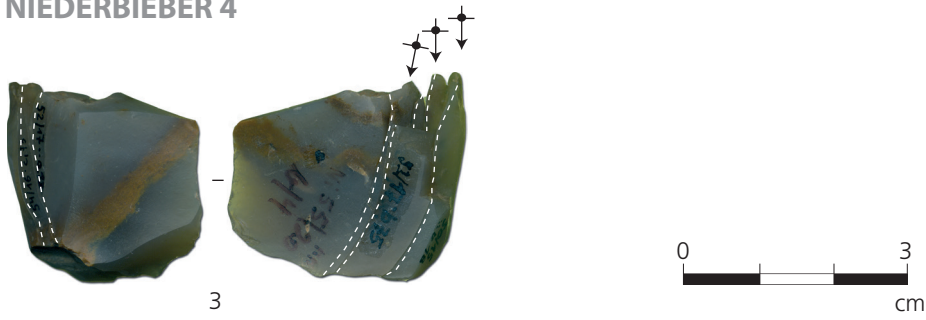
We can note that these first cortical flakes or blades are not often used for tool manufacture. The FMG selected rather robust short blades or flakes from the first knapping sequence to manufacture their tool kit (Fig. 11). They often used small regular blades to make different tool types. These blanks are probably produced in the same production sequence as the backed point blanks. Also, very few flake cores are represented in the inventories (Fig. 11). The majority of flakes that were used as blanks for tools originated from the maintenance phase of the blade and bladelet production or were knapped during the final stage of the core exploitation.

AN3-FMG

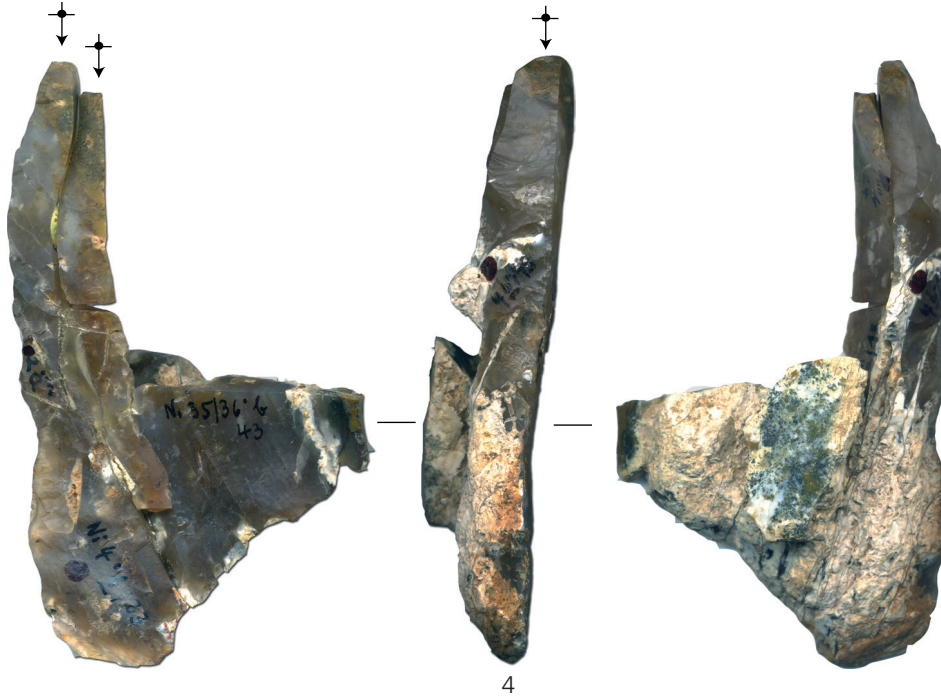
Fig. 9. Some examples of expedient ▶  
knapping sequences (graph L. Mevel).

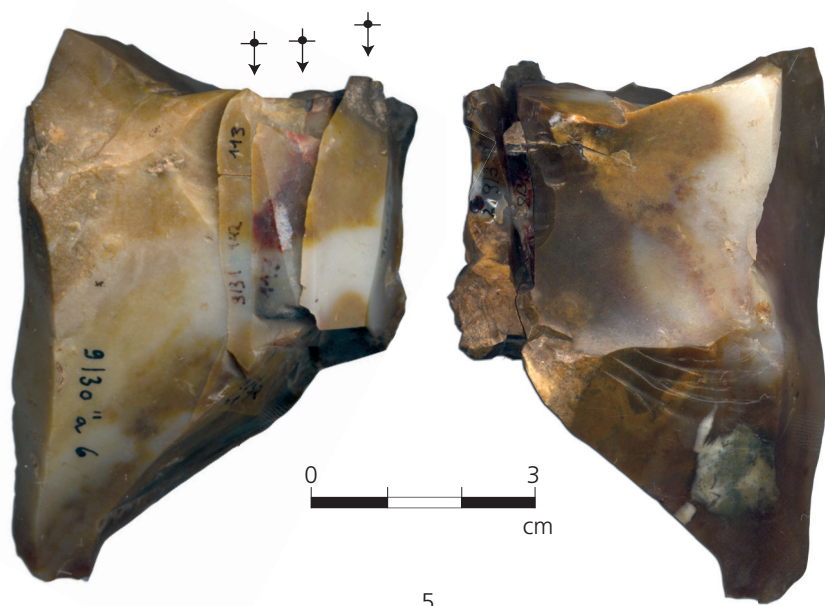


NIEDERBIEBER 4



NIEDERBIEBER 1





## 6 FIRST ECONOMIC DATA

The inventories contain a relatively restricted number ranging between three and 15 cores with two exceptions: Kettig and Bad Breisig, which yielded numerous cores. It is always difficult to evaluate the productivity of blocks knapped in a camp without exhaustive refitting. However, in a first approach to estimate this behaviour, the number of blades and bladelets (obtained by adding the complete blades and the proximal fragments) and the number of cores can be compared in each inventory to receive a ratio that gives an approximate value for the number of blanks produced per core – a MNI of blades and bladelets produced by any single core. This MNI shows a significant variability between the sites (Tab. 5). The collections from Niederbieber and Andernach show a rate of productivity ranging between 8.7 and 12 blades or bladelets per core, whereas this rate lies only around three blanks per core in Bad Breisig and Kettig.

These data, which it is necessary to regard as trends, make it possible to highlight a relative proximity of the behaviour between the collections coming from Kettig and Bad Breisig. Bad Breisig can be considered as a final episode of the FMG settlement from the Central Rhineland based

Tab. 5 Evaluation of the blades and bladelets production by core on the GI-1c1 to GS 1 sites as recorded by L. Mevel.

Sites	Cores	Complete blades and bladelets and proximal fragments	MNI	Ratio/cores
Nibi1	11	228	134	12.00
Nibi4	15	268	131	8.70
Nibi5	7	146	73	10.40
Nibi6	3	66	33	11.00
Nibi7	5	103	57	11.40
AN2	13	270	123	9.46
AN3	12	292	149	12.40
KETT	46	450	149	3.30
BB	86	451	209	2.40

on its stratigraphic position (BAALES/JÖRIS 2001; GRIMM 2003; 2004). The chronological position of Kettig indicates an older FMG assemblage more comparable to Andernach 2-FMG but it remains more dubious due to rather unreliable radiocarbon dates (see GRIMM in press). Thus, in the light of the economic similarity, Kettig could also be considered as relatively close to Bad Breisig. The very different production strategies of lithic implements at these two sites (see above) exclude function as a possible reason for this similarity. In a comparison of the techno-typological behaviour of Kettig, Andernach 2-FMG, and the

BAD BREISIG

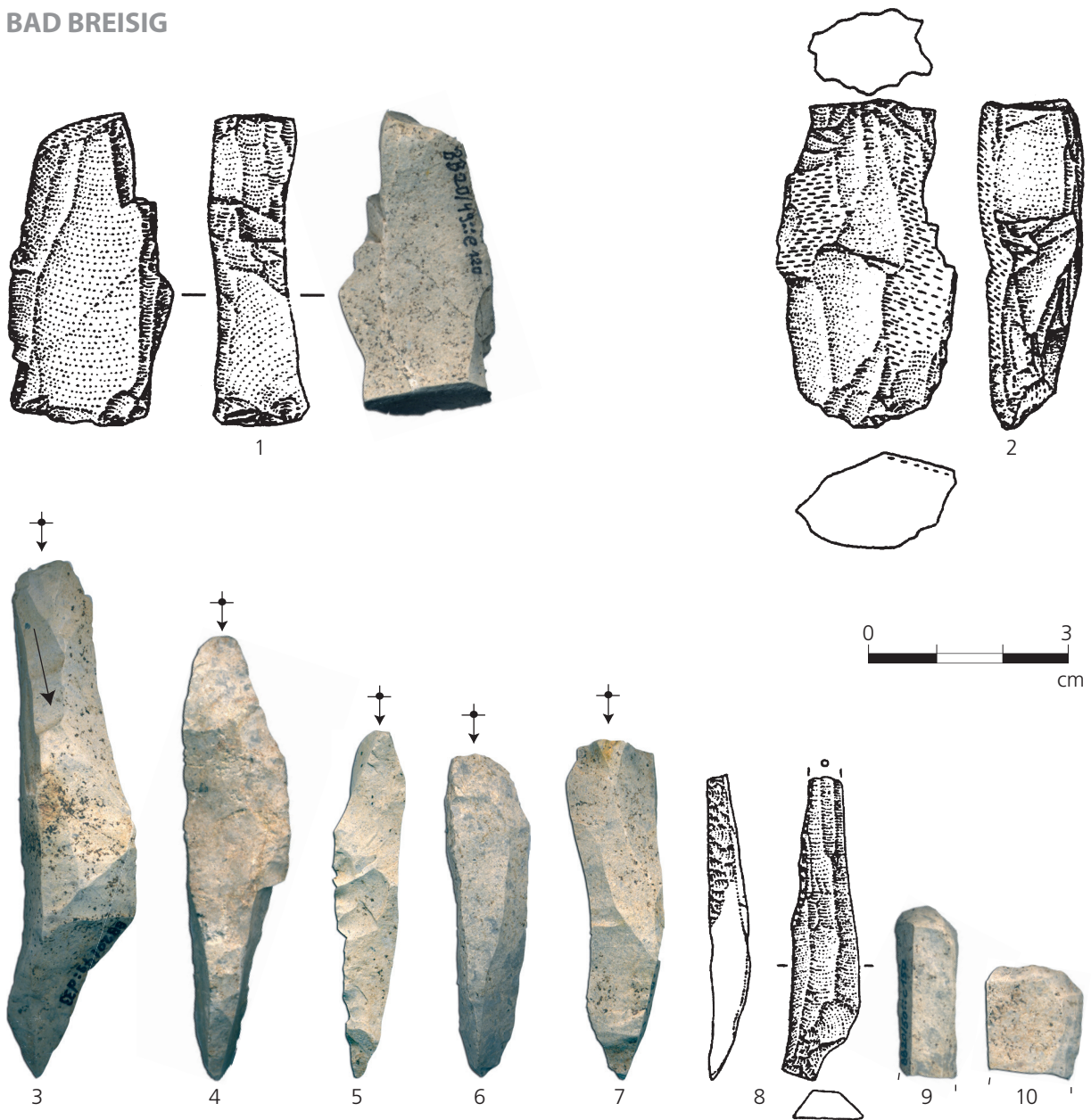
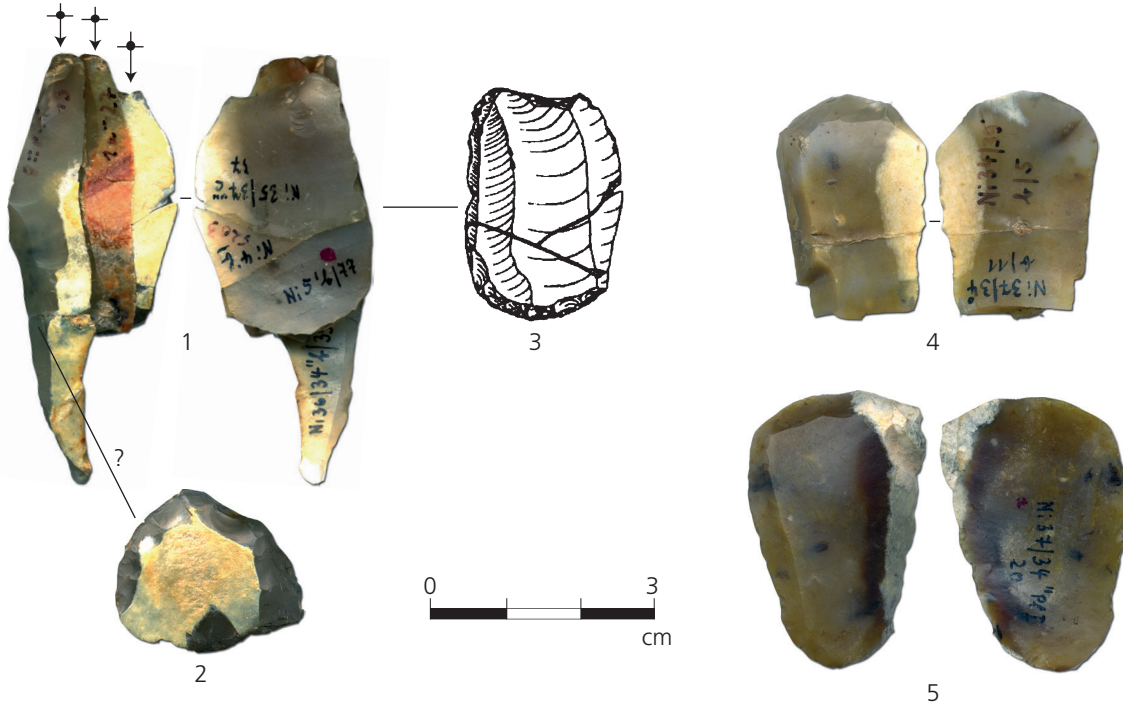


Fig. 10. Bad Breisig: 1–2 cores; 3–7 burin spall-like blanks connected to the blades/bladelets chaîne opératoire; 8 backed point; 9–10 end-scrapers (drawings G. Rutkowski, RGZM; photos L. Mevel).

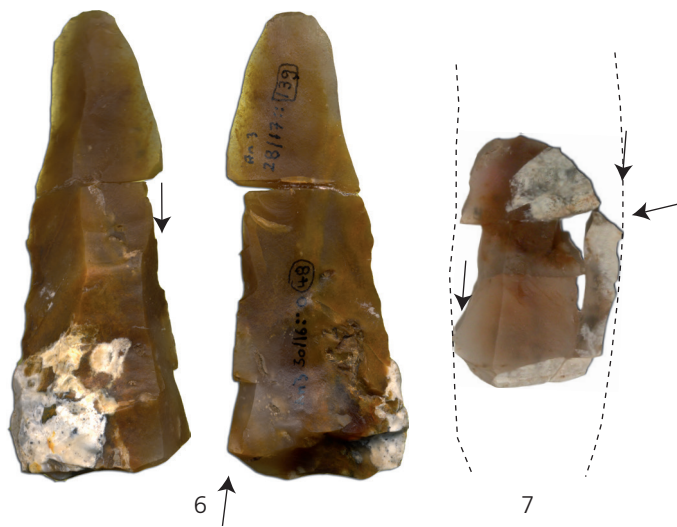
concentrations at Niederbieber yield a greater diversity of the probably older FMG assemblages (cf. GRIMM in press). Only new  $^{14}\text{C}$  dates will make it possible to confirm a chronological proximity between Kettig and Bad Breisig or Andernach 2-FMG. In the meantime, we can already note that the different occupations from Niederbieber and Andernach 3-FMG present unquestionable affinities in the techno-economic behaviour.

Harald Floss' research demonstrates that the lithic economy of the Upper Magdalenian people was mainly based on the exploitation of allochthonous raw material (FLOSS 1994; 2000), whereas the FMG preferred local or regional raw material sources. However, several publications on this subject showed that the FMG still exploited non-regional sources of raw material and, in particular, the flint

**NIEDERBIEBER 1**



**AN3-FMG**



**NIEDERBIEBER 4**

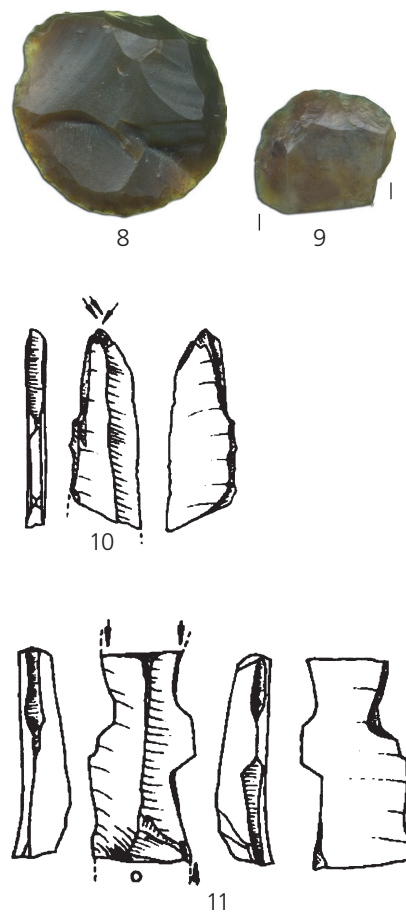
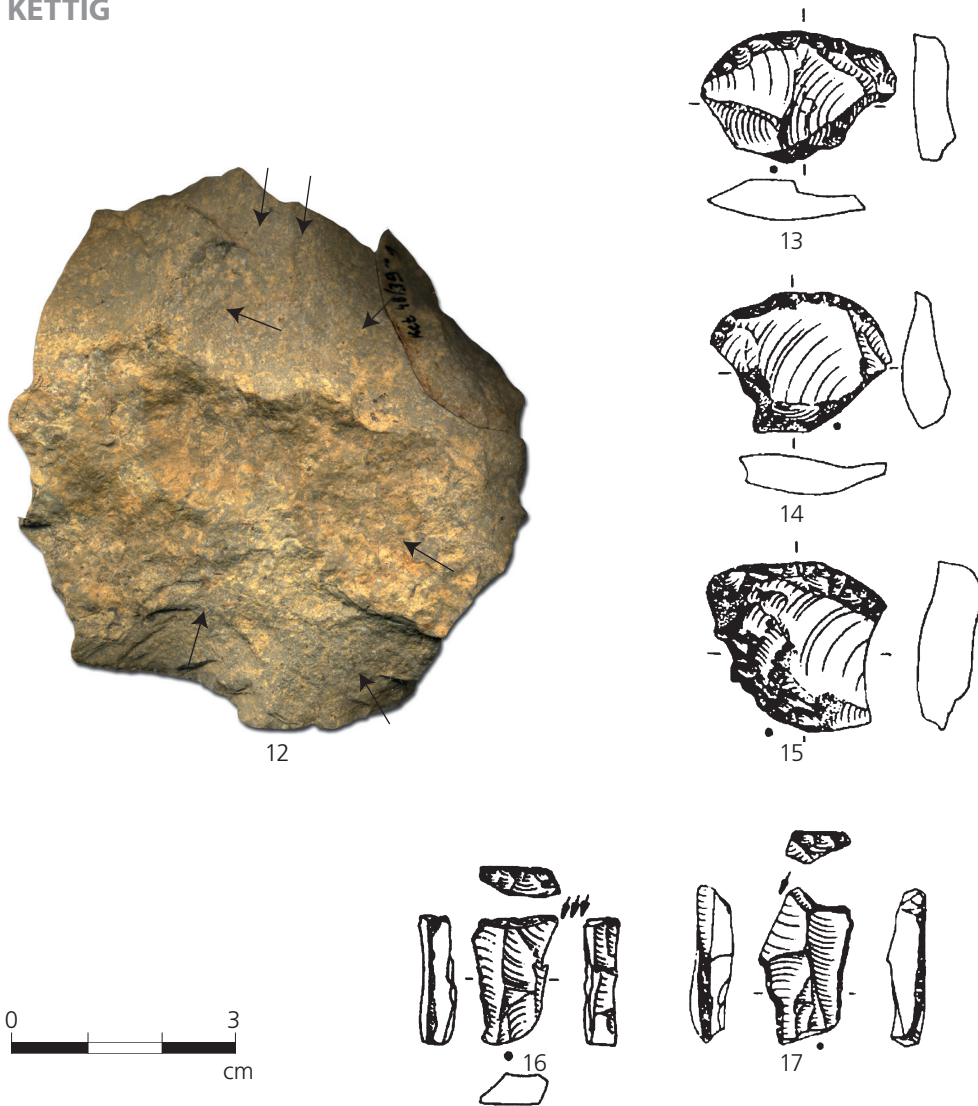


Fig. 11. Some examples of the blank production and selection for tool manufacturing. Niederbieber 1: refitting including an end-scrapers (3) produced at the beginning of the core exploitation (1) and a possible flake coming from the first flake sequence transformed into an end-scrapers; AN3-FMG: “long” regular blades transformed into a burin (6-7); Niederbieber 4: flakes and blade fragment transformed into end-scrapers (8-9) and regular small blades transformed into burins (10-11); Kettig: flake core made of Tertiary quartzite and end-scrapers made on flint flakes (13-15); burins made on regular small blades (flint, 16-17) (graph L. Mevel). ▶



► Cont. Fig. 11

sources from the Meuse region or from the Saalian moraines (STREET et al. 2006). These raw materials usually represent a minor part of the collections except for the inventory from Niederbieber 7 (GELHAUSEN 2011, 27; see above).

This major transformation of the behaviour is clearly concomitant with a shift of the economic paradigm. During the Upper Magdalenian, it seems that an important part of the lithic blanks – and in particular the flint blades – were produced outside the camp. In contrast, a large majority of the used blanks were produced *in situ* during the FMG phase. Indeed, the whole *chaîne opératoire* was carried out on the site.

In addition, despite the fact that the lithic economy is based on several local and regional resources, the systematic presence of allochthonous raw material – in the most important assemblages – suggests that these groups still had a cycle of nomadism which was not circumscribed by the periphery of the area of the Neuwied Basin. Although the social relation network seems less intense than during the Upper Magdalenian, the FMG from the Neuwied Basin were probably still in contact with human groups from the adjacent areas. The FMG clearly adapted their technical system to the raw materials available on a regional scale and/or changing conditions of traveling such as a need for lighter

equipment. Increased knowledge about the usability of local and/or regional resources combined with the technical change seemed to allow an intensified exploitation of these local and regional resources (GRIMM in press).

Consequently, it is important to note that the raw material selection is clearly not opportunistic, although the qualitative diversity of the resources used by the FMG might suggest this (AN-2FMG, AN3-FMG, Niederbieber *vs* Bad Breisig and Kettig). The majority of the raw material nodules are small-sized compared to those used by the Magdalenian, but they are in general fine-grained and of very good aptitude for knapping and the blocks were carefully exploited.

## 7 THE FIRST FMG EVIDENCE OF THE NEUWIED AREA? ANDERNACH-MARTINSBERG (AN2-FMG) AND GÖNNERSDORF SW

The absolute  $^{14}\text{C}$  dates obtained on the FMG level of Andernach 2 and on the south-western part of the Upper Magdalenian site of Gönnersdorf suggested the possibility of an earlier phase of FMG and/or a Final Magdalenian settlement between the end of the Upper Magdalenian and the classical phase of the FMG industries (see Tab. 1).

In the case of Andernach 2 (AN2-FMG), the corpus of  $^{14}\text{C}$  dates clearly suggests a diachronic FMG settlement of the site. The oldest measurements underline occupations ranging between 12,000 and 11,600  $^{14}\text{C}$ -BP (12,000–11,470 calBC<sup>1</sup>; STREET et al. 2006; 2012; GRIMM in press). A single date (OxA-V-2218-39: 12,270  $\pm$  50 BP; 13,080–12,240 calBC) indicates a possible, earlier occupation but it remains isolated and appears rather unreliable. The other dates are more recent. They suggest an occupation of the site between 11,600 and 11,200  $^{14}\text{C}$ -BP (11,470–11,160 calBC). The most recent dates of the AN2-FMG settlement are coherent with the dates obtained from AN3-FMG.

In the case of Gönnersdorf SW, we can ask whether it is possible to highlight the presence of a technological component different from the Upper Magdalenian in relation to the rare possible backed points discovered there and a rather young  $^{14}\text{C}$  date for an Upper Magdalenian settlement (OxA-15296: 12,385  $\pm$  65 BP; 12,894–12,174 calBC).

Hence, our objective is to verify if the lithic industries from these sites permit highlighting an early FMG phase in the Central Rhineland in terms of a technological analysis.

### 7.1 Gönnersdorf SW: a FMG background noise?

The SW concentration of Gönnersdorf was explored on a surface of 114.5 m<sup>2</sup>. This unit is characterized by a relatively small quantity of lithic artefacts and faunal remains (BUSCHKÄMPER 1993).

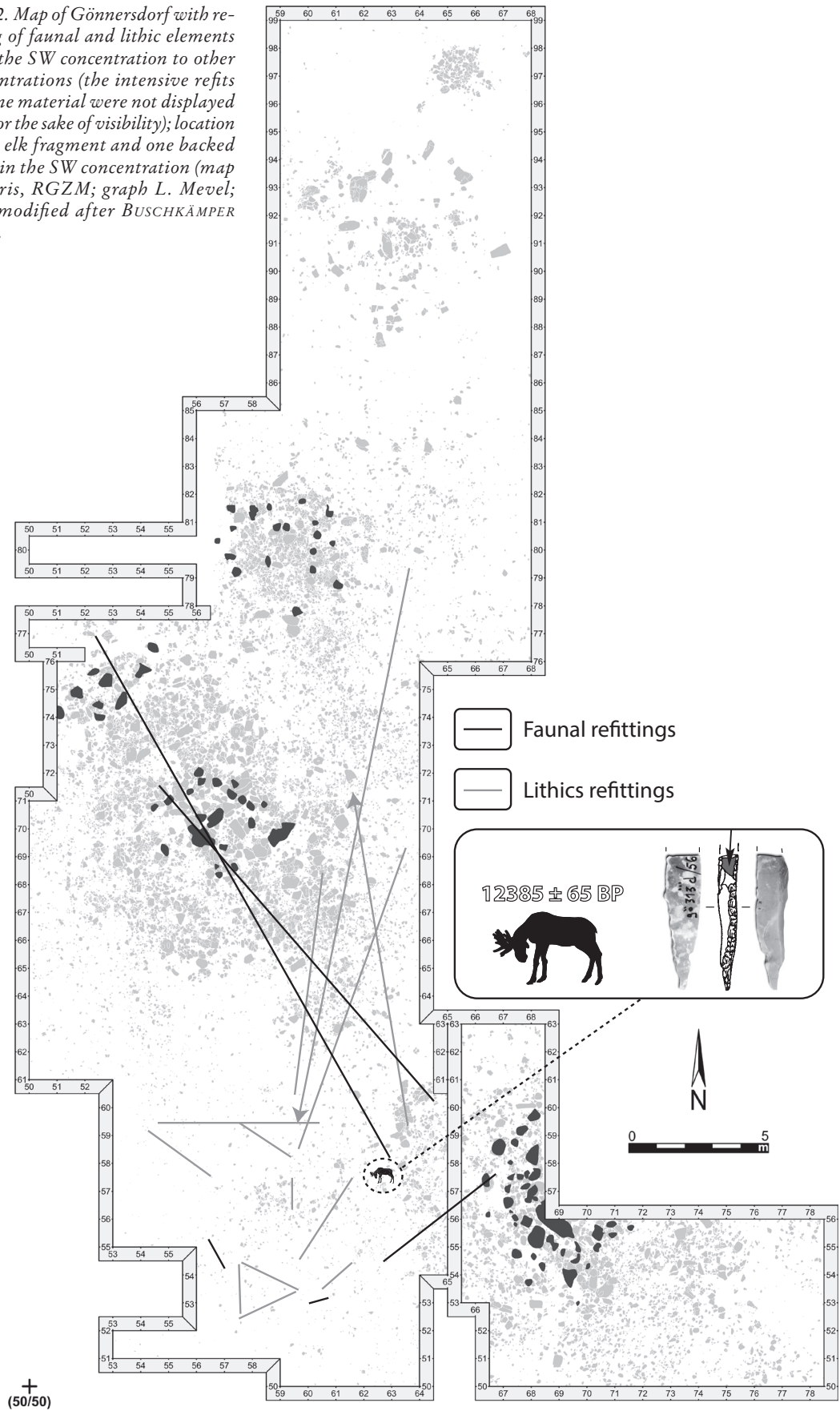
Substantial spatial structuring is not evident except in the eastern part of the concentration, close to concentration 1. The majority of the flint artefacts of the south-western assemblage was found in the N/E part. Indeed, 52 % of the artefacts (without chip fragments) are concentrated on a surface of 39 m<sup>2</sup> (corresponding to approximately 30 % of the entire excavated surface).

The analyses already realised on the archaeological material of this concentration and, in particular, the connections with the other concentrations of the site (KI, II, III, IV), showed circulations between the various units of lithic artefacts, stone material, and faunal remains (BUSCHKÄMPER 1993; Fig. 12).

For example, six connections between fragments of faunal remains were established: two intra-units; one between concentration SW and concentration I; and three between concentration SW and

1 The dates were calibrated using the CalPal programme and the CalPal-2007<sub>HULU</sub> calibration curve (JÖRIS/WENIGER 2007).

Fig. 12. Map of Gönnersdorf with re-fitting of faunal and lithic elements from the SW concentration to other concentrations (the intensive refits of stone material were not displayed here for the sake of visibility); location of the elk fragment and one backed point in the SW concentration (map O. Jöris, RGZM; graph L. Mevel; data modified after BUSCHKÄMPER 1993).



concentration II. These connections suggest the partial contemporaneity of material from the SW concentration with the different Upper Magdalenian spots of Gönnersdorf (Fig. 12).

The inventory comprises 2804 lithic remains but only 565 if we exclude the chips from the inventory ( $\leq 1$  cm). Among these artefacts, 164 tools were identified. The backed pieces largely dominate this corpus ( $n = 60$ ) and burins were also present in a relatively large number ( $n = 32$ ; Fig. 13,12–14). Among them, several specimens are burin-like cores (Fig. 13,15).

Different sources of allochthonous flint dominate the raw material spectrum, even if 26 % of the artefacts were made of Tertiary quartzite.

The corpus of backed pieces consists dominantly of backed bladelets ( $n = 50$ ; Fig. 13,1–5). In his master thesis, Jörg Buschkämper identified among the backed pieces six backed points (Fig. 13,6–11). However, only one had an impact fracture that can support the hypothesis of axial hafting (Fig. 13,9). From a spatial point of view, this possible backed point was found close to an elk fragment which yielded the previously mentioned  $^{14}\text{C}$  date.

The absence of impact fractures on the other possible backed points does not make it possible to consider them as axial projectile heads. In addition, the blanks used for these pieces fall in the morphometric variability of the entire corpus of backed pieces.

Soft organic percussion was visible on only two backed bladelets of the collection (seven had a preserved butt), but the unretouched blades and bladelets showed the characteristic features of soft organic percussion (61 %). Only 15 % of the blades and bladelets (eight bladelets and one blade) wore indications of the use of a soft hammerstone. Thus, we cannot perceive any change to the Upper Magdalenian behaviour regarding the percussion technique.

The lithic collection showed an important fragmentation of the *chaîne opératoire* in time and space. The scarcity ( $n = 7$ ) of cores in the inventory is one example in support of this conclusion. The lack of refittings or the absence of the beginning of the *chaîne opératoire* (cortical flakes, crested blades) also support this statement. The bladelet production seems to be the most important objective on the site. It is carried out according to two different methods: from blocks ( $n = 4$ ) and from burin-like cores ( $n = 3$ ). In consequence, it is not really a surprise to find many “burin spalls” used as blanks to make the backed bladelets.

Considering these similarities with the Upper Magdalenian assemblage, the lithic inventory does not support the presence of a FMG component at the south-western concentration of Gönnersdorf. The existence of a single backed point is not sufficient to consider the collection coming from an early FMG settlement. However, the association of some elk remains (STREET/TURNER 2014, 245–246) and a backed point suggested the possibility of an isolated event later than the Upper Magdalenian settlement. Thus, we can consider Gönnersdorf SW perhaps best as a Final Magdalenian settlement. Moreover, several Magdalenian settlements in the Paris Basin, Switzerland, and south-western Germany also contain backed points in their assemblages (see SCHMIDER 1992; ALIX et al. 1993; VALENTIN 1995; 2008a; LHOMME et al. 2004). Thus, it will be necessary to further document the techno-economic behaviour of the Upper Magdalenian settlements and to elucidate the already mentioned relationship between the different concentrations of the site and the SW concentration, to evaluate the implication of these isolated pieces at Gönnersdorf.

### 7.2 Andernach-Martinsberg (AN2-FMG): evidence of an early FMG settlement?

The AN2-FMG settlement overlaid an important Upper Magdalenian settlement and lies at a distance of 20 m to the densest part of AN3-FMG (KEGLER 2002; GELHAUSEN et al. 2004). The excavated surface of AN2-FMG corresponds to a reduced part of a bigger camp unfortunately un-excavated. A previous spatial analysis brought serious arguments in favour of at least a bipartition of the material in two components, based on the dichotomy between the flint concentrations, mainly originating from the Meuse valley, and the concentrations of Tertiary quartzites (STAPERT/STREET 1997). Furthermore, the presence

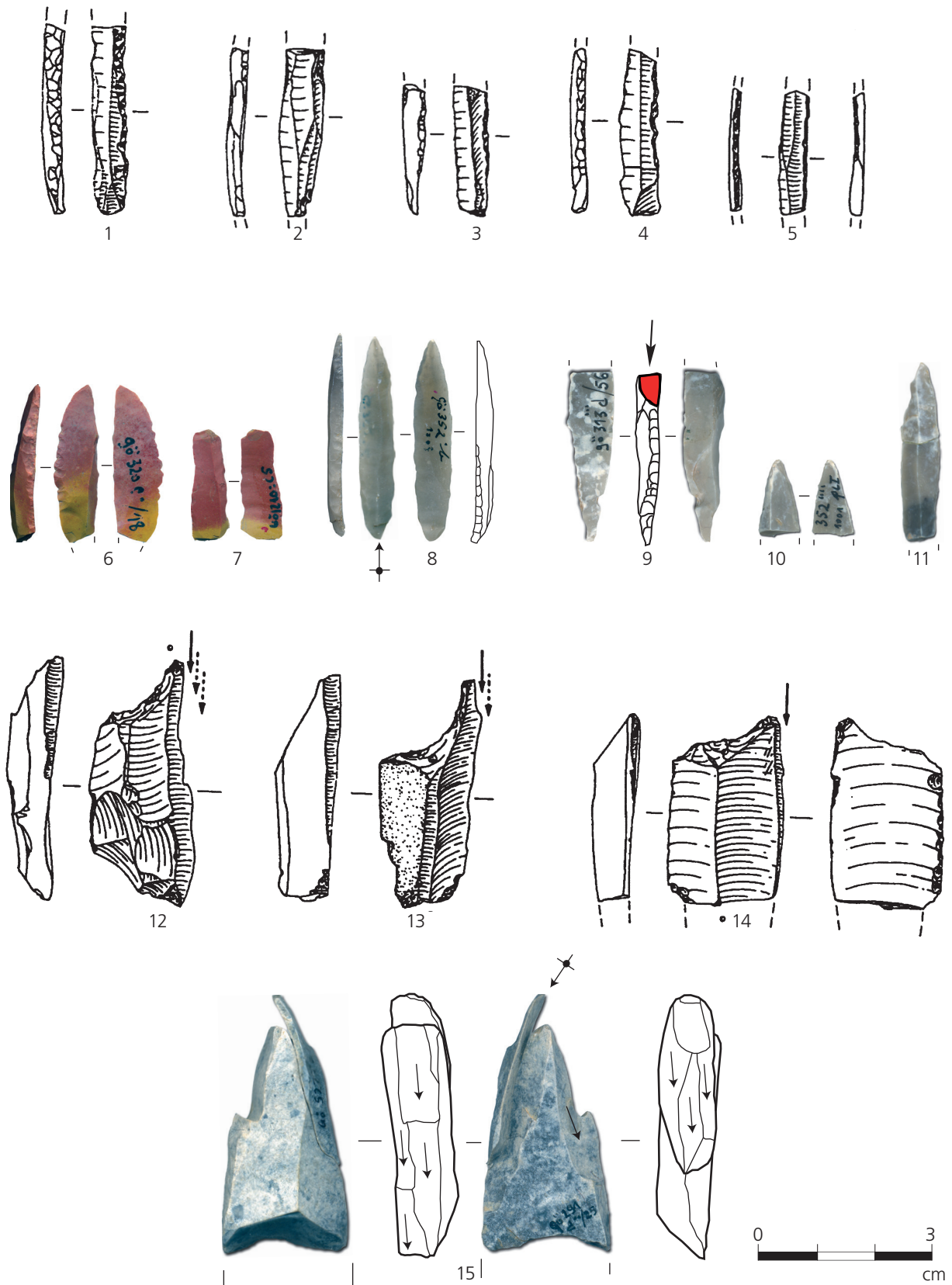


Fig. 13. Lithic industry from Gönnersdorf SW. 1–5 Backed bladelets; 6–11 backed points; 12–14 burins; 15 burin-like core (drawings: Buschkämper 1993; graph L. Mevel).

of possible hearths within the distribution of the Tertiary quartzite, each surrounded by a distinct faunal inventory could indicate another three episodes (STREET et al. 2006).

The lithic inventory comprises 1500 artefacts (BOLUS 1984; FLOSS 1994) but only 505 if we exclude the smaller remains of the inventory ( $\leq 1$  cm). The raw materials are rather typical of what we find in the GI-1b settlements from the Neuwied basin. Here, different qualities of Tertiary quartzite dominate the spectrum of exploited materials. Several varieties of flint of very good quality are also present. A smaller number of chalcedony artefacts was also found. Here, it is a very low quality raw material which strongly contrasts with the good quality chalcedony used in AN3-FMG or Niederbieber for example. The retouched artefacts are dominated by various categories of backed pieces ( $n = 36$ ). They were more or less equally manufactured on regular short blades ( $n = 11$ ) and small bladelets ( $n = 8$ ). The scrapers ( $n = 25$ ) are mainly represented by flint specimens and were equally made on flakes ( $n = 11$ ) and blades ( $n = 11$ ). The backed pieces made on flint ( $n = 17$ ) and on Tertiary quartzite ( $n = 19$ ) are present in similar numbers. The smaller backed pieces were more frequently made on Tertiary quartzite ( $n = 5$ ).

The important rate of fragmentation of these artefacts does not make it possible to consider the initial morphometry of these various categories of blanks. We can note that the longest and most regular elements were almost all manufactured on flint. Moreover, the laminar aspect of the backed pieces is clearly more visible on the flint specimens.

The Tertiary quartzite backed pieces were frequently made on shorter and less regular blanks. Does the choice of the raw material play a decisive role in what seems to be a true distinction? It is difficult to argue because some long and robust laminar blanks in Tertiary quartzite attest that it was completely possible to obtain this kind of blanks in this raw material (Fig. 14). According to the results of the functional analysis carried out by Hugues PLISSON (1985), the two categories of points were used as projectile implements. The Tertiary quartzite is the raw material most frequent among the artefacts larger or equal to 1 cm ( $n = 242$ ). The intention of obtaining bladelets is prominent in this artefact category. The complete bladelet blanks suggest a production of these blanks mainly ranging between 4 and 2 cm length. These observations are also in accordance with those on the rare bladelet cores of the assemblage. The intention to produce blades on Tertiary quartzite is marginal to non-existent. However, as we previously noted, there are some robust blade fragments of this material in the collection (Fig. 14,6). They were highly reduced and transformed and they were certainly produced outside of the excavated unit. Except for very few examples, the use of the soft hammerstone, in a tangential version, is exclusive for this raw material.

The flint artefacts are clearly connected to a blade and bladelet *chaîne opératoire*, partially carried out *in situ*. The majority of these blades and bladelets possess lengths between 6 and 3 cm (Fig. 14). The rare technical artefacts show that the production was exclusively orientated to obtain straight and regular short blades (Fig. 15). The negatives of removals show that these blanks were produced during recurrent blade production sequences. The use of the soft hammerstone, in a tangential version (PELEGRIN 2000), is also exclusive for this raw material.

According to the results presented previously, it is possible to divide the assemblage into two distinct components. However, given the reduced size of the inventory, it is difficult to argue in favour of a diachronic distinction.

Based on the fact that the flint raw material generally provided regular and standardised laminar blanks partially transformed into “long” lithic backed points, we cannot absolutely exclude an economic variable. Therefore, flint appears to have been mainly reserved for the manufacturing of regular short blades and the Tertiary quartzite for the bladelet production. According to our observations on the other inventories of the area, it seems that the qualitative criteria are not sufficient to characterize an early phase of the FMG settlements in AN2-FMG. Thus, if the flint component of AN2-FMG represented an early witness of the FMG settlement, there are very few differences to other FMG assemblages such as Niederbieber or AN 3-FMG but some more differences to Kettig and Bad Breisig.

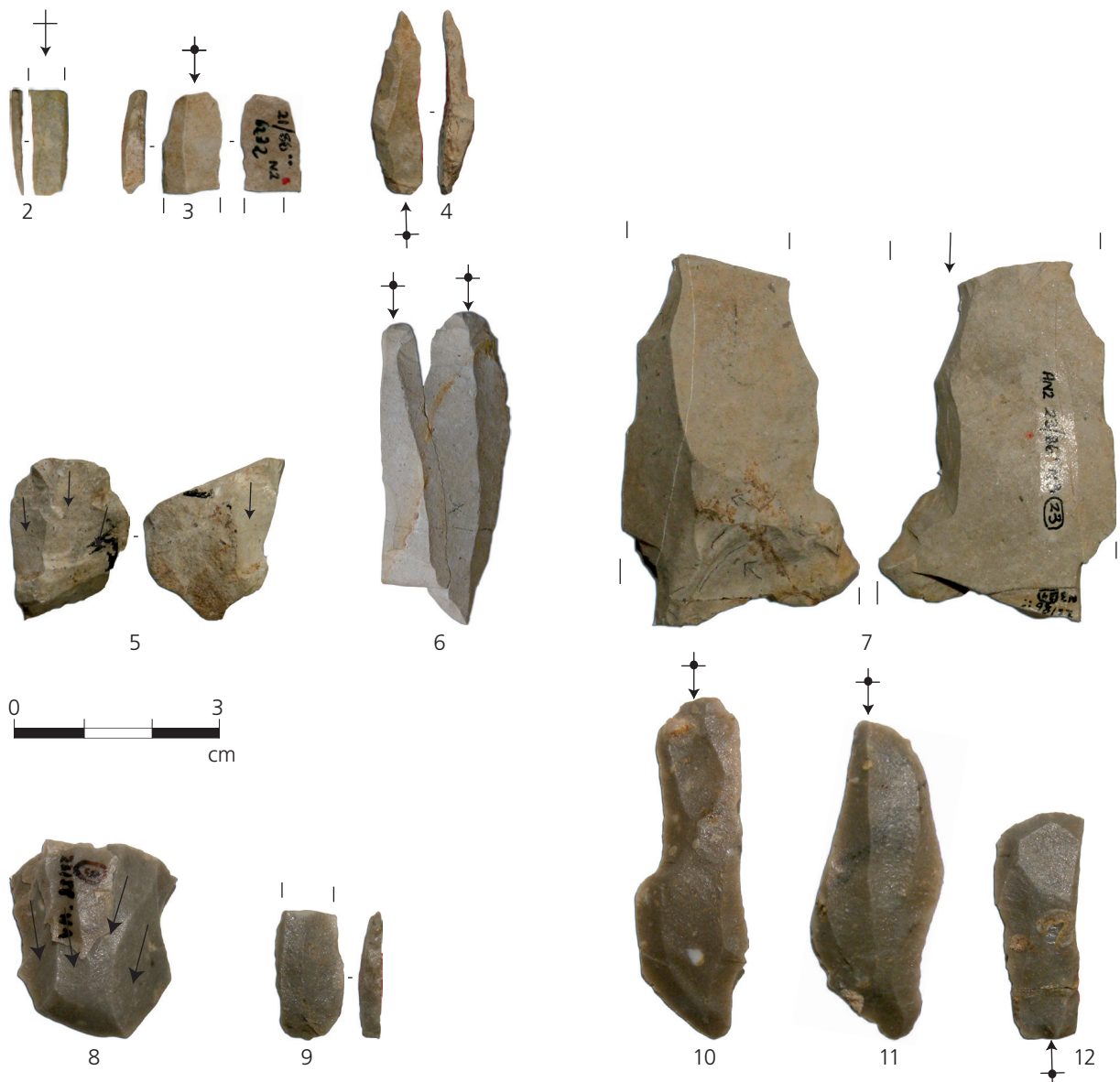
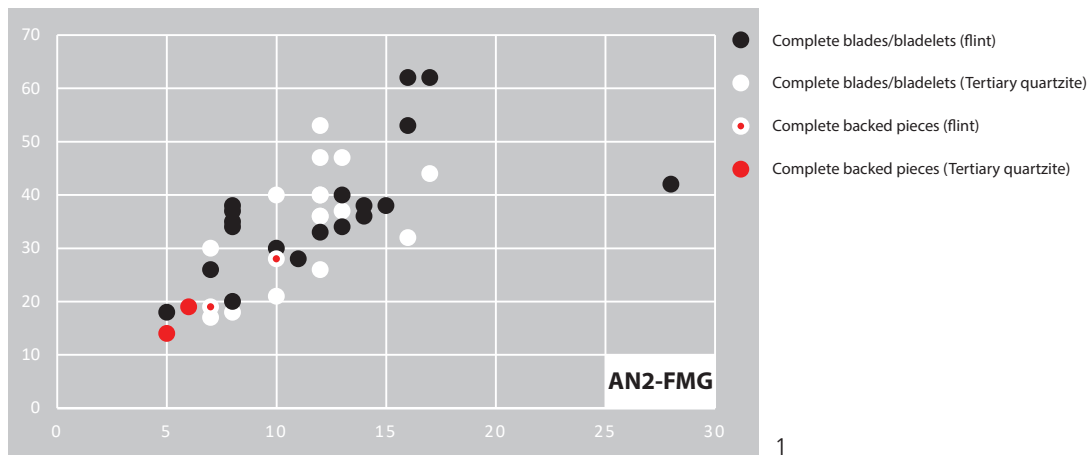


Fig. 14. AN2-FMG: Length/width ratio of the flint and Tertiary quartzite elements with completely preserved lengths (1); examples of the Tertiary quartzite industry: 1–3 backed points; 4, 7 bladelet cores; 5, 9, 10 small regular unretouched blades; 11 end scraper; 6 big blade fragment (graph L. Mevel).

## AN2-FMG

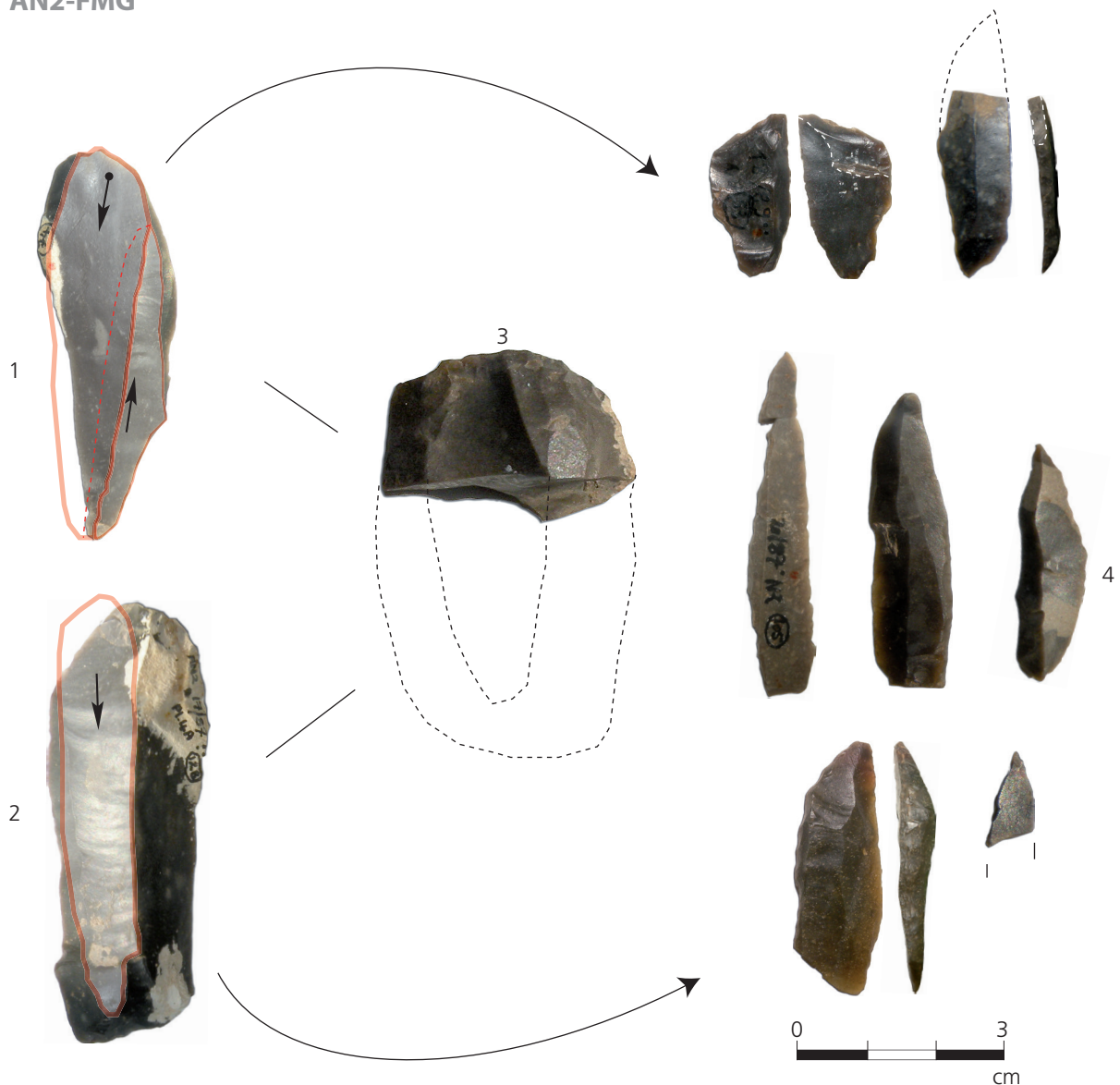


Fig. 15. AN2-FMG: 1–2 flint blades connected to a small regular blade production; 3 blade core fragment; 4 backed points made of flint (graph L. Mevel).

## 8 CONCLUSION AND PERSPECTIVE

This first comparative technological study highlights similarities and differences between the analysed FMG sites from the Central Rhineland. The material analysed thus far is not sufficient to identify an early FMG phase in the Central Rhineland, despite a few radiocarbon dates which seem to be coherent with an early phase in the Azilianisation process (BODU et al. 2006; VALENTIN 2008a; 2008b; MEVEL et al. 2014; GRIMM in press). At this stage, we can simply argue that in the Central Rhineland no FMG inventory exists that is strictly similar to the early Azilian from the Paris Basin (BODU 1998; BODU et al. 2006; BODU/MEVEL 2008) or from the Somme Basin (COUDRET/FAGNART 1997; 2015). In contrast, we can underline the relative proximity of the evolutionary trajectories if we take into account the technical trends observed with the collection from Andernach AN2-FMG. Thus, this

collection is not only the first “post-magdalenian” settlement from this area but also represents the oldest unambiguous evidence of FMG in NW-Europe. Indeed, the production of small regular and rectilinear blades on good quality flint with a soft hammerstone is an objective shared by the groups of Andernach and the chronologically some hundred years older, lower level of Closeau (BODU 2000; BODU et al. 2006). Unfortunately, it is a single point of comparison.

Although it is possible to identify some differences in the techno-economic behaviour between the different sites from the Neuwied Basin, details of the chronological succession require further analysis. The inventory of Bad Breisig that can be considered as the most recent witness of the FMG phase in the Central Rhineland is also the most “Azilian” site of the area. The techno-economic behaviour is in fact very close to that known for example from the upper layer of Le Closeau, in particular in the importance of the expedient production sequence (KILDEA 1996: locus 1, 3, 5, 6, 7, 11; BODU 1998). Based on the unquestionable stratigraphic position, we consider Bad Breisig as the thus far youngest FMG site from the Central Rhineland. Consequently, can we consider some of the observed behavioural aspects as characteristic for a later phase? The described proximity to the assemblage Kettig possibly shows that the behavioural transformation arrived before the Laacher See eruption. Here, new  $^{14}\text{C}$  dates could bring some answers about the chronological seriation of these events during the entire period considered. From this point of view, the different concentrations of Niederbieber and Andernach AN3-FMG would constitute an earlier step of the FMG settlement of the Neuwied area suggesting, with the evidence from AN2-FMG, a relatively long continuity in the technical behaviour. For the moment, this distinction is based on qualitative criteria and we lack further  $^{14}\text{C}$  dates, in particular from Kettig, AN3-FMG, and some of the Niederbieber concentrations, to validate this hypothesis. The perception of a progressive evolution of behaviour could be connected with different geographical sectors. An evolutionary development is now documented in the northern French Alps (MEVEL et al. 2014; MEVEL 2017) and perhaps in the Paris Basin (BODU 2000). Indeed, several *loci* from the intermediate layer of Le Closeau could also fit in this dynamics of progressive evolution of the technical practices (MEVEL/BODU in press). In contrast, the current evidence from the Central Rhineland indicates a technical system that is stable over long phases and to which changes are introduced only during a short period (cf. GRIMM in press). Consequently, in this geographical sector behavioural changes appear thus far not to follow the same progressive evolution as in the French regions but seem to occur in a more threshold-like manner.

As we previously mentioned, this paper presents a preliminary point of view on the technical behaviour of the FMG from the Central Rhineland. For the future, it will be necessary to refine the intra- and inter-site comparison taking into account further, more detailed data such as the morphological typology of the lithic implements and refitting. Furthermore, more data needs to be collected to refine the intra-site (e.g. Kettig, Niederbieber) but also the regional chronology. Finally, it will be important to confront these first results with other FMG settlements from the Central Rhineland, in particular, other concentrations of Niederbieber, to test the results presented here and to help us clarify the evolution of the economic behaviour in this region.

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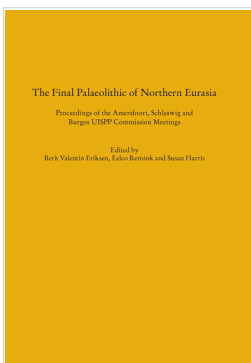
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**Berit Valentin Eriksen, Susan Harris, Eelco Rensink (Hrsg.)**

## **The Final Palaeolithic of Northern Eurasia**



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