7. INTER-ASSEMBLAGE COMPARISONS

7.1. The VLL Lithic Assemblage

7.1.1. Introduction

The Middle Pleistocene to Late Pleistocene transition at the VLL *locus* at Veldwezelt-*Hezerwater* was a period of remarkable changes in both climate and environment. During the period of climatic amelioration, which followed the Penultimate Glacial Maximum, Northwest Europe probably saw a significant demographic expansion and the development of “new” lithic technologies. During the Middle Pleistocene to Late Pleistocene transition phase, semi-rotating parallel/prismatic and opportunistic core reduction strategies and “small tools” were in place at the VLL *locus*. So-called “expedient” core reduction strategies were used to flake locally-found low-quality lithic raw materials. The location of the VLL *locus* was probably primarily chosen by the Middle Palaeolithic humans because of the immediate availability of low-quality raw material outcrops. The analysis of the lithic assemblage, which was left behind by the Middle Palaeolithic flint knappers who were occupying the VLL *locus*, allowed the following general inferences regarding the most important characteristic technological features of the lithic assemblage: (1) the core assemblage was dominated by parallel/prismatic core reduction, (2) especially relatively small cores were found, (3) the appearance of strategies for rejuvenating core striking platforms [core rejuvenation flakes] has been attested, (4) a general predominance of laminar end products has been observed and (5) a toolkit, which was essentially dominated by small tool forms, has been found. The lithic assemblage, which was excavated at the VLL *locus*, shows that an essentially “small-tool-component” could be added to “macrolithic” Middle Palaeolithic assemblages. Indeed, it seems that the heavy Middle Palaeolithic tools were thus sometimes replaced by a much lighter toolkit. At the VLL *locus* at Veldwezelt-*Hezerwater*, there was a clear increase in the production of blades, as well as in the production of burins, notched and denticulated pieces. These tools show a distinct pattern of size reduction. These core and tool reduction strategies made possible a much lighter and more portable toolkit that would allow small expeditionary task groups a higher degree of mobility. These techno-typological features, which are relatively common in the lithic assemblage of the VLL *locus*, appear to signal some sort of “ecology-driven” change in Middle Palaeolithic technological adaptations.

This section was mainly designed to place the VLL lithic assemblage, which has been excavated at Veldwezelt-*Hezerwater*, in a broader research context by drawing comparisons to other published Middle Palaeolithic open-air laminar assemblages in Northwest Europe. Unfortunately, very few Late Saalian (MIS 6) sites have been excavated in Northwest Europe. We would like to have based our inter-assemblage comparisons on “detached” contextual attributes, which were indeed responsible for the observed contrasts or similarities. Unfortunately, this has not been proved possible. Lithic core and tool reduction strategies cannot be compared adequately with each other if time, climate, environment, raw material or cultural development, are also possible factors in the diversity and organisation of the lithic assemblages. Unfortunately, we were forced to undertake inter-assemblage comparisons without making rigorous chronological distinctions. We are aware that by comparing Middle and Late Pleistocene assemblages, we run the risk of comparing lithic core and tools reduction strategies, which were made and modified in very different adaptive contexts, without being able to identify the contextual attributes, which were effectively responsible for the attested contrasts and similarities among the different lithic assemblages.

7.1.2. Discussion of the Middle Palaeolithic Laminar Sites in Northwest Europe

7.1.2.1. Introduction

It seems that the "origins" of blade production are very complex. However, the Middle Palaeolithic laminar assemblage, which has been excavated at the VLL *locus* at Veldwezelt-*Hezerwater*, is not really unique. It seems that blades struck from prismatic or near prismatic cores appear and disappear through time and space. Indeed, many lithic assemblages from (1) Europe (*e.g.*, Révillion & Tuffreau 1994), (2) Asia (*e.g.*, Rust 1950; Garrod & Kirkbride 1961; Jelinek 1981, 1990; Derevianko & Petrin 1993, 1995; Mercier *et al*. 1995; Derevianko & Markin 1995, 1997; Kuhn *et al*. 1999; Derevianko *et al*. 2000a,b; Bantingham *et al*. 2001) and (3) Africa (*e.g.*, Vermeersch 1992, 1995, 2001b; Vermeersch *et al*. 1990; Cornelissen 1995; Deacon & Wurz 1996; McBrearty & Brooks 2000) provide evidence for the production and use of blades during the "Middle" Palaeolithic and even during the late "Lower" Palaeolithic (*e.g.*, Bordes 1977). It seems that, laminar assemblages are somewhat randomly scattered across both time and space prior to the "Upper" Palaeolithic. So, blade production does not seem to be that big a "threshold" in the development of human technological capacities, since late "Lower" and "Middle" Palaeolithic people already possessed the cognitive sophistication and the manual dexterity required to carry out complex lithic reduction operations, like handaxe production, Levallois core reduction and other complicated technologies.

In Belgium, Northern France, the Rhineland (Germany) and in the United Kingdom several Middle Palaeolithic sites rich in blades (*e.g.*, Boëda 1988; Conard 1990; Otte *et al*. 1990; Révillion 1994; Révillion & Tuffreau 1994; Révillion 1995; Mellars 1996; Depaepe 1997; Bar-Yosef & Kuhn 1999) have been excavated over the course of the last two decades. These laminar Middle Palaeolithic assemblages appear to be largely limited to open-air sites. These sites can be dated to the Saalian *s.l.* (MIS 8, 7 & 6), the Last Interglacial *s.l.* to Early Weichselian transitional phase (late MIS 5a to first half of MIS 4) and the second half of the Middle Weichselian (second half of MIS 3). However, indications of the existence of deliberate and highly specialised blade production in Northwest Europe had been available for some time in early discoveries at sites as Crayford, Kent, England (*e.g.*, Spurrell 1880; Cook 1986) and Coquelles, northern France (*e.g.*, Lefèbvre 1969; Tuffreau 1971).

7.1.2.2. Overview of the Key Saalian *s.l.* Laminar Sites in Northwest Europe

- **Crayford** (Fig. 7.1.1. & Table 7.1.), "*Stoneham's Pit*", Kent, England (*e.g.*, Spurrell 1880; Roe 1981; Cook 1986) is a Saalian (probably MIS 7) site. The Crayford blade assemblage (n=510) was the first known "Middle" Palaeolithic blade assemblage that has already been discovered way back in the 19th Century. At this site, unipolar convergent and bipolar recurrent parallel cores and blades were found. However, many opportunistic flakes were also present within this lithic assemblage. In the United Kingdom, similar lithic blade assemblages are often referred to as "Crayford-type blade-dominated assemblages" (*e.g.*, Wenban-Smith 1992, 1996). Another important characteristic of these "Crayford-type" lithic assemblages is that they never contain Levallois products. The "Crayford-type" toolkit is dominated by denticulated and notched pieces. However, some side-scrapers may be present. Finally, it is important to keep in mind that the "Crayfordian" is a different type of technology than the so-called "Clactonian". Indeed, "Clactonian" assemblages comprise more globular cores, which were reduced in a less structured way. The "Clactonian" contains no blades at all.

- **Baker's Hole** (Fig. 7.1.2 & Table 7.1.), Northfleet, Kent, England (*e.g.*, Wenban-Smith 1990, 1992, 1996). At this Saalian site (between 250,000 to 200,000 years ago), artefacts have been collected since the 1880's. The two major lithic assemblages at Baker's Hole were collected by R.A. Smith and J.P.T. Burchell. It was found that the "Burchell collection" contained a major laminar component, which was similar to the assemblage found at Crayford. Indeed, the "Burchell collection" entirely lacked Levallois products and consisted entirely of opportunistic flake or blade production of the so-called "Crayford-type". On the other hand, the "Smith Collection" was a laminar assemblage that also included Levallois flakes.

- **Coquelles** (Fig. 7.1.3, 7.2 & Table 7.1.), "*La Petite Rouge Cambre*", Pas-de-Calais, France (*e.g.*, Lefèbvre 1969; Tuffreau 1971; Révillion 1995). This is another Saalian *s.l.* site, which is situated not far from Sangatte. The "Lower Gravel" is characterised by some big laminar non-Levallois parallel cores. The morphology of the initial elongated flint nodules still characterises the morphology of the resulting cores. The "Upper Gravel" is characterised by the presence of a Levallois blade assemblage. Within the fine sediments on top of the terrace (*Couche* 5), which were affected by periglacial phenomena, another non-Levallois blade assemblage has been found. Within the toolkits, many notched and denticulated pieces were present.

- **Markkleeberg** (Fig. 7.1.4 & Table 7.1.), Germany (*e.g.*, Baumann *et al.* 1983) probably is an Early Saalian *s.l.* site, which is mainly characterised by Levallois blade reduction. However, Levallois flake cores and many side-scrapers, transverse side-scrapers and bifaces were also present within the lithic assemblage.

- **Saint-Valéry-sur-Somme** (Fig. 7.1.5 & Table 7.1.), "*Moulin de la veuve Rignon*", Somme, France (*e.g.*, de Heinzelin & Haesaerts 1983; Tuffreau 1987; Révillion 1995) is another example of non-Levallois blade production (n=133), which can probably be dated to the Early or Middle Saalian *s.l.* (MIS 8 or 7). The non-Levallois elongated cores, which were carefully prepared, were struck off from two opposed striking platforms. Only 39 blades were present. The active faces of the prismatic cores, from which the recurrent blade removals were struck off were usually semi-rotating. A few notched pieces were also present.

- **Rissori** (Fig. 7.1.6 & Table 7.1.), Masnuy-Saint-Jean, *Hainaut*, Belgium, (*e.g.*, Adam & Tuffreau 1973; Adam 1991, 2002), which is a Saalian *s.l.* lithic assemblage, is mainly characterised by numerous Levallois blades. However, at Rissori, several prismatic semi-rotating blade cores were present as well. Crested blades have also been found. The Rissori toolkit is heavily dominated by relatively big side-scrapers and points.

- **Rheindahlen B1/B2** (Fig. 7.1.7 & Table 7.1.), Mönchengladbach, Nordrhein-Westfalen, Germany (*e.g.*, Bosinski 1966, 1973; Thieme 1983; Schirmer & Feldmann 1992; Klostermann & Thissen 1995; Thissen 1998; Ikinger 2002; Schirmer 2002) is arguably the most important open-air reference site in the West of present-day Germany. However, the chronostratigraphic position of the site has been hotly debated. Now, the loess-soil sequence of Rheindahlen has been safely attributed to the Middle Saalian *s.l.*, which is the terrestrial equivalent of MIS 7 (Schirmer & Feldmann 1992; Schirmer 2002). The lithic assemblage of Rheindahlen is characterised by the presence of many Levallois and non-Levallois blades. Several crested blades were also found. The presence of tools with stem-like proximal ends is remarkable. As a result, the B1/B2 lithic assemblage has been interpreted as "Micoquian".

- **Biache-Saint-Vaast - *niveau* IIA** (Fig. 7.1.8 & Table 7.1.), *Pas-de-Calais*, France (*e.g*., Tuffreau 1988; Tuffreau & Sommé 1988; Boëda 1988; Dibble 1995). This late Middle or early Late Saalian *s.l.* Levallois-based lithic assemblage with a laminar tendency was characterised by unipolar and bipolar recurrent Levallois core reduction. Indeed, the production of elongated Levallois flakes and blades seems to have been one of the aims of the attested core reduction strategies. Within the lithic assemblage that was excavated at Biache-Saint-Vaast, many Levallois flakes and blades were present (n=400). Many tools (n=500) have also been recognised within the lithic assemblage (Tuffreau 1988; Dibble 1995). Side-scrapers were present in great numbers. However, there is a relatively low proportion of the notched and denticulated tool forms (n=12 & 37 respectively). Most of the tools were made on the larger blanks (6-8cm). However, the smallest side-scraper was 3.1 cm. Thus, tools this small were still considered useful. However, it seems that at the site of Biache-Saint-Vaast, the natural presence of good-quality raw materials, resulted in formal Levallois core reduction.

- **Étaples-*Bagarre - couche 7*** (Fig. 7.1.9 & Table 7.1.), *Pas-de-Calais*, France (*e.g*., Tuffreau 1987) represents another Late Saalian *s.l.* Levallois blade assemblage together with non-Levallois blade production. The tool forms comprise side-scrapers, denticulated and notched pieces.

- **Veldwezelt-*Hezerwater* - VLL *Locus*** (Fig. 7.1.10 (VLL *s.s*.), Fig. 7.1.11 (GRA[2B]) & Table 7.1.), *Limburg*, Belgium probably is a Late Saalian *s.l.* site where parallel/prismatic and opportunistic core reduction strategies have been attested. We would like to make a distinction between the VLL *s.s.* and the GRA[2B] lithic assemblages, which were excavated at Veldwezelt-*Hezerwater*. It is quite remarkable that no clear Levallois products were found. The toolkit was mainly characterised by small tools.

7.1.2.3. Overview of the Key Last Interglacial *s.l.* (MIS 5) Laminar Sites in Northwest Europe

- ***La Butte d'Arvigny*** (Fig. 7.1.12 & Table 7.1.), Moissy-Cramayel, *Seine-et-Marne*, France (*e.g*., Gouédo *et al*. 1994; Laurent *et al*. 2000), is situated to the North of Melun. The site, which has recently been dated (ESR) to around 90,000 years ago (Laurent *et al*. 2000), was characterised by the presence of a non-Levallois blade assemblage. The toolkit is further characterised by the presence of a small number of notched and denticulated pieces. However, some side-scrapers were also found.

- **Wallertheim D** (Fig. 7.1.13 & Table 7.1.), Germany (*e.g*., Conard 1990; Conard & Adler 1997; Adler *et al*. 2003) is a site that can be dated to the Last Interglacial *s.l*. The lithic assemblage (n=634) is characterised by the presence of massive parallel blades (n=20). Refits document unipolar parallel and pyramidal blade core reduction. The toolkit (n=33) includes backed blades and steeply retouched points.

- **Rocourt** (Fig. 7.1.14 & Table 7.1.), *Liège*, Belgium (*e.g*., Cahen 1984; Haesaerts 1984; Boëda 1988; Otte *et al*. 1990; Otte 1994) is a site, which should probably be dated to the transition from the late Last Interglacial *s.l.* to the Early Weichselian. The lithic assemblage (n=407), which has been excavated at the Rocourt site, included 78 "Levallois" blades. Several blades have been refitted. This is one of the most sophisticated Middle Palaeolithic blade sites in Northwest Europe. The toolkit (n=21) comprised retouched blades, burins, notched and denticulated pieces.

- **Saint-Germain-des-Vaux/Port-Racine** (Fig. 7.1.15 & Table 7.1.), *Manche*, France (*e.g.*, Révillion 1993; Révillion & Cliquet 1994) has yielded an assemblage, which belongs to the end of the Last Interglacial *s.l.* The lithic assemblage is characterised by non-Levallois semi-rotating and rotating unipolar and bipolar prismatic cores. The blades represented only 5% of the assemblage. However, Levallois blades were also attested (18%). Opportunistic core reduction was present as well. The tools (2.5%) were dominated by denticulated and notched pieces.

- **Riencourt-lès-Bapaume - CA Horizon** (Fig. 7.1.16 & Table 7.1.), *Pas-de-Calais*, France (*e.g.*, Cliquet & Révillion 1991; Ameloot-van der Heijden 1991, 1993a,b, 1994; Tuffreau 1993) is a late Last Interglacial *s.l.* site. The lithic assemblage (n=5000) is mainly characterised by the presence of blades obtained from prismatic cores. Typical "crested blades" were used to initiate the sequence of blade detachments from the core. However, there are also clear examples present of the transition from a Levallois flake core to a non-Levallois semi-rotating prismatic core. In other cases, flaking was fully rotating. At Riencourt-lès-Bapaume, "classic" Levallois flake cores with preferential flaking or centripetal flaking were present as well. There were 23 Levallois cores, 39 prismatic cores and 18 opportunistic cores present within the lithic assemblage. The toolkit included 108 tools such as burins and backed pieces associated with side-scrapers.

- **Seclin - D7** (Fig. 7.1.17 & Table 7.1.), *Nord*, France (*e.g.*, Tuffreau & Révillion 1984; Tuffreau *et al.* 1985; Révillion 1989; Révillion 1993; Récillion & Tuffreau 1994) probably dates to the transition from the Last Interglacial *s.l.* to the Early Weichselian. Levallois blade core reduction and prismatic blade core reduction are both attested. The great majority of the blade cores apparently were Levallois cores. However, Révillion (1989) stresses the distinctively "Upper" Palaeolithic character of some aspects of the blade production at Seclin. Indeed, many of the blade cores show blade removals extending around a substantial part of the core surface (semi-rotating) and in some cases around the whole of the core (rotating) to produce fully prismatic cores. At Seclin, there seems to exist an interesting mixture of both Levallois and prismatic core reduction strategies.

- **Lailly, "*Le Domaine du Beauregard*"** (Fig. 7.1.18 & Table 7.1.), *Vallée de la Vanne*, Yonne, France (*e.g.*, Locht *et al.* 1991a; Locht & Depaepe 1994) is a late Last Interglacial *s.l.* assemblage, which contains prismatic cores (n=10) with one or two striking platforms and 58 blades. Repreparation of the striking platforms by rejuvenation core flakes is also attested. Levallois flake core reduction and biface production was also present.

- **Vinneuf N1** (Fig. 7.1.19 & Table 7.1.), *Yonne*, France (*e.g.*, Gouédo 1994) also seems to represent a late Last Interglacial *s.l.* "Micoquian" lithic assemblage (n=1013). Indeed, the assemblage of Vinneuf N1 is characterised by bifaces (n=27) and tools (n=148), which seem to belong to the "Micoquian". However, the abundance of non-Levallois, semi-rotating prismatic cores and blades is striking. The toolkit included bifaces, side-scrapers, burins and retouched blades.

- **Molinons, "*Le Grand Chanteloup*"** (Fig. 7.1.20 & Table 7.1.), *Vallée de la Vanne*, Yonne, France (*e.g.*, Locht *et al.* 1991b; Locht & Depaepe 1994) is a late Last Interglacial *s.l.* site where semi-rotating prismatic cores with one or two striking platforms were present. Levallois core reduction is completely lacking. The toolkit contains side-scrapers, burins, notched and denticulated pieces.

- **Villeneuve l'Archeveque - *Niveau* B** (Fig. 7.1.21 & Table 7.1.), "*La Prieurée*", *Vallée de la Vanne*, Yonne, France (*e.g*., Locht & Depaepe 1994) is a late Last Interglacial *s.l*. "Micoquian" site. Indeed, biface production and Levallois flake core reduction have been observed. However, prismatic cores with one or two striking platforms were also found at the site.

- **Tönchesberg 2B** (Fig. 7.1.22 & Table 7.1.), Germany (*e.g*., Conard 1990, 1992) has been dated to the late Last Interglacial *s.l*. Almost 83% of the lithic assemblage (n=557) consisted of quartz flake artefacts. The remaining 17% of the assemblage was made of fine-grained raw materials, which were worked into forms that are "characteristic" of "Upper" Palaeolithic assemblages. However, only one blade core and 30 blades were present. No Levallois products were found.

7.1.2.4. Overview of the Key Middle Palaeolithic Weichselian *s.s*. (MIS 4 & 3) Laminar Sites in Northwest Europe

- ***Champ Grand*, Saint-Maurice-sur-Loire** (Fig. 7.1.23 & Table 7.1.), *Loire*, France (*e.g*., Slimak 1997, 1999), which is about 60,000 years olds, (artefacts n=552) was clearly marked by the presence of non-Levallois blade (n=200) production. Most cores (n=12) were unipolar or bipolar semi-rotating prismatic cores. Many striking platforms were reshaped by the removal of rejuvenation flakes. The toolkit was characterised by burins, notched pieces and retouched blades.

- **Bagneux, "*La Ferme de Mauny*"** (Fig. 7.1.24 & Table 7.1.), *Vallée de la Vanne*, *Yonne*, France (*e.g*., Krier *et al*. 1991; Locht & Depaepe 1994). This site probably dates to the Early or early Middle Weichselian. Here, unipolar and bipolar prismatic cores with one or two striking platforms were used to produce blades. Repreparation of the striking platforms by the removal of rejuvenation core flakes was attested. Levallois flake core reduction and biface production was also present at the site.

- **Lailly, "*Le Fond de la Tournerie*"** (Fig. 7.1.25 & Table 7.1.), *Vallée de la Vanne*, *Yonne*, France (*e.g*., Depaepe *et al*. 1991; Locht & Depaepe 1994) is an Early or early Middle Weichselian assemblage (n=3,540). Only 22 prismatic blades and 2 Levallois blades were present within the lithic assemblage. The assemblage is further characterised by Levallois flake core reduction and biface production.

7.1.3. Discussion

At the VLL *locus* at Veldwezelt-*Hezerwater*, a clear trend towards laminar core reduction was present. At this *locus*, mainly low-quality and frost-affected lithic raw materials were locally present. It was found that this particular raw material context has resulted in more or less "expedient" parallel/prismatic and opportunistic core reduction strategies. However, there seems to be no compelling correlation between good-quality raw materials and the production of formal blades. Indeed, blades and blade-like flakes were mainly made from low-quality lithic raw materials. At the VLL *locus* at Veldwezelt-*Hezerwater*, with an abundance of low-quality raw materials, there just seemed to be less need for Middle Palaeolithic flint knappers to force the full potential (*e.g*., "curated" Levallois core reduction) from every piece of lithic raw material. These findings suggest that the quantity and the quality of the locally available lithic raw material strongly influenced the Middle Palaeolithic core reduction strategies.

However, it seems that during the Middle Palaeolithic, parallel/prismatic core reduction and especially Levallois blade core reduction were quite common phenomena in Northwest Europe. In our overview, 25 of the most important Middle Palaeolithic blade sites, which were situated in Northwest Europe (Fig. 7.1.), have been discussed. While each of the 25 blade sites described above had unique features, which we do not wish to minimise, technological similarities and affinities among the attested core and tools reduction strategies are nevertheless apparent (Table 7.1.).

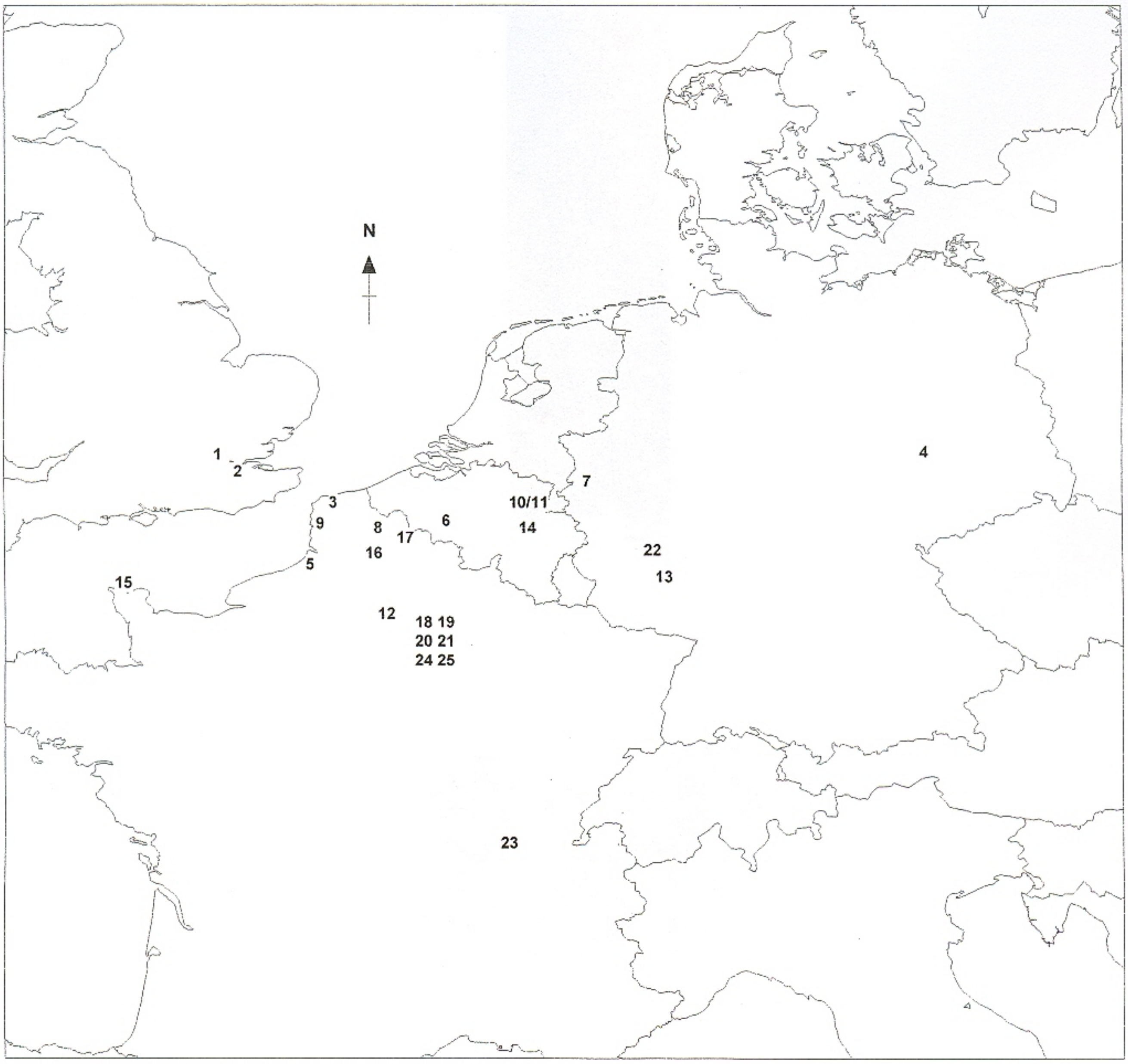

Fig. 7.1. Overview of the key Middle Palaeolithic blade sites in Northwest Europe

Sites: A. Saalian *s.l.*: 1. Crayford; 2. Baker's Hole; 3. Coquelles; 4. Markkleeberg; 5. Saint-Valéry-sur-Somme; 6. Rissori; 7. Rheindahlen B1/B2; 8. Biache-Saint-Vaast - *niveau IIA*; 9. Étaples-*Bagarre - couche 7*; 10. Veldwezelt-*Hezerwater* - VLL *Locus s.s.* (11: GRA[2B]); **B. Last Interglacial *s.l.*:** 12. *La Butte d'Arvigny*; 13. Wallertheim D; 14. Rocourt; 15. Saint-Germain-des-Vaux/Port-Racine; 16. Riencourt-lès-Bapaume - CA; 17.Seclin; 18. Lailly, "*Le Domaine du Beauregard*"; 19. Vinneuf N1; 20. Molinons, "*Le Grand Chanteloup*"; 21. Villeneuve l'Archeveque - *Niveau* B; 22. Tönchesberg 2B; **C. Weichselian *s.s.*:** 23. *Champ Grand*, Saint-Maurice-sur-Loire; 24. Bagneux, "*La Ferme de Mauny*"; 25. Lailly, "*Le Fond de la Tournerie*"

Table 7.1. Overview of the most important Middle Palaeolithic blade sites in Northwest Europe and their resemblance to the VLL lithic assemblage at Veldwezelt-*Hezerwater*

Veldwezelt-*Hezerwater*:	**VLL lithic assemblage:**
	(1) parallel/prismatic cores (2) opportunistic cores (3) flakes, blade-like flakes & blades (4) no Levallois cores (5) no Levallois flakes (6) small tools
1. Key Saalian *s.l.* Blade Sites	
Crayford	almost identical to the VLL lithic assemblage
Baker's Hole	"Burchell collection" is virtually identical to the VLL assemblage
Coquelles	"*Couche* 5" is almost identical to the VLL lithic assemblage
Markkleeberg	completely different: Levallois blades
Saint-Valéry-sur-Somme	almost identical to the VLL lithic assemblage
Rissori	main differences: Levallois blades & different toolkit
Rheindahlen B1/B2	main differences: Levallois blades & "Micoquian" tools
Biache-Saint-Vaast - IIA	main differences: Levallois blades & different toolkit
Étaples-*Bagarre - couche 7*	main differences: Levallois blades & different toolkit
Veldwezelt - VLL *locus*	VLL *locus s.s.* & GRA[2B]
2. Key Last Interglacial *s.l.* Blade Sites	
La Butte d'Arvigny	almost identical to the VLL lithic assemblage
Wallertheim D	main differences: massive blades & tools
Rocourt	main difference: Levallois blades
Saint-Germain-des-Vaux	main difference: Levallois blades
Riencourt-lès-Bapaume	main difference: Levallois blades
Seclin - D7	main difference: Levallois blades
Lailly, "*Beauregard*"	main differences: Levallois products & bifaces
Vinneuf N1	main difference: Micoquian context
Molinons, "*Chanteloup*"	very similar to the VLL lithic assemblage
Villeneuve l'Archeveque	main difference: Micoquian context
Tönchesberg 2B	main difference: quartz artefacts
3. Key Weichselian *s.s.* Blade Sites	
Champ Grand	almost identical to the VLL lithic assemblage
Bagneux	main differences: Levallois products & bifaces
Lailly, "*Tournerie*"	main differences: Levallois products & bifaces

Sites in Northwest Europe that technologically speaking were very close to the lithic assemblage, which was excavated at the VLL *locus* at Veldwezelt-*Hezerwater* included: (1) Crayford, (2) Baker's Hole, (3) Coquelles (Fig. 7.2.), (4) Saint-Valéry-sur-Somme, (5) *La Butte d'Arvigny*, (6) Molinons and (7) *Champ Grand*. These blade assemblages included highly reduced prismatic cores, an abundance of blades, bladelets and crested blades. In other lithic assemblages, sometimes, a Levallois component was present. It was found that the Middle Palaeolithic blade production strategies in Northwest Europe could be classified into two broad groups, which were labelled (1) "prismatic" blade core reduction and (2) "Levallois" blade core reduction. Indeed, the "dual-component nature" of Middle Palaeolithic blade assemblages is reflected by the presence of on the one hand "prismatic" blades and on the other hand "Levallois" blades. The "prismatic blade core reduction strategy" was certainly not linked to and differs significantly from the "Levallois core reduction strategy". Many prismatic cores were flaked using the "rotating" and the "semi-rotating" reduction strategy. Usually, "prismatic core reduction" was initiated by the removal of a natural ridge or a crested blade. Some prismatic cores show a single striking platform, although most prismatic cores show two opposed striking platforms. Many striking platforms have been reshaped by the removal of core rejuvenation flakes or tablets.

It has been found that there are lithic assemblages with only Levallois blades and that there are assemblages with only prismatic blades. However, the use of "Levallois" or "prismatic" blade core reduction is not necessarily exclusive. There are also assemblages with both Levallois and prismatic blades. Indeed, several different blade and flake core reduction strategies can be found within one and the same lithic assemblage (Table 7.1.). Many assemblages even yielded a disordered mixture of prismatic core reduction, Levallois flake or blade core reduction, biface production, "Micoquian" tool reduction, *etc*. (Table 7.1.). There thus seems to be no clear-cut demarcation between the occurrences of these technological strategies. The natural outcome of this dynamic system of flint knapping seems to be more or less "unpredictable" and even quite "chaotic". However, these "chaotic" associations of different core reduction strategies have been attested repeatedly within the lithic assemblages of different sites. This shows that these "coexisting" core and tool reduction strategies were not the result of post-depositional disturbance. It seems that Middle Palaeolithic flint knappers could choose very different reduction strategies on the basis of the quantity and quality of the available raw materials.

One trend seems to suggest that Levallois core reduction was usually used to process relatively large, spherical, usually imported good-quality raw materials, whereas elongated, local poor-quality raw materials were worked by prismatic core reduction strategies. However, this general trend does not necessarily imply the existence of rigid and discrete core reduction sequences. For example, several cores show a blade surface on the one side and a flake surface on the other side. However, it seems that where prismatic core reduction was employed, Levallois core reduction became less important. So, prismatic and Levallois core reduction strategies were part of the diverse "Middle" Palaeolithic technological "*repertoire*" of modes of lithic exploitation. Indeed, there must have existed a whole technological "*repertoire*", which could be invoked according to a specific context. Several core and tool reduction strategies could thus be used, as it were, "simultaneously". However, these prismatic and Levallois blades were not produced by different populations, but by the same people. Blades were probably aimed at specific tasks under specific environmental conditions. However, most of the blades have not been worked into formal tools. Finally, it appears that most of the flakes, blade-like flakes and blades at the VLL *locus* at Veldwezelt-*Hezerwater* were immediately used as "expedient" tools *s.l.* without prior retouching.

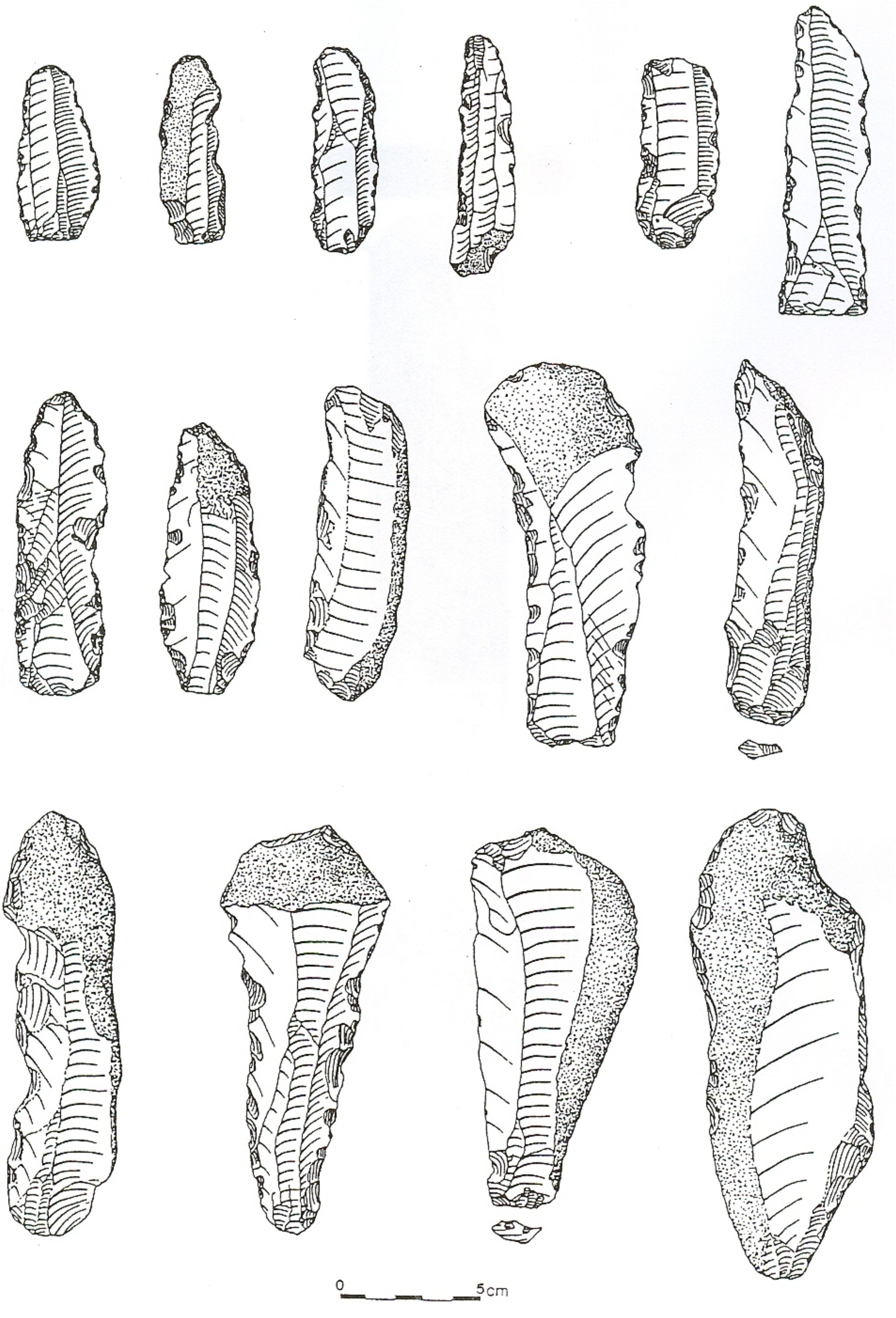

Fig. 7.2. Coquelles: blades (Révillion 1995, Fig. 1.)

The overview (Table 7.1.) of the blade sites in Northwest Europe shows that blade assemblages can be found in the Saalian *s.l.*, the Last Interglacial *s.l.* and the Weichselian *s.s.* However, blade assemblages were not present during the coldest and warmest phases (*e.g.*, Early Weichselian, Eemian *s.s.*) of the interglacial/glacial cycles. It was found that the blade sites in Western Europe were mostly occupied during the temperate or cool phases of the interglacials *s.l.* (*e.g.*, Molinons, Rocourt) and often associated with steppe soils (*e.g.*, Seclin, Rheindahlen B1/B2, Tönchesberg, Lailly-*Beauregard*, Riencourt-lès-Bapaume). It seems that these blade sites were part of a "continuum of change" in human adaptation that only makes sense in terms of what happened before and after it. The paradox of many prismatic blade assemblages is that during a shift to a greater emphasis on prismatic core reduction, Levallois core reduction strategies were mostly retained. Far from being incompatible, prismatic blades and Levallois flakes and blades together may actually extend the broad benefits of the "dual-component nature" of prismatic and Levallois core geometries.

However, each time blades appeared during the late Middle and Late Pleistocene, the typical "Middle" Palaeolithic component of the toolkits either decreased or completely disappeared. At the same time, light-weight tool forms sometimes appeared in relative great numbers. So, the diverging "Middle" Palaeolithic assemblages do not seem to represent "discrete" entities, but they rather seem to "inter-grade" with one another in a "continuum of variability". These lithic assemblages seem to represent a temporal and spatial "mosaic" pattern of changing core and tool reduction strategies and blade core reduction strategies just seem to represent a standard component of the Middle Palaeolithic technological "*repertoire*". On the other hand, there does not seem to exist a "single" Middle Palaeolithic blade core reduction strategy, but there are probably several. Indeed, blade core reduction strategies must probably have been discovered and rediscovered at different times, at different places and maybe in many different ways during the late Middle and Late Pleistocene. There seems to be no unbroken sequence linking "Lower" to "Middle" to "Upper" Palaeolithic blade core reduction strategies, since "traditional" flake-based Middle Palaeolithic assemblages were found "between" them. The production of blades waxes and wanes markedly over time. Nevertheless, the knowledge and ability to produce and use blades from either Levallois cores or prismatic cores seems to possess tremendous time depth.

We think that the advantages of Middle Palaeolithic blade production and use were only situationally relevant. Blade core reduction strategies were invented, abandoned and reinvented due to a variety of factors. However, there are only a limited number of ways to produce usable blanks from a piece of raw material and these tend to appear, disappear and reappear repeatedly throughout the Palaeolithic. So, there is just no common origin. Blades simply represent one alternative way of making tools to solve particular problems. The range of environments in which blades occurred during the late Middle and Late Pleistocene would indeed argue against a single, overarching explanation of this type. The contexts, in which they developed, were simply too diverse. What we see is a "mosaic" pattern of several technological features that belonged to the standard "*repertoire*" of "Middle" Palaeolithic flint knappers. Core reduction strategies are "non-linear dynamic systems". The constant repetition of blows on pieces of raw material will inevitably produce blades at a certain point. It seems that blades are just the natural, unintentional outcome of the dynamics of flint knapping. Blades can thus arise in any situation. This means that blade core reduction strategies do not need to be "invented". They need to be recognised as being more useful in specific contexts. So, independent occurrences in space-time of similar core reduction strategies should thus not come as a surprise. Not their "invention" or "reinvention", but the recognition of their usefulness in new situations is the new phenomenon that occurs.

7.2. The VLB Lithic Assemblage

7.2.1. Introduction

During this part of the Middle Pleistocene to Late Pleistocene transition phase, boreal forests began to develop in Northwest Europe. Charcoal remains, which were found at the VLB *locus*, were determined by F. Damblon (*KBIN*). This charcoal analysis showed the local presence of "*Pinus silvestris*" [pine]. The landscape was thus likely to have been fairly open, marked by concentrations of pine and probably birch. The analysis of the lithic assemblage, which was left behind by the Middle Palaeolithic flint knappers who were occupying the VLB *locus*, allowed the following general inferences regarding the most important characteristic technological features of the lithic assemblage: (1) the presence of parallel core reduction, (2) the occurrence of opportunistic core reduction, (3) the presence of flat-faced, "classic" Levallois *nuclei*, (4) the presence of a few Levallois flakes and (5) a toolkit, which was essentially dominated by small tool forms.

7.2.2. Discussion

The VLL and VLB lithic assemblages basically were quite similar lithic assemblages. This was mainly the result of the locally-found low-quality lithic raw materials, which were found at both sites. It was found that this particular raw material context has resulted in parallel and opportunistic core reduction strategies. Indeed, at the VLB *locus* at Veldwezelt-*Hezerwater*, a trend towards "parallel" core reduction was originally also present. However, it is very interesting to see that at the VLB *locus,* there were also two Levallois cores excavated. Indeed, these imported Levallois cores, Levallois products and Levallois preparation flakes almost completely obliterated the laminar trend within the VLB lithic assemblage. At the end of the day, the presence of Levallois products within the VLB lithic assemblage and the absence of Levallois products within the VLL lithic assemblage gave rise to two separate typo-technological assemblages. We also have compared the VLB lithic assemblage to the same list of laminar lithic assemblages as the VLL lithic assemblage has been compared to (Table 7.2.). We found that in Northwest Europe only the so-called "Smith Collection", which has been excavated at Baker's Hole, Kent, UK (*e.g*., Wenban-Smith 1990, 1992, 1996), was very close to the VLB lithic assemblage (Table 7.2.). Both assemblages were characterised by the presence of blades, blade-like flakes, opportunistic and Levallois flake core reduction.

7.2.3. Conclusion

The lithic artefacts, which were excavated at the VLB *locus*, were partly an "expedient" response to the shapes of the flint nodules available at the "spring-amphitheatre". These Middle Palaeolithic flint knappers just improvised and simply adapted to the local lithic raw material situation. On the other hand, the presence of high-quality formal Levallois cores at the VLB *locus* also shows that the Middle Palaeolithic flint knappers who were active there, were capable flint knappers. Then again, these people also planned their activities well in advance. If the late Late Saalian dating of the VLB lithic assemblage is correct, then this lithic assemblage is chronologically quite close to the so-called "Eemian" sites, which were found in the East of present-day Germany. Could there really be a chronological or a technological link between the VLB *locus* and the so-called German "Eemian" sites? In order to answer this difficult question, we will have to deal with the so-called "Eemian Problem" first. We will do this in the next section as part of the "Last Interglacial *s.l*." Middle Palaeolithic occupation of Northwest Europe.

Table 7.2. Overview of the most important Middle Palaeolithic blade sites in Northwest Europe and their resemblance to the VLB *Locus* at Veldwezelt-*Hezerwater*

Veldwezelt-*Hezerwater*:	**VLB lithic assemblage**
	(1) parallel cores (2) opportunistic cores (3) blades, blade-like flakes & flakes (4) Levallois cores (5) Levallois flakes (6) a few small tools
1. Key Saalian *s.l.* Blade Sites	
Crayford	main difference: no Levallois products present
Baker's Hole	"Smith collection" is almost identical to the VLB lithic assemblage
Coquelles	"*Couche* 5" lacks Levallois products
Markkleeberg	main difference: presence of Levallois blades
Saint-Valéry-sur-Somme	main difference: no Levallois products present
Rissori	main differences: Levallois blades present & different toolkit
Rheindahlen B1/B2	main differences: Levallois bladcs present & "Micoquian" tools
Biache-Saint-Vaast - IIA	main differences: Levallois bladcs present & different toolkit
Étaples-*Bagarre - couche 7*	main difference: Levallois bladcs present & different toolkit
Veldwezelt - VLL *locus*	main difference: no Levallois flake core reduction present
2. Key Last Interglacial *s.l.* Blade Sites	
La Butte d'Arvigny	main difference: no Levallois products present
Wallertheim D	main differences: massive blades & tools present
Rocourt	main difference: "Levallois" blades present
Saint-Germain-des-Vaux	main difference: Levallois blades present
Riencourt-lès-Bapaume	main difference: Levallois blades present
Seclin - D7	main difference: Levallois blades present
Lailly, "*Beauregard*"	main difference: presence of bifaces
Vinneuf N1	main difference: Micoquian context
Molinons, "*Chanteloup*"	main difference: no Levallois products present
Villeneuve l'Archeveque	main difference: Micoquian context
Tönchesberg 2B	main differences: quartz artefacts & no Levallois present
3. Key Weichselian *s.s.* Blade Sites	
Champ Grand	main difference: no Levallois products present
Bagneux	main difference: presence of bifaces
Lailly, "*Tournerie*"	main differences: Levallois blades & bifaces present

7.3. The VBLB & VBLB-S Lithic Assemblages

7.3.1. The VBLB *Locus*

At the VBLB *locus* at Veldwezelt-*Hezerwater*, a succession of several Bt-horizons separated by bleached and humic horizons could be observed. Only the greyish VBLB Bth-horizon contained lithic artefacts and many charcoal pieces, identified as *Betula sp.* [birch] (determination by F. Damblon - *KBIN* Brussels - 1998). The presence of birch seems to indicate the presence of an interglacial climate with a "continental" trend and the existence of an "open" environment. As expected, the dark humic OHZB horizon contained the volcanic minerals with enstatite (Gullentops & Meijs 2002; Meijs 2002). This extremely detailed succession of mature soils and humic horizons, representing the "Rocourt Soilcomplex" (Gullentops & Meijs 2002; Meijs 2002) covered by the "Warneton Soilcomplex" (Gullentops & Meijs 2002; Meijs 2002) gives us a fairly complete image of the complex terrestrial climatic fluctuations during the Last Interglacial *s.l.* (MIS 5). The horizon in which the lithic assemblage of the VBLB *locus* had been excavated, has been interpreted as corresponding to a late phase of the Last interglacial *s.l.* (Fig. 2.9.), probably "*Saint Germain* 2" (Woillard 1975, 1978, 1979). The steppe soils of the "Warneton Soilcomplex" with the typical "enstatite tuff" (Gullentops 1954) are assumed to occur near the transition from the late Last Interglacial *s.l.* to the Early Weichselian, probably around 70,000 years ago (*e.g.*, Dansgaard *et al*. 1993). Consequently, the underlying VBLB Bth-horizon at Veldwezelt-*Hezerwater* could thus probably be dated to MIS 5a. This interpretation is in accordance with the interpretations of other researchers (*e.g.*, Kukla & An 1989; Van Vliet-Lanoë 1989; Antoine *et al*. 1999; Schirmer 2000, 2002).

The cores and the cortical flakes present in the lithic assemblage of the VBLB *locus* at Veldwezelt-*Hezerwater* show rolled cortex, which seems to indicate that the flint nodules were probably found in the nearby *Maas* terrace. Most artefacts of the VBLB *locus* are of a remarkably "fresh" nature. The lithic assemblage (n = 350) of the VBLB *locus* is primarily characterised by the predominance of Levallois core reduction. However, some larger non-Levallois flakes (>5cm) were present in the lithic assemblage as well. The toolkit is made up of side-scrapers, one bifacial single convex side-scraper and one bifacial foliate. Earlier we distinguished a "rich" and a "poor" area at the VBLB *locus*. All the larger Levallois flakes, the larger non-Levallois flakes and the retouched tools were found in the poor "Northern Sector", whereas the Levallois core, the Levallois core-edge flakes, the cortical flakes, the small Levallois preparation flakes, the chips and the knapping waste were found in the rich "Southern Concentration". This dichotomy of two discrete interrelated artefact groups, located at two separate areas at the VBLB *locus* is also to be recognised in the geomorphological position of the "Southern Concentration" and the "Northern Sector". The rich "Southern Concentration" is situated on the lower, Southern part of the site, between 19.20 m and 19.60 m above the conventional site datum of the site. The poor "Northern Sector" is situated on the higher, Northern part of the site, between 19.80 m and 20.80 m above the conventional site datum. The elevation difference between these two areas amounts to more than one metre. At the "rich area", Middle Palaeolithic people were beyond any doubt aiming to manufacture large Levallois blanks, which were discarded at the "poor area", where the Middle Palaeolithic humans utilised the tools *s.l.* in a variety of tasks. The "Southern Concentration" could thus probably be interpreted as a knapping workshop, whereas the "Northern Sector" could probably be explained as the "tool utilisation zone", where the presence of numerous pieces of charcoal (*Betula sp.*) also indicated the proximity of a hearth. We suppose that the spatial organisation of VBLB *locus* at Veldwezelt-*Hezerwater* by its Middle Palaeolithic occupants was intentional.

7.3.2. The VBLB-S *Locus*

The pedo-stratigraphical situation at the VBLB-S *locus* at the so-called "Rocourt-Island" at Veldwezelt-*Hezerwater* is more or less comparable to the situation at the VBLB *locus*. Indeed, both lithic assemblages were situated in the upper VBLB Bth soil horizon of the so-called "Rocourt Soilcomplex" (Gullentops & Meijs 2002; Meijs 2002). However, the vertical artefact distribution at the VBLB-S *locus* is much more outspoken. We suppose that this phenomenon was a direct result of the more intense colluvial activity at the VBLB-S *locus*. Other post-depositional processes, like soil bioturbation processes that were also active at the VBLB-S *locus*, seem to have played an important role as well. Nevertheless, the soil horizon in which the lithic assemblage of the VBLB-S *locus* finally came to rest, should probably also be dated to MIS 5a.

At the VBLB-S *locus* at Veldwezelt-*Hezerwater*, only products of "opportunistic" core reduction have unambiguously been recognised. Unfortunately, no cores, no larger flakes, no unambiguous Levallois products, no formal tools and no refits were found. On the other hand, sorting lithic artefacts into specific Raw Material Units (RMUs) was not a straightforward process either. However, about 9 RMUs have been established. The raw material ("*Lanaye* Flint Group") ranges from dark grey to course grained flint. It seems that at the VBLB-S *locus*, only a reworked and random "background noise" of lithic artefacts was recovered right across the *locus*. If we contemplate the absence of cores, the absence of unambiguous Levallois products, the absence of tools *s.s.*, the absence of artefact concentrations and the absence of refits, one sees evidence for the movement of these lithic elements across the landscape by natural post-depositional agents. The distribution of the excavated archaeological remains of the VBLB-S *locus* does not seem to reflect the original human-induced artefact distribution. In other words, *intra-locus* spatial patterns just seem to represent a random distribution of artefacts induced by natural post-depostional processes. So, the VBLB-S lithic artefacts were not only found *ex situ*, but their present-day, archaeologically recorded distribution does not even remotely reflect the original human-induced lithic artefact distribution.

7.3.3. The VBLB & VBLB-S *Loci*: A Single Settlement System?

The succession of several Bt-horizons separated by bleached and humic horizons has been observed at the VBLB *locus* as well as at the VBLB-S *locus*. Only the greyish Bth-horizon at the VBLB and VBLB-S *loci* contained artefacts. This means that the lithic assemblages found at both *loci* are more or less "contemporaneous". These lithic finds could thus easily represent the remnants of a single integrated Middle Palaeolithic settlement system. Indeed, the fact of the matter is that the VBLB lithic assemblage was found on the left bank of a Last Interglacial *s.l.* side-valley of the *Hezerwater* brook, whereas the derived VBLB-S lithic assemblage and thus also the original VBLB-S site was situated on the right bank of the same Last Interglacial *s.l.* side-valley of the *Hezerwater* brook. This means that maybe a single group of Middle Palaeolithic people was occupying both banks of this side-valley of the *Hezerwater* brook at the same time. This would imply that the lithic assemblages, which were excavated at the VBLB and VBLB-S *loci* and which were separated more than 30 m from each other, were actually part of a single site. However, no refits were found between the VBLB and VBLB-S lithic assemblages. So, it is still possible that we are dealing here with at least two "recurrent" Middle Palaeolithic occupation phases. This would imply that two Middle Palaeolithic sites were situated only 30 m from each other. Consequently, more sites must have existed and may still exist in this part of the *Hezerwater* valley, which seems to have been occupied quite extensively during the late Last Interglacial *s.l.* (MIS 5a).

7.3.4. Overview of the "Last Interglacial *s.l.*" Sites in Northwest Europe

7.3.4.1. The Eemian *s.s.* (MIS 5e)

7.3.4.1.1. Introduction

The Eemian *s.s.* (MIS 5e) seems to represent an exceptionally warm period that contrasted starkly with the intense glacial conditions immediately before. In the initial 5,000 years of the Eemian *s.s.* (*e.g.*, Kukla 2000; Kukla *et al*. 2002), global mean annual temperature increased 10-15°C and sea level rose 5-6 m above that of the present (compared with 130 m lower during MIS 6). Series of δ^{18}O values higher than the Holocene mean value of -35‰ occur between 130,000 and 115,000 years in the GRIP ice-core record (Johnsen *et al*. 1995, 1997). This core increment is being interpreted as being deposited during the Eemian *s.s.* (MIS 5e), which thus seems to represent a period with temperatures exceeding those of today. The Eemian *s.s.* is usually also recorded in other climate proxies as warmer than the Holocene average and warmer than the mean of the other recent interglacials (Johnsen *et al*. 1995, 1997).

7.3.4.1.2. The "Eemian Problem"

It has been argued (*e.g.*, Gamble 1986, 1995, 1999) that Middle Palaeolithic people may have had to abandon Northwest Europe during the height of interglacials. Indeed, according to Gamble (1986, 1995, 1999) interglacial Europe, especially the Eemian *s.s.*, was a hostile environment to Middle Palaeolithic humans, because the majority of the biomass was stored in non-edible form, like stems and leaves of trees. Moreover, the dispersion and the small scale of the plant resources made them costly when measured by the time needed to collect them (*e.g.*, Kelly 1995). The same is true for the animal food resources. Although a large variety of species roamed the forests, they were very scattered. Indeed, interglacial herd animals live in smaller herds in comparison to the inhabitants of the much cooler so-called "mammoth steppe" (Guthrie 1990). In spite of these claims, Roebroeks *et al*. (1992) refuted the basis of Gamble's model by stating, that a much wider range of environments was exploited by Middle Palaeolithic humans in Northwest Europe. They claimed that archaeological sites were present during full interglacials with deciduous forests. Most of these sites were found in the travertines and at the lakeshores in Northern Germany (*e.g.*, Roebroeks *et al*. 1992; Wenzel 1998; Roebroeks & Tuffreau 1999; Speleers 2000; Roebroeks & Speleers 2002).

It is unsurprising that controversy exists concerning the ability of Middle Palaeolithic humans to exploit particular biotopes (*e.g.*, Gamble 1986, 1995; Roebroeks *et al*. 1992; Tuffreau & Antoine 1995; Mellars 1996; Speleers 2000; Van Andel & Davies 2003). One reason for this debate is the patchy nature of the environmental data. Indeed, attributions and correlations were, and very often still are, highly problematic. The fact of the matter is that several archaeological sites have previously been falsely attributed to the "Eemian". Nowadays, the so-called "Eemian", which was defined at its type locality near Amersfoort (NL), covers only a restricted part of the Last Interglacial *s.l.* (*e.g.*, Turner 2000). The Amersfoort Eemian *s.s.* is broadly the continental equivalent of MIS 5e. Two somewhat cooler "interglacials" (MIS 5c & MIS 5a) come after the Eemian *s.s*. It is now becoming clear, that several sites previously referred to as "Eemian" actually date to one of these "interglacials". Another problem is that most of the so-called "Eemian" archaeological sites were labelled "Eemian" just because the faunal remains associated with the lithics had an "interglacial" character. At that time, older interglacials (*e.g.*, MIS 7, MIS 9, MIS 11) were not known or not believed in.

7.3.4.1.3. The Eemian *s.s.* Archaeological Sites in Northwest Europe

7.3.4.1.3.1. The Eemian *s.s.* Travertine Sites

Many of the so-called “Eemian” archaeological sites have been recovered from travertine deposits. Travertine is usually deposited during moist and relatively warm periods (Ložek 1961). However, the deposition of travertine does not seem to depend primarily on temperature, but on relatively humid climatic conditions, when the yield of springs was high (Ložek 1961). In dry periods, the deposition of travertine has always been interrupted. Most of these archaeological travertine sites were found in only three German travertine-rich valleys: (1) the *Ilm* Valley (Weimar), (2) the *Tonna* Valley (Burgtonna) and (3) the *Neckar* Valley (Stuttgart). Several of these sites have been known since the end of the 18th century and have traditionally been assigned an “Eemian” age just because of the presence of “interglacial” floral and faunal remains. However, the exact chronostratigraphical position of these artefactual and faunal records is not always clear. At these archaeological travertine sites, a direct link with Saalian *s.l.* sediments is mostly absent. These lithic assemblages are often from old collections, which are now dispersed over museum collections all over Germany. Furthermore, detailed information about the exact provenance and the stratigraphical position of these lithic assemblages, which have been collected by various researchers over a long period of time, is usually missing. Here, we will give an overview of the different archaeological travertine sites (Fig. 7.3.).

- **Burgtonna**, *Thuringia*, Germany has traditionally been dated to the Eemian *s.s.* (*e.g.*, Lindner 1994). However, the radiometric dates (^{230}Th/^{234}U) of Burgtonna (Brunnacker *et al*. 1983) do not indicate a MIS 5e age (*e.g.*, TBUR6: 101,000 $\pm$9,000), but a MIS 5c age, which also seems to be corroborated by the associated faunal and floral assemblages. Nevertheless, Lindner (1994) still claims an Eemian *s.s.* date. The archaeological finds (n=100) include flakes, chips and chunks.

- **Steinmühle bei Veltheim**, *Sachsen-Anhalt*, Germany is still being dated to the Eemian *s.s.* (*e.g.*, Mania 1988). However, the chronostratigraphical framework at the archaeological site at Steinmühle bei Veltheim is also problematic. The stratigraphy was established only on the local terrace stratigraphy, which is of course not detailed enough to attribute the site to the Eemian *s.s.* The site could be MIS 5, but MIS 7 is also possible, since the European pond turtle or *Emys orbicularis* (Hemprich 1932) was found at the site. Unfortunately, no radiometric dates are available to date. The lithic assemblage included only fifty flakes and a hammer stone.

- **Stuttgart-Bad Cannstatt**, Seelberg, *Baden-Württemberg*, Germany is another so-called “Eemian” site (*e.g.*, Reiff 1994). At this site, very few artefacts (n=19) and faunal remains were recovered. The radiometric dates (Grün *et al*. 1982) again do not suggest a MIS 5e date (*e.g.*, THE2: 99,000 $\pm$6,000), but once more a MIS 5c date. Even more problematic is the presence of mammoth in the faunal assemblage (Kranz *et al*. 1930), which was found in association with the artefactual remains.

- **Stuttgart-Untertürkheim**, *Baden-Württemberg*, Germany was also dated to the Eemian *s.s.* (Wenzel 1998, 2002). At this site, only a few artefacts (n=120) were found in different archaeological horizons. The radiometric dates (Grün *et al*. 1982) again do not suggest a MIS 5e date (*e.g.*, TBD4: 106,000 $\pm$4,000), but once more a MIS 5c date. Another problem was the prominent presence of a lot of steppe dwellers (*e.g.*, horse) within the faunal assemblage, indicating a temperate environment (Wenzel 1998, 2002).

- **Taubach**, *Thuringia*, Germany has traditionally been dated to the Eemian *s.s.* (*e.g.*, Behm-Blancke 1960). With an ^{230}Th/^{234}U age of TTAU9: 117,000 +19,000/–16,000 (Brunnacker *et al*. 1983), the site is probably one of the few sites, which actually do date to the Eemian *s.s*. However, it is very interesting to note that most of the artefacts were found at the base of the travertine deposits, which seems to indicate that the moment of occupation took place before the Eemian *s.s.* optimum (Kahlke & Mania 1994). However, there are also a lot of steppe dwellers (*e.g.*, horse) present within the faunal assemblage, indicating a mosaic environment. This could point to a very early MIS 5e date or even a late MIS 6 occupation phase. There were more than one thousand artefacts present at the site. Two Levallois cores, a few side-scrapers and a few notched and denticulated pieces have also been found.

- **Weimar-Parktravertin**, *Thuringia*, Germany is another site, which has traditionally been dated to the Eemian *s.s.* (*e.g.*, Behm-Blancke 1960). The ^{230}Th/^{234}U radiometric date of TWE10.2: 120,000 $\pm$12,000 (Brunnacker *et al.* 1983) indicates an early MIS 5e or even a late MIS 6 occupation phase. However, at Weimar-Parktravertin, the faunal (*e.g.*, horse) and floral (*e.g.*, pine) assemblage also indicates an occupation phase, which can be situated before the Eemian optimum. More than 1,500 artefacts were found. The toolkit comprised side-scrapers, notched and denticulated pieces.

7.3.4.1.3.2. The Eemian *s.s.* Lake Sites

The geological setting of the lake sites at Grabschütz (*e.g.*, Weber 1990), Gröbern (*e.g.*, Weber 1990), Lehringen (*e.g.*, Thieme & Veil 1985) and Rabutz (*e.g.*, Toepfer 1958; Weber 1990) is more or less identical. At these sites (Fig. 5.33.), “interglacial” deposits were formed in basins, which were cut out in “Saalian” deposits. Based on palynological and faunal data, these “interglacial” deposits were traditionally attributed to the Eemian *s.s.* (MIS 5e).

- **Grabschütz**, *Sachsen-Anhalt*, Germany has traditionally been dated to the Eemian *s.s.* (*e.g.*, Weber 1990). However, because of the presence of *Apodemus maastrichtiensis*, Von Koenigswald and Heinrich (1999) correlated the site with MIS 7. No radiometric dates are available and only a few artefacts have been found (n=27).

- **Gröbern**, *Sachsen-Anhalt*, Germany has also been dated to the Eemian *s.s.* (*e.g.*, Weber 1990). However, the occupation took place around the transition from the hazel-yew-lime period (Pollen Zone 4B - Zagwijn 1996) to the hornbeam period (Pollen Zone 5 - Zagwijn 1996). So, the occupation at Gröbern took place after the climatic optimum of the Eemian *s.s*. A late MIS 5e age is possible, although a MIS 7 age is another possibility. Only 27 flint artefacts were found in association with 195 elephant bones.

- **Lehringen**, *Niedersachsen*, Germany is another Eemian *s.s.* site (*e.g.*, Thieme & Veil 1985). However, the occupation at Lehringen took also place around the transition from the hazel-yew-lime period to the hornbeam period. So, the occupation at Lehringen took also place after the climatic optimum of the Eemian *s.s*. A late MIS 5e age is thus also possible, although a MIS 7 age still is a valid alternative. Only 25 flint artefacts were found together with elephant bones and a yew spear.

- **Rabutz**, *Sachsen-Anhalt*, Germany (n artefacts: >300) has also been dated to the Eemian *s.s.* (*e.g.*, Toepfer 1958). However, because of the occurrence of *Apodemus maastrichtiensis*, Von Koenigswald and Heinrich (1999) correlated the site with MIS 7.

Fig. 7.3. Overview of the "traditional" key Eemian *s.s.* sites in Northwest Europe

Sites: 1. Burgtonna; 2. Steinmühle bei Veltheim; 3. Stuttgart-Bad Cannstatt, Seelberg; 4. Stuttgart-Untertürkheim; 5. Taubach; 6. Weimar-Parktravertin; 7. Grabschütz; 8. Gröbern; 9. Lehringen; 10. Rabutz

7.3.4.1.4. Discussion

Our current knowledge of the Eemian *s.s.* occupation of Northwest Europe is based on only a few Middle Palaeolithic sites that have been discussed higher. The correlation of these archaeological sites with the Eemian *s.s.* (MIS 5e), which is mainly based on the lithostratigraphical position of the sediments, the composition of the faunal assemblages and the radiometric dates, seems well-established. However, a heated discussion (*e.g.*, Gamble 1986, 1999; Roebroeks *et al.* 1992; Wenzel 1998; Speleers 2000; Roebroeks & Speleers 2002) is still ongoing about the age of these sites. Palaeobotanists assume an "oceanic" climate in Northwest Europe during the Eemian climatic optimum, with uniform deciduous forest vegetation (*e.g.*, Zagwijn 1996). Some authors argue that these interglacial forests *s.s.* effectively were "green human deserts" (Gamble 1986).

The remains of floral and faunal species in travertine deposits usually suggest that travertine formation took place mainly during warm and humid, “interglacial” periods. As far as colder type floral and faunal assemblages are found, they mostly seem to occur at the base of the travertine deposits (Ložek 1961). Hence we can infer that the development of travertine deposits usually set in during still relatively cool climatic conditions and went on during the whole warm and humid climatic period. However, the deposition of travertine deposits does not seem to depend primarily on temperature, but on relatively humid “oceanic” climatic conditions. The Eemian *s.s.* was indeed characterised by warm and moist “oceanic” conditions, while the later phases of the Last Interglacial *s.l.* were characterised by an increasing “continentalisation” of climatic conditions (Zagwijn 1996). It is important to keep in mind that the Eemian *s.s.* only covers a restricted part of the Last Interglacial *s.l.* (*e.g.*, Turner 2000). The Eemian *s.s.* broadly is the terrestrial equivalent of MIS 5e. Two cooler “interglacial” periods (MIS 5c & MIS 5a), belonging to the Last Interglacial *s.l.*, come thus after the Eemian *s.s.*

It is now becoming clear (Table 7.3.), that several sites previously referred to as “Eemian” (*e.g.*, Burgtonna, Stuttgart-Bad Cannstatt, Stuttgart-Untertürkheim) probably date to the terrestrial equivalent of MIS 5c. Some other sites (*e.g.*, Steinmühle bei Veltheim, Grabschütz, Rabutz), which also have traditionally been attributed to the “Eemian”, may actually be dated to the Saalian Interglacial (MIS 7). It seems that only the sites of Taubach, Weimar-*Parktravertin*, Gröbern and Lehringen may actually be dated to the Eemian *s.s.* However, the first two sites were probably inhabited during the early phases of the Eemian *s.s.*, while the latter two sites were probably occupied during the later phases of the Eemian *s.s.* Indeed, local conditions might explain the exceptional presence of Middle Palaeolithic humans in Northwest Europe during the Eemian *s.s.* Indeed, there is evidence that the Eemian *s.s.* faunal record of Central Europe (*e.g.*, Van Kolfschoten 2000) indicates local “mosaic” environments with an alternation of densely forested and more open vegetation. Nevertheless, it is still possible that the sites of Taubach and Weimar-*Parktravertin* have a Late Saalian age, while the sites of Gröbern and Lehringen might have a Middle Saalian (MIS 7) age.

Table 7.3. Overview of the “traditional” key Eemian *s.s.* sites in Northwest Europe

Sites	**MIS**	**References**	**Alternative Interpretation**
1. Travertine Sites:			
Burgtonna	5e	Lindner 1994	probably MIS 5c
Steinmühle bei Veltheim	5e	Mania 1988	MIS 7 or MIS 5
Stuttgart-Bad Cannstatt	5e	Reiff 1994	probably MIS 5c
Stuttgart-Untertürkheim	5e	Wenzel 1998, 2002	probably MIS 5c
Taubach	5e	Behm-Blancke 1960	late MIS 6 or early MIS 5e
Weimar-Parktravertin	5e	Behm-Blancke 1960	late MIS 6 or early MIS 5e
2. Lake Sites:			
Grabschütz	5e	Weber 1990	probably MIS 7
Gröbern	5e	Weber 1990	MIS 7 or late MIS 5e
Lehringen	5e	Thieme & Veil 1985	MIS 7 or late MIS 5e
Rabutz	5e	Toepfer 1958	probably MIS 7

Finally, we would also like to point to the problems concerning the chrono-stratigraphic position of the so-called Eemian *s.s.* lake sites: (1) Grabschütz, (2) Gröbern, (3) Lehringen and (4) Rabutz. Indeed, Von Koenigswald and Heinrich (1999) excluded an Eemian *s.s.* age for the faunal assemblages from Grabschütz and Rabutz, because of the occurrence of *Apodemus maastrichtiensis*. This species of mice, is a species, which is not unambiguously attested during the Eemian *s.s.* As a result, an Eemian *s.s.* age seems not really possible. Mania (1999) has also pointed to the apparent differences between the floral composition and the mollusc associations from Rabutz and Grabschütz and the floral assemblage and the mollusc associations from the more "classical" Eemian *s.s.* sites like Taubach and Burgtonna. On the other hand, the stratigraphic setting of the Grabschütz and Rabutz sites is more or less identical and quite similar to the one at Gröbern. The "interglacial" deposits of these sites were formed within a basin of Early Saalian "glacial" deposits (Mania 1999). Indeed, these "glacial" deposits seemed to refer to the "Drenthe Glacial", which is the terrestrial equivalent of MIS 8. It is now almost certain that the sites of Grabschütz, Rabutz and Gröbern should also be dated to the "Intra-Saalian" interglacial (MIS 7), which was apparently characterised in Northwest Europe by "sub-continental", warm climatic conditions. These findings seem to indicate that the Northwest European "Eemian *s.s.*" sites were only inhabited before or after the Eemian climatic optimum. We suppose that none of the Eemian *s.s.* sites have been occupied during the climatic optimum itself. It is also very interesting to note that, with one or two exceptions, the range of the radiometric dates of the travertine sites fall outside the Eemian *s.s.* Indeed, the radiometric dates tend to point to the less "oceanic" and environmentally more open periods of the Late Saalian or even to the second half of the Last Interglacial *s.l.* The available data seem to suggest that Middle Palaeolithic people tried to avoid these fully interglacial "high-risk" environments as much as possible. Heavily forested environments were not the Middle Palaeolithic humans' favourite hideouts, because they depended for a great deal on big game, which was not available in great numbers in dense interglacial forests.

7.3.4.1.5. Conclusion

Fully interglacial environments were probably only successfully exploited for the first time during the Holocene (Gamble 1986, 1995, 1999). Nevertheless, some scientists even suggest, that not even Holocene hunter-gatherers were well equipped to survive in heavily forested environments (*e.g.*, Bradley *et al.* 1989; Jacobi 1997). The Eemian climax forests in Northern Europe appear to have been "green human deserts" (Gamble 1986), because they were less suitable places for food collecting as undergrowth vegetation would have been very sparse and diffuse. It is however possible, that river valleys were ecologically more diverse, thus rich in plant food and animal species. For example, in "Scladina Cave" near Sclayn, Belgium, a horizon has been assigned to the Eemian *s.s.* (*e.g.*, Otte *et al.* 2002). Radiometric dates are varying from 127 ky to 100 +46/-32 ky (Bocherens *et al.* 1999). Palynological correlations (Bastin 1992) suggest, however, that the horizon may correspond to the Saint-Germain II interstadial (MIS 5a). For now, we suppose that is safe to say that in Northwest Europe, interglacial *s.s.*, broadleaf and moist climax forests were probably not really targeted by Middle Palaeolithic people, who may have preferred open, "mosaic" environments. Finally, the sites of Taubach and Weimar-Parktravertin were characterised by Levallois core reduction, side-scrapers, notched and denticulated pieces. Technologically speaking, these two lithic assemblages are thus quite close the VLB lithic assemblage, which has been excavated at Veldwezelt-*Hezerwater*. What is more, the sites of Taubach and Weimar-*Parktravertin* could alternatively be dated in the late Late Saalian, which brings them also close chronologically to the VLB *locus* at Veldwezelt-*Hezerwater*.

7.3.4.2. The Middle and Later Parts of the Last Interglacial *s.l.* (MIS 5d to MIS 5a)

7.3.4.2.1. Introduction

Within the Late Pleistocene (*e.g.*, Dansgaard *et al*. 1993), an oscillatory but gradual shift is apparent from environments of a pronounced warm climatic optimum (Eemian *s.s.*) to environments of the most severe continental climate (Late Weichselian). Whereas the climatic optimum occurred at the beginning of the Late Pleistocene, the coldest phase is recorded shortly before the end of the Late Pleistocene. In this respect, the so-called loess-soil "cyclothems" [cyclic packages of strata that indicate a progressive change] clearly resemble the so-called "asymmetric sawtooth", which has been attested in the Late Pleistocene marine and ice isotope records (*e.g.*, Kukla & An 1989; Antoine *et al*. 1999; Schirmer 2000, 2002). Indeed, the loess-soil sequences right across Northwest Europe (*e.g.*, Kukla & An 1989; Antoine *et al*. 1999; Schirmer 2000, 2002; Gullentops & Meijs 2002) provide proof of a complicated sequence of environmental, and by proxy, palaeoclimatic changes, which have unmistakably effected Northwest Europe and its inhabitants during the Late Pleistocene. The middle and later parts of the Last Interglacial *s.l.* soilcomplex, which are the terrestrial equivalent of MIS 5d-c-b-a, represent a succession of four major climatic oscillations. The general trend is characterised by an increasing "continentalisation" of climatic conditions (Zagwijn 1996). The middle and later parts of the Last Interglacial *s.l.* thus encompass two cooler "interglacials" (MIS 5c & 5a), interspersed with two major cold "stadials" (MIS 5d & 5b), followed by minor climatic oscillations (Fig. 2.7.1.). Pollen records (*e.g.*, Woillard 1974, 1975, 1979) show that during the two cold "stadials" the temperatures did not drop sufficiently to kill off all tree cover (Fig. 7.4.). It seems that only the Early Weichselian (MIS 4) marked the start of the glaciation proper (*e.g.*, Kukla *et al.* 2002).

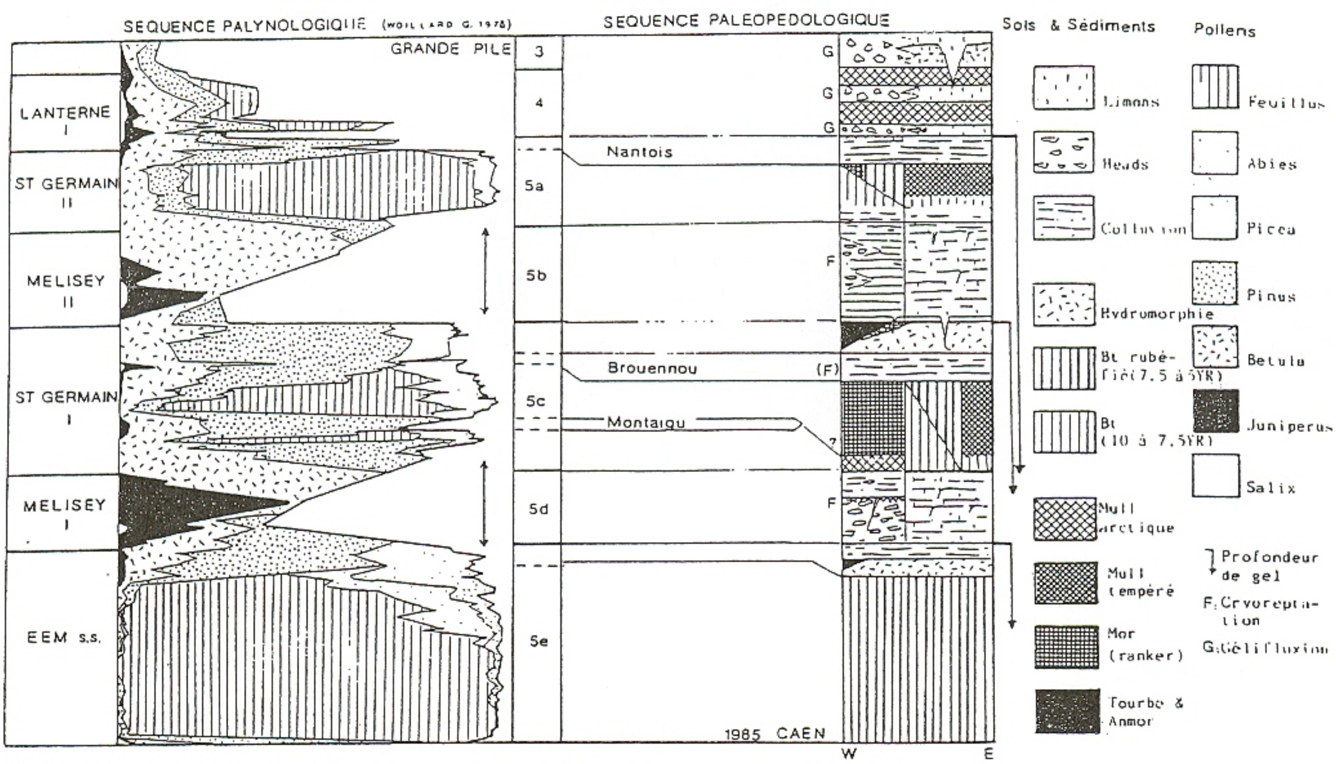

Fig. 7.4. Correlation between the Last Interglacial *s.l.* pollen sequence of *Grande Pile* (Woillard 1978) and the Last Interglacial *s.l.* soilcomplex (Van Vliet-Lanoë 1986, Fig. 5.)

Micromorphological study of the “Rocourt” and “Warneton” Soilcomplexes enabled Van Vliet-Lanoë (1975, 1986, 1989, 1990, 1992) to recognise a succession of two major phases of pedogenesis within the middle and later parts of the Last Interglacial *s.l*. (Fig. 7.4.). These two phases of “interglacial” pedogenesis were respectively correlated with “Saint-Germain I” (MIS 5c) and “Saint-Germain II” (MIS 5a), recognised at Grande Pile (Vosges, France) by Woillard (1974, 1975, 1979). Woillard also recognised three further “interstadial” phases within the pollen record, which she labelled “Ognon I, II & III”. These three “Ognon” stages were correlated with the three phases of “interstadial” pedogenesis, which have been recognised within the “Warneton Soilcomplex” (*e.g*., Van Vliet-Lanoë 1990, 1992). The same succession of soils has also been observed in the “Rocourt Soilcomplex” and the “Warneton Soilcomplex” at Veldwezelt-*Hezerwater* (Gullentops *et al*. 1998; Gullentops & Meijs 2002). In this part of the study, we will again concentrate on the key open-air archaeological sites, which have been excavated in loamy environments, because of the detailed chronostratigraphic picture, which is presented by their loess-soil sequences. We will also try to make a comparison of the similarities and differences between the lithic assemblages of these sites and the VBLB *locus* at Veldwezelt-*Hezerwater*.

7.3.4.2.2. Saint-Germain I (MIS 5c)

- **Bettencourt N3b** (Fig. 7.7.1. & Table 7.4.), *Somme*, France (*e.g*., Locht 2002) is a Last Interglacial *s.l.* site, which has been excavated at the base (early MIS 5c occupation & synsedimentary pedogenesis?) of the second Bt-horizon of the Rocourt Soilcomplex. The assemblage (n=1,351) was characterised by flakes (n=356), blades (n=66) and Levallois flakes (n=50). The toolkit included only 5 side-scrapers.

- **Auteuil *inf*.** (Fig. 7.7.2. & Table 7.4.), *Oise*, France (*e.g*., Swinnen *et al*. 1996) is another Last Interglacial *s.l.* site, which has been excavated within (bioturbation?) the second Bt-horizon of the Rocourt Soilcomplex. The lithic assemblage (n=201) has been characterised by the presence of flakes (n=49) and Levallois flakes (n=45). However, blades were lacking. The toolkit (n=23) was mainly characterised by side-scrapers.

- **Vinneuf-*Les Hauts Massous*** (Fig. 7.7.3. & Table 7.4.) *Yonne*, France (*e.g*., Deloze *et al*. 1994) also seems to represent a Last Interglacial *s.l*. lithic assemblage (n=1,013), which has been excavated in the second Bt-horizon of the Rocourt Soilcomplex. The assemblage of Vinneuf is mainly characterised by the presence of bifaces (n=27) and tools (n=148), which seem to belong to the so-called “Micoquian”. The toolkit thus included bifaces, side-scrapers, burins and retouched blades.

- **Villiers-Adam-*Le Petit Saule*** (Fig. 7.7.4. & Table 7.4.), *Val d’Oise*, France (*e.g*., Bahain & Drwila 1996) has also been excavated in the second Bt-horizon of the Rocourt Soilcomplex. This lithic assemblage (n=1,254) has mainly been characterised by the presence of flakes (n=647), blades (n=163), points (n=56), Levallois flakes (n=83) and pseudo-Levallois points (n=21). The toolkit (n=62) included side-scrapers (n=40), Mousterian points (n=4), denticulated and notched pieces and one bifacial foliate.

- **Bettencourt N3a** (Fig. 7.7.5. & Table 7.4.), *Somme*, France (*e.g*., Locht 2002) is another Last Interglacial site, which has been excavated near the top (late MIS 5c occupation?) of the second Bt-horizon of the Rocourt Soilcomplex. The lithic assemblage (n=86) has been mainly characterised by the presence of flakes (n=16) and blades (n=4). No Levallois flakes and no tools have been found.

Table 7.4. Overview of the Key Open Air Sites in Northwest Europe dated to the Middle and Later Parts of the Last Interglacial *s.l.*

Sites	Stratigraphy	MIS	References
1. Saint-Germain I			
Bettencourt N3b (F)	Roc. Sc.: 2nd Bt	5c	*e.g.*, Locht 2002
Auteuil *inf*. (F)	Roc. Sc.: 2nd Bt	5c	*e.g.*, Swinnen *et al*. 1996
Vinneuf-*Les Hauts Massous* (F)	Roc. Sc.: 2nd Bt	5c	*e.g.*, Deloze *et al*. 1994
Villiers-Adam-*Le Petit Saule* (F)	Roc. Sc.: 2nd Bt	5c	*e.g.*, Bahain & Drwila 1996
Bettencourt N3a (F)	Roc. Sc.: 2nd Bt	5c	*e.g.*, Locht 2002
2. Saint-Germain II			
Bettencourt N2b (F)	Roc. Sc.: 3rd Bt	5a	*e.g.*, Locht 2002
Sains-en-Amiénois (F)	Roc. Sc.: 3rd Bt	5a	*e.g.*, Fagnart/Fournier 1982
Lailly-*Le Domaine de Beauregard Niv*. B (F)	Roc. Sc.: 3rd Bt	5a	*e.g.*, Deloze *et al*. 1994
Molinons-*Le Grand Chanteloup* (F)	Roc. Sc.: 3rd Bt	5a	*e.g.*, Deloze *et al*. 1994
Villeneuve-*l'Archevêque/La Prieurée Niv*. B (F)	Roc. Sc.: 3rd Bt	5a	*e.g.*, Deloze *et al*. 1994
Bettencourt N2a - *secteur* 1 (F)	Roc. Sc.: 3rd Bt	5a	*e.g.*, Locht 2002
Veldwezelt-*Hezerwater* - VBLB *locus* (B)	Roc. Sc.: 3rd Bt	5a	*e.g.*, Bringmans *et al*. 2003
Veldwezelt-*Hezerwater* - VBLB-S *locus* (B)	Roc. Sc.: 3rd Bt	5a	*e.g.*, Bringmans *et al*. 2003
Remicourt - *En Bia Flo* (B)	Roc. Sc.: 3rd Bt	5a	*e.g.*, Haesaerts *et al*. 1999
3. Ognon I			
Rocourt (B)	Lower War. Sc.	5a/4	*e.g.*, Otte *et al*. 1990
Maastricht-*Belvédère* Site J (NL)	Lower War. Sc.	5a/4	*e.g.*, Roebroeks *et al*. 1997
Bettencourt N1 (F)	Lower War. Sc.	5a/4	*e.g.*, Locht 2002
Tönchesberg 2B (G)	Lower War. Sc.	5a/4	*e.g.*, Conard 1990
Riencourt-lès-Bapaume Ca (F)	Lower War. Sc.	5a/4	*e.g.*, Ameloot 1994
Auteuil *sup*. (F)	Lower War. Sc.	5a/4	*e.g.*, Swinnen *et al*. 1996
4. Ognon II			
Blangy-Tronville *inf*. (F)	Middle War. Sc.	5a/4	*e.g.*, Depaepe *et al*. 1999
5. Ognon III			
Seclin (F)	Upper War. Sc.	5a/4	*e.g.*, Tuffreau *et al*. 1994
Blangy-Tronville *sup*. (F)	Upper War. Sc.	5a/4	*e.g.*, Depaepe *et al*. 1999

Legend: (B): Belgium; (F): France; (G): Germany; (NL): The Netherlands

Roc. Sc.: Rocourt Soilcomplex; War. Sc.: Warneton Soilcomplex

7.3.4.2.3. Saint-Germain II (MIS 5a)

- **Bettencourt N2b** (Fig. 7.5, Fig. 7.7.6. & Table 7.4.), *Somme*, France (*e.g.*, Locht 2002) is a Last Interglacial *s.l.* site, which has been excavated at the base (early MIS 5a occupation & synsedimentary pedogenesis?) of the third Bt-horizon of the Rocourt Soilcomplex. The lithic assemblage (n=6,539) was mainly characterised by the presence of laminar core reduction (blades: n=375) and Levallois core reduction (Levallois products: n=122). The toolkit was quite small (n=23). Only 9 side-scrapers have been found. A few denticulated and notched pieces were also present.

- **Sains-en-Amiénois** (Fig. 7.7.7. & Table 7.4.), *Somme*, France (*e.g.*, Fagnart & Fournier 1982) has been excavated within (bioturbation?) the third Bt-horizon of the Rocourt Soilcomplex. The lithic assemblage has mainly been characterised by the presence of Levallois core reduction. The toolkit comprised mostly side-scrapers.

- **Lailly-*Le Domaine de Beauregard Niv.* B** (Fig. 7.7.8. & Table 7.4.), *Yonne*, France (*e.g.*, Deloze *et al*. 1994) has also been excavated in the third Bt-horizon of the Rocourt Soilcomplex. The lithic assemblage (n=1,922) has been mainly characterised by the presence of flakes (n=653), blades (n=58) and Levallois products (n=145). The toolkit was quite large (n=130). Almost 70 side-scrapers have been identified. Two bifaces have also been found.

- **Molinons-*Le Grand Chanteloup*** (Fig. 7.7.9. & Table 7.4.), *Yonne*, France (*e.g.*, Deloze *et al.* 1994) has been excavated in the third Bt-horizon of the Rocourt Soilcomplex. The lithic assemblage (n=1,347) has been mainly characterised by the presence of flakes (n=560), blades (n=17) and Levallois flakes (n=74). The toolkit was quite large (n=114). More than 50 side-scrapers have been identified. There were also 11 denticulated, 5 notched pieces and 6 bifaces (10-18 cm) present within the toolkit.

- **Villeneuve-*l'Archevêque/La Prieurée Niv.* B** (Fig. 7.7.10. & Table 7.4.), *Yonne*, France (*e.g.*, Deloze *et al*. 1994) has also been excavated in the third Bt-horizon of the Rocourt Soilcomplex. The lithic assemblage (n=658) has been mainly characterised by the presence of flakes (n=205), blades (n=56) and Levallois flakes (n=62). The toolkit comprised 121 pieces. More than 40 side-scrapers have been identified.

- **Bettencourt N2a** (Fig. 7.7.11. & Table 7.4.), *Somme*, France (*e.g.*, Locht 2002) is another Last Interglacial *s.l.* site, which has been excavated in the third Bt-horizon of the Rocourt Soilcomplex. The lithic assemblage (n=10) has mainly been characterised by the presence of a few flakes (n=2), the absence of Levallois products and tools.

- **Veldwezelt-*Hezerwater* - VBLB *Locus*** (Fig. 7.7.12. & Table 7.4.), *Limburg*, Belgium (*e.g.*, Bringmans *et al*. 2003) is a Last Interglacial *s.l.* site, which has been excavated in the third Bt-horizon of the Rocourt Soilcomplex (synsedimentary pedogenesis). The presence of Levallois products (cores & flakes) has been attested. The toolkit was quite small (n=4). Two unifacial tools and two relatively small (5-6 cm) bifacial tools were found.

- **Veldwezelt-*Hezerwater* - VBLB-S *Locus*** (Fig. 7.7.13. & Table 7.4.), *Limburg*, Belgium (*e.g.*, Bringmans *et al*. 2003) also is a Last Interglacial *s.l.* lithic assemblage, which has also been excavated in the third Bt-horizon of the Rocourt Soilcomplex. However, no unambiguous products of Levallois core reduction and no tools were excavated. Only products of opportunistic core reduction have been attested.

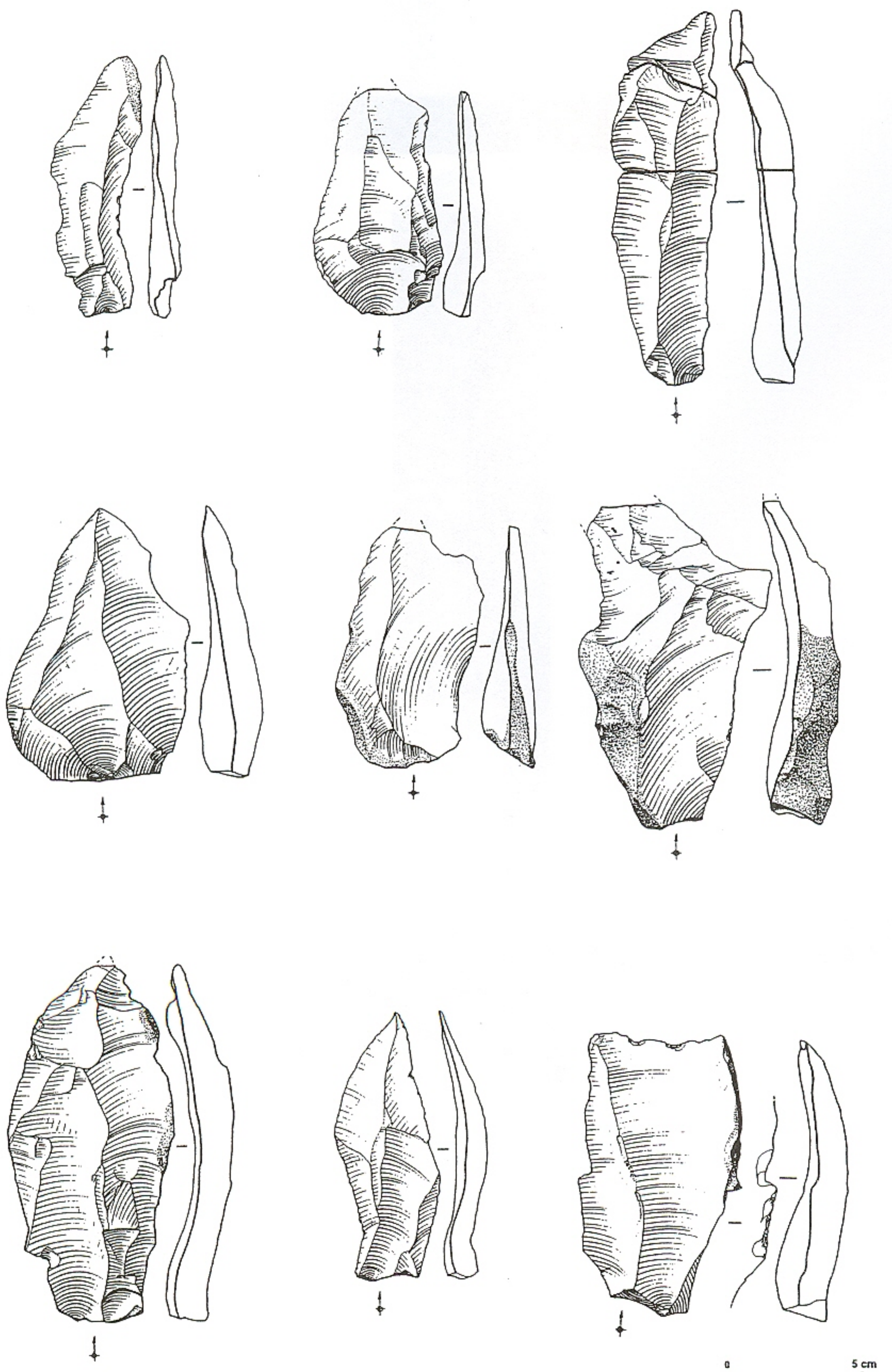

Fig. 7.5. Bettencourt N2b: flakes, blades & points (Locht *et al*. 1996, Fig. 35.)

- **Remicourt - *En Bia Flo*** (Fig. 7.6, Fig. 7.7.14. & Table 7.4.), *Liège*, Belgium (*e.g.*, Haesaerts *et al*. 1999) is a late Last Interglacial *s.l.* site, of which the "*in situ*" part has been excavated in the third Bt-horizon of the Rocourt Soilcomplex. At the site of Remicourt, two concentrations ("A" & "B") have been encountered. Concentration "A" included 234 artefacts mainly produced by laminar core reduction strategies. This concentration has been interpreted as a knapping spot. Concentration "B" comprised 149 artefacts and probably represented a "living area". The lithic assemblage, which has been excavated at Concentration "B" included laminar products, Levallois flakes, a few side-scrapers and two bifacial tools.

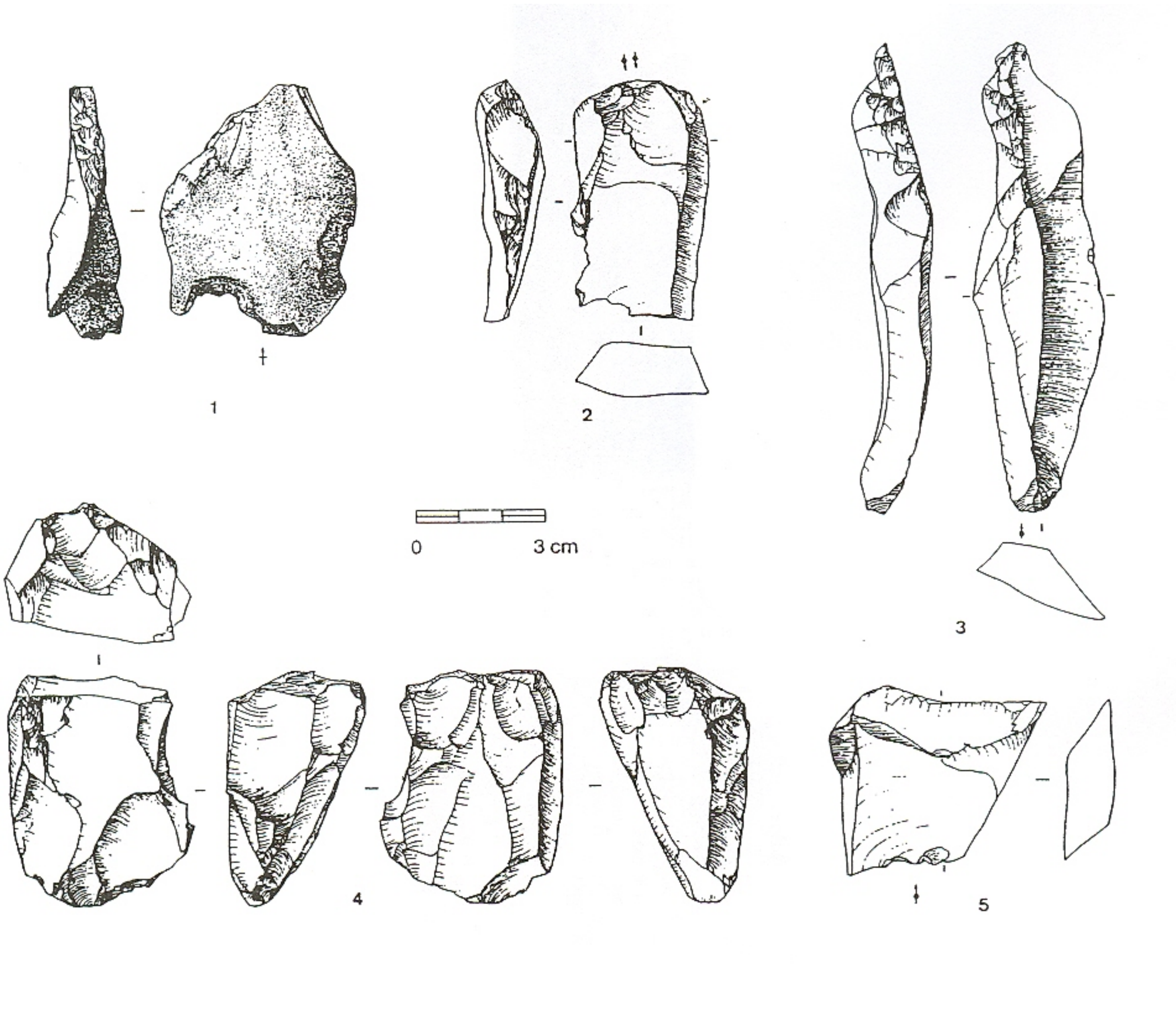

Fig. 7.6. Remicourt - *En Bia Flo*: 1. bifacial tool; 2. blade; 3. blade; 4. core; 5. tool (Haesaerts *et al*. 1999, Fig. 6.)

7.3.4.2.4. Ognon I (MIS 5a/4)

- **Rocourt** (Fig. 7.7.15. & Table 7.4.), *Liège*, Belgium (*e.g.*, Otte *et al*. 1990) has been excavated in the Lower Warneton Soilcomplex. The lithic assemblage of Rocourt (n=407) included 78 Levallois blades. Several blades have been refitted. The Rocourt toolkit (n=21) included retouched blades, burins, notched and denticulated pieces.

- **Maastricht-*Belvédère* Site J** (Fig. 7.7.16. & Table 7.4.), *Limburg*, The Netherlands (*e.g*., Roebroeks *et al*. 1997) is a late Last Interglacial *s.l*. site, which has mainly been found in the Lower Warneton Soilcomplex. In total, 2,863 lithic artefacts have been excavated at Site J. The toolkit comprised 35 retouched tools and was mainly characterised by side-scrapers, notched and denticulated pieces.

- **Bettencourt N1** (Fig. 7.7.17. & Table 7.4.), *Somme*, France (*e.g*., Locht 2002) is another late Last Interglacial site, which also has been excavated in the Lower Warneton Soilcomplex. The lithic assemblage (n=438) has mainly been characterised by the presence of flakes (n=114) and Levallois products (n=17). A few blades and points were also present. The toolkit again was very small. Four side-scraper have been identified.

- **Tönchesberg 2B** (Fig. 7.7.18. & Table 7.4.), *Rheinland-Pfalz*, Germany (*e.g*., Conard 1990, 1992) is a late Last Interglacial *s.l*. site, which seems to have been excavated in the Lower Warneton Soilcomplex. Almost 83% of the lithic assemblage (n=557) consisted of quartz flake artefacts. The remaining 17% of the lithic assemblage was made of fine-grained raw materials. More than 50 flakes, 30 blades and one blade core were present within the fine-grained segment of the assemblage. No Levallois products have been found.

- **Riencourt-lès-Bapaume CA** (Fig. 7.7.19. & Table 7.4.), *Pas-de-Calais*, France (*e.g*., Ameloot-van der Heijden 1994) is another late Last Interglacial *s.l*. site, which has been excavated in the Lower Warneton Soilcomplex. The lithic assemblage, which is quite large (n=5,000), is mainly characterised by the presence of blades. The toolkit included 108 tools such as burins and backed pieces associated with side-scrapers.

- **Auteuil *sup*.** (Fig. 7.7.20. & Table 7.4.), *Oise*, France (*e.g*., Swinnen *et al*. 1996) is a site, which has been excavated in the Lower Warneton Soilcomplex. The lithic assemblage (n=1,549) has mainly been characterised by the presence of flakes (n=389) and Levallois flakes (n=207). The toolkit was quite large (n=98) and was largely characterised by side-scrapers (n=84).

7.3.4.2.5. Ognon II (MIS 5a/4)

- **Blangy-Tronville *inf*.** (Fig. 7.7.21. & Table 7.4.), *Somme*, France (*e.g*., Depaepe *et al*. 1999) is a late Last Interglacial *s.l*. archaeological horizon, which has been excavated in the Middle Warneton Soilcomplex. The lithic assemblage (n=92) of Blangy-Tronville *inf*. was primarily characterised by the presence of blades. The toolkit included a few side-scrapers.

7.3.4.2.6. Ognon III (MIS 5a/4)

- **Seclin** (Fig. 7.7.22. & Table 7.4.), *Nord*, France (*e.g*., Tuffreau *et al*. 1994) has probably been excavated in the Upper Warneton Soilcomplex. The assemblage (n=3,402) included flakes (n=2,061), blades (n=779) and Levallois flakes (n=242). The toolkit comprised 67 pieces (*e.g*., 25 side-scrapers & 22 “marginally retouched pieces”).

- **Blangy-Tronville *sup*.** (Fig. 7.7.23. & Table 7.4.), *Somme*, France (*e.g*., Depaepe *et al*. 1999) has been excavated in the Upper Warneton Soilcomplex. The assemblage (n=337) was characterised by Levallois products. The toolkit included side-scrapers.

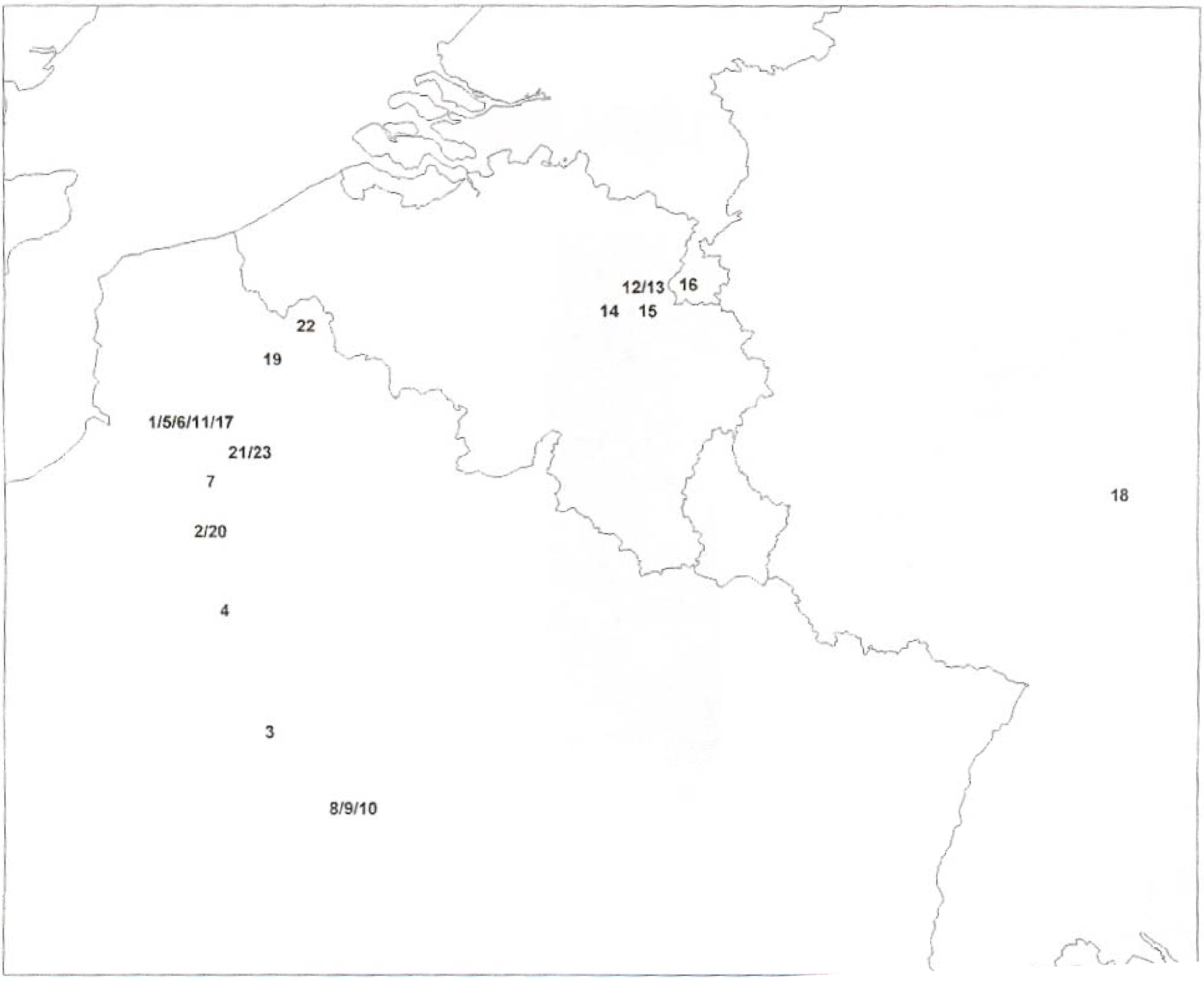

Fig. 7.7. Overview of the key Last Interglacial *s.l.* sites in Northwest Europe

Sites: 1. Bettencourt N3b; 2. Auteuil *inf*.; 3. Vinneuf-*Les Hauts Massous*; 4. Villiers-Adam-*Le Petit Saule*; 5. Bettencourt N3a; 6. Bettencourt N2b; 7. Sains-en-Amiénois; 8. Lailly-*Le Domaine de Beauregard Niv*. B; 9. Molinons-*Le Grand Chanteloup*; 10. Villeneuve-*l'Archevêque/La Prieurée Niv*. B; 11. Bettencourt N2a - *secteur* 1; 12. Veldwezelt-*Hezerwater* - VBLB *locus*; 13. Veldwezelt-*Hezerwater* - VBLB-S *locus*; 14. Remicourt - *En Bia Flo*; 15. Rocourt; 16. Maastricht-*Belvédère* Site J; 17. Bettencourt N1; 18. Tönchesberg 2B; 19. Riencourt-lès-Bapaume Ca; 20. Auteuil *sup*.; 21. Blangy-Tronville *inf*.; 22. Seclin; 23. Blangy-Tronville *sup*.

7.3.4.2.7. Discussion

This overview shows that the Last Interglacial *s.l.* Middle Palaeolithic assemblages seem to have several technological features in common. First of all, most of these lithic assemblages, which have been excavated at these sites, were mainly characterised by the presence of Levallois core reduction strategies. The length of most of the Levallois flakes averages 6 to 8 cm, which means that most of these Levallois flakes could be labelled as "medium-sized" artefacts. Secondly, several lithic assemblages also include an important number of blades. Thirdly, the toolkits are usually small. Most formal tools were side-scrapers and most of these side-scrapers were smaller than 8 cm. Sometimes, a few bifaces were also present within the toolkit (1-5% of the assemblage).

It is quite remarkable that the most important laminar assemblages (*e.g*., Rocourt, Bettencourt N1, Tönchesberg 2B, Riencourt-lès-Bapaume Ca, Blangy-Tronville *inf*., Seclin) were present in the transition from the Last Interglacial *s.l*. to the Early Weichselian (Table 7.5.). This interglacial/glacial transition (MIS 5a/4-transition) is characterised by a significant cooling climatic trend. Could the presence of blade assemblages in this transitional period be a result of climatic and environmental change? However, we have to keep in mind that throughout the middle and the later parts of the Last Interglacial *s.l*., blades (Table 7.5.) were present in the lithic assemblages (*e.g*., Bettencourt N3b, Villiers-Adam-*Le Petit Saule*, Bettencourt N3a, Bettencourt N2b, Lailly-*Le Domaine de Beauregard Niv*. B, Molinons-*Le Grand Chanteloup*, Villeneuve-*l'Archevêque/La Prieurée Niv*. B). We could thus safely say that different core reduction strategies have coexisted within single lithic assemblages. However, most of these Last Interglacial *s.l*. lithic assemblages were also characterised by Levallois core reduction. However, the "pure" Last Interglacial *s.l*. Levallois assemblages (Table 7.5.) seem to share the same general technological adaptation, namely "medium-sized Levallois blanks in association with medium-sized tools" (*e.g*., Auteuil *inf*., Sains-en-Amiénois, Veldwezelt-*Hezerwater* - VBLB *locus*, Remicourt - *En Bia Flo*, Bettencourt N1, Auteuil *sup*., Blangy-Tronville *sup*., *etc*.).

The lithic assemblages, which have been excavated at these sites, do thus not belong to the Eemian *s.s.* (MIS 5e). The absence of artefacts in the lowest Bt-horizon of the "Rocourt Soilcomplex", for instance at the VBLB *locus* at Veldwezelt-*Hezerwater* (PGB), which is the terrestrial equivalent of the Eemian *s.s.* (MIS 5e), has been observed at all these sites, which were preserved in a loamy matrix. This absence of artefacts could indicate that Northwest Europe must apparently have been deserted by Middle Palaeolithic people during the Eemian *s.s*. The seemingly disadvantageous "oceanic" influence was indeed much more pronounced in the Western part of Europe, where the seasonal change of land surface temperatures was much weaker, than in the Eastern part of Europe. But, although this may sound perfectly plausible an explanation, even the so-called "Eemian *s.s.*" travertine and lake sites in Germany fail to present solid unambiguous evidence for a real climax "Eemian *s.s*." human habitation.

Notwithstanding the hypothetical presence of humans in the East of Germany, no traces of Eemian *s.s*. occupation were found in Northern France, Belgium, The Netherlands, Luxemburg and the Western part of Germany. Hypothetical traces of Eemian *s.s*. human occupation in loamy environments should be present within or on top of the truncated lowest Bt-horizon of the "Rocourt Soilcomplex". However, they were not found. Another striking aspect is the total absence of traces of human occupation during the Last Interglacial *s.l*. in the United Kingdom, although many Last Interglacial ("Ipswichian") sediments were found. The crux of the so-called "Eemian Problem" seems to boil down to the preference of Middle Palaeolithic humans to occupy open, "mosaic" environments. The Eemian *s.s*. climax forests in Northwest Europe actually appear to have been so-called "green human deserts" (Gamble 1986). It is also important to highlight that in Belgium and in The Netherlands, there is only evidence for human occupation during the "*Saint Germain* 2" and "*Ognon* I" phases. In Northern France there is also evidence for human occupation during the "*Saint Germain* 1", the "*Ognon* II" and the "*Ognon* III" phases (Table 7.5.). Another important observation is that during the "*Melisey* I" and the "*Melisey* II" phases, two periods which were characterised by cold environments with local loess deposition, and which have been correlated respectively with MIS 5d and MIS 5b (*e.g*., Woillard 1974, 1975, 1979), there is also no unambiguous evidence of human occupation in Northwest Europe. Indeed, in the loess-soil sequences of Northwest Europe, the Late Pleistocene archaeological finds are mostly found within palaeosoils rather than in pure loess.

Table 7.5. Overview of the Key Open Air Sites in Northwest Europe dated to the Middle and Later Parts of the Last Interglacial *s.l.*

Sites	MIS	Comparison with the VBLB Lithic Assemblage
1. Saint-Germain I		
Bettencourt N3b (F)	5c	main difference: presence of many blades
Auteuil *inf*. (F)	5c	quite similar, although many formal tools present
Vinneuf-*Les Hauts Massous* (F)	5c	completely different: bifaces & "Micoquian" tools
Villiers-Adam-*Le Petit Saule* (F)	5c	differences: blades, points, pseudo-Levallois points
Bettencourt N3a (F)	5c	differences: blades, no Levallois products & no tools
2. Saint-Germain II		
Bettencourt N2b (F)	5a	main difference: presence of many blades
Sains-en-Amiénois (F)	5a	quite similar, although many formal tools present
Lailly-*Le Domaine de Beauregard Niv*. B (F)	5a	completely different: blades, bifaces & many tools
Molinons-*Le Grand Chanteloup* (F)	5a	completely different: blades, bifaces & many tools
Villeneuve-*l'Archevêque/La Prieurée Niv*. B (F)	5a	main differences: blades & many tools
Bettencourt N2a - *secteur* 1 (F)	5a	quite different: no Levallois products & no tools
Veldwezelt-*Hezerwater* - VBLB *locus* (B)	5a	identical
Veldwezelt-*Hezerwater* - VBLB-S *locus* (B)	5a	quite different: no Levallois products & no tools
Remicourt - *En Bia Flo* (B)	5a	main difference: the presence of blades
3. Ognon I		
Rocourt (B)	5a/4	completely different: blade assemblage
Maastricht-*Belvédère* Site J (NL)	5a/4	main difference: large toolkit
Bettencourt N1 (F)	5a/4	quite similar, although blades & points were present
Tönchesberg 2B (G)	5a/4	completely different: blade assemblage
Riencourt-lès-Bapaume Ca (F)	5a/4	completely different: blade assemblage
Auteuil *sup*. (F)	5a/4	quite similar, although many formal tools present
4. Ognon II		
Blangy-Tronville *inf*. (F)	5a/4	completely different: blade assemblage
5. Ognon III		
Seclin (F)	5a/4	completely different: blade assemblage
Blangy-Tronville *sup*. (F)	5a/4	quite similar lithic assemblage

Legend: (B): Belgium
(F): France
(G): Germany
(NL): The Netherlands

7.3.5. Conclusion

The technological adaptation of "medium-sized Levallois blanks in association with medium-sized tools", which has been observed at the VBLB *locus* at Veldwezelt-*Hezerwater* and at other Last Interglacial *s.l.* sites in Northwest Europe, was probably not the result of a "cultural" shift, because this "new" technological trend did not have the appearance of a very different sort of behaviour. However, "new" technological adaptations always develop within a particular "cultural" context, probably as a response to changing needs or constraints. But once developed, the "new" technological adaptations modify the very nature of the "cultural framework" itself. Indeed, culture and technology seem to represent two different, semi-parallel tracks of development, which are continually co-evolving in a complex web of dynamic relationships. Most of the technological adaptations we observed, seem to reflect the responses of Middle Palaeolithic people towards changing "niche" resource opportunities.

7.4. The Middle Weichselian TL & WFL Lithic Assemblages

7.4.1. Weichselian *s.s.* Chronological and Environmental Framework

Since we advocate a long Last Interglacial *s.l.* (MIS 5), we also support a short Weichselian *s.s.* (MIS 4, 3 & 2). As a result, we assume that the "Early", "Middle" and "Late" Weichselian are the terrestrial equivalents of MIS 4, 3 and 2 respectively. The first half of the Early Weichselian *s.s.* (first half MIS 4) represented a period of gradual cooling (*e.g.*, Dansgaard *et al*. 1993). However, the first big cold push occurred only in the second half of the Early Weichselian *s.s.* (second half MIS 4). The Middle Weichselian *s.s.* (MIS 3) represented a fluctuating "bipolar" climate, characterised by episodes of alternating cool and arid conditions with warmer and wetter conditions. These periods lasted only for a few thousand years and the transitions were usually very quick (*e.g.*, Dansgaard *et al*. 1993). As many as 15 major interstadials were recorded during the Middle Weichselian. Finally, the Late Weichselian *s.s.* (MIS 2) was the coldest and driest period of the last ice age (*e.g.*, Dansgaard *et al*. 1993).

7.4.2. Weichselian *s.s.* Archaeological Framework

At the TL and WFL *loci*, Middle Palaeolithic humans were probably living on the so-called "mammoth steppe" (Guthrie 1984, 1990) near the fringes of broken woodland. These Middle Palaeolithic groups were probably only present in Northwest Europe during the warmest interstadials of the Middle Weichselian (MIS 3). On stratigraphical grounds, we estimated that the Middle Palaeolithic humans were present at the TL and WFL *loci* at Veldwezelt-*Hezerwater*, during the first half of the Middle Weichselian (first half of MIS 3), roughly between 60,000 and 50,000 years ago. The Radiocarbon Laboratory of the University of Groningen (The Netherlands) processed and dated (AMS) a sample of unidentifiable fragmentary "mammal" bones from the WFL *locus*. The uncalibrated result was 45,440 +4450/-2850 BP (GrA-19889). The question of how climate change did match the resource needs of these Middle Palaeolithic humans still is a major problem. Many scholars (*e.g.*, Trinkaus 1981; Stinger 1995) believe that Middle Palaeolithic humans in Northwest Europe must have been biologically "cold-adapted" to survive in these "harsh" environments. The Weichselian ice age is often referred to as the most important period of Middle Palaeolithic occupation in Northwest Europe (*e.g.*, Trinkaus 1981; Stinger 1995). However, the actual number of Weichselian sites, in particular open-air sites, in Northwest Europe may be smaller than is often thought.

7.4.3. Overview of the Weichselian Middle Palaeolithic Open-air Sites in Belgium

During the last 100 years, a number of Middle Palaeolithic open-air sites have been recovered in Belgium. Virtually none of these assemblages were found *in situ*. Most of these lithic assemblages even lacked a minimum of stratigraphic and chronological integrity. Some of the most informative Belgian lithic assemblages were located at Etterbeek (Rutot 1903-1904), Mol (de Heinzelin 1962), Braine-le-Château (Vermeersch 1971), Lichtaart (Vermeersch 1971) and Franquenies (Michel & Haesaerts 1975; Haesaerts 1978). However, all these lithic assemblages were found in a gravel-bed, which probably represented the base of the Quaternary-age sediments. The open-air site "*l'Hermitage*" at Huccorgne (*e.g.*, Ulrix-Closset 1975; Haesaerts 1978), which brought to light a more promising stratigraphic context, was characterised by a poor Middle Palaeolithic assemblage with bifaces (probably "MTA"). Nevertheless, this site probably dates to the Weichselian. At Spiennes-*Carrière Hélin* (Michel 1978), two Weichselian horizons (GLR1 & GLR2) were also found. Again, the lithic artefacts were encountered in two different gravel-beds. The lithic assemblages of Schulen (Van Peer 1979) and of Rotselaar (Van Peer 1982) were brought up from a sandy matrix, which yielded virtually no stratigraphic evidence. In a gravel-bed at Lauw (Gijselings & Dopere 1983), which seems to represent the base of the Weichselian-age sediments, a Middle Palaeolithic assemblage has also been found. The lithic assemblage of Zemst (Bogemans & Caspar 1984), on the other hand, was encountered in criss-crossing sandy channels. In Aalter (Van der Haegen 1992; Crombé & Van der Haegen 1994a, 1994b), two Middle Palaeolithic sites were discovered. Again, the stratigraphic context was difficult to interpret. Although found in soliflucted deposits, arguably the most interesting site was excavated at Vollezele-*Congoberg* (Vynckier *et al*. 1985, 1986). The lithic assemblage of Vollezele-*Congoberg* probably also dates to an early phase of the Weichselian. These examples show that it will not be easy to draw any conclusion regarding the chrono-technological position of the TL and WFL assemblages.

7.4.4. Overview of the Weichselian Middle Palaeolithic Key Open-air Sites in Northwest Europe

In the United Kingdom, Middle Palaeolithic artefacts are absent in most of the Weichselian/Devensian floodplain gravels. Only the "Christchurch Gravels" in Hampshire (Calkin & Green 1949) and the "Ouse Gravels" at Earith and St. Neots (Paterson & Tebutt 1947) brought to light a few so-called "*Bout-coupé*" hand-axes and a few Levallois flakes. The richest Weichselian assemblage with hand-axes and Levallois flakes was found in a river terrace at Bramford Road near Ipswich (Wymer 1985). Recently, another probably Weichselian open-air site has been excavated in a humic horizon at Lynford in Norfolk, UK (Boismier *et al*. 2003). At this site, 8 hand-axes and a few rejuvenation flakes were found in association with mammoth remains. Unfortunately, the stratigraphic context at Lynford was not very revealing. Middle Palaeolithic artefacts, which were probably not *in situ*, have also been recorded from a few British cave sites. Although the stratigraphical evidence is not good, the deposits are unlikely to be earlier than the Weichselian. Middle Palaeolithic cave assemblages were found at "Pin Hole" and "Robin Hood's Cave" at Creswell Crags (Roe 1981) and at the "Rhino Hole" and "Hyaena Den" at Wookey (Tratman *et al*. 1971). It can be concluded that Weichselian Middle Palaeolithic assemblages are very rare in the United Kingdom. The attested sites probably date to early Weichselian phases. The same seems to be true for the Weichselian Middle Palaeolithic sites in the Netherlands. For example, at Nieuwegein, Utrecht (*e.g.*, Niekus 1995, 1996) a suction-dredged lithic assemblage, found in a sandy matrix, probably also belongs to an early phase of the Weichelian.

The general trend in Belgium, the Netherlands and the United Kingdom is that very few well-preserved Middle Palaeolithic open-air sites, which could be dated to the Weichselian, are known. One possible answer for this trend is that the erosional processes might have been quite severe. On the other hand, very few Middle Palaeolithic humans may have been living in these parts of Northwest Europe during the Weichselian. The unstable Weichselian climate with its long “deep freezes”, which were alternating with milder conditions, and the rapid changing environments made it quite difficult for Middle Palaeolithic humans to repopulate Northwest Europe in large numbers during the warmer phases of the Weichselian. We will now focus on the Weichselian key open-air sites, which were excavated in Northern France and Western Germany. We will only examine sites that can present high-quality stratigraphical (*e.g.*, Antoine *et al* 2003) and chronological (*e.g.*, Vermeersch 2005) evidence.

- **Beauvais 1 & 2** (Fig. 7.8.1. & Table 7.6.), *Oise*, France (*e.g.*, Locht *et al*. 1995), belongs to the early “*Pléniglaciaire inférieur*” (early MIS 4). The lithic assemblage (n=11,700) was dominated by Levallois core reduction. The toolkit (n=250) mainly contained side-scrapers, denticulated pieces and knives. The faunal assemblage was characterised by the presence of reindeer.

- **Hermies A** (Fig. 7.8.2. & Table 7.6.), *Pas-de-Calais*, France (*e.g.*, Vallin & Masson 1996), has been dated to the “*Début Glaciaire Weichsélien*” (probably early MIS 4 - after the steppe soils). The lithic assemblage of Hermies A, chips excluded, contained 761 artefacts, 7 Levallois cores and a few marginally retouched flakes.

- **Corbehem** (Fig. 7.8.3. & Table 7.6.), *Pas-de-Calais*, France (*e.g.*, Tuffreau 1979), probably belongs to the “*Début Glaciaire*” (early MIS 4). The lithic assemblage is characterised by Levallois core reduction and side-scrapers.

- **Buhlen-*Level II*** (Fig. 7.8.4. & Table 7.6.), *Hessen*, Germany (e.g., Bosinski & Kulick 1973; Jöris 2001), probably is an early MIS 3 site. The assemblage included Levallois cores and Levallois points. The Buhlen assemblage has been labelled as “Mousterian”. However, the site lacks characteristic tools.

- **Veldwezelt-*Hezerwater* - TL *loci*** (Fig. 7.8.5. & Table 7.6.), *Limburg*, Belgium (*e.g*., Bringmans *et al*. 2003), is an early Middle Weichselian site, which was characterised by centripetal/Levallois and opportunistic core reduction. The toolkit was mainly characterised by the presence of large Quina tools.

- **Lichtenberg** (Fig. 7.8.6. & Table 7.6.), Lüchow-*Dannenberg*, *Niedersachsen*, Germany (*e.g*., Veil *et al*. 1994), is another early MIS 3 site, which thus seems to belong to the Middle Weichselian. More than 1,600 artefacts and 87 tools were found. The toolkit was mainly characterised by the presence of side-scrapers, a few hand-axes and several so-called “*Keilmesser*” (bifacially “backed knives” or “wedge-knives”). The lithic assemblage of Lichtenberg has been attributed to the so-called “*Keilmessergruppen*” with “Quina-affinities” (Richter 1997, 2000).

- **Königsaue** (Fig. 7.8.7. & Table 7.6.), Aschersleben-*Staßfurt*, *Sachsen-Anhalt*, Germany (*e.g*., Koller *et al*. 2001a,b), is an important site, which has been dated from 55,800 to 45,000 years ago. It is thus probably a Middle Weichselian site. More than 6,000 artefacts (cores, flakes & blades) have been excavated. The rich toolkit included side-scrapers, “*Keilmesser*” and “*Faustkeilblätter*”, which are small, pointed “*Micoquian*” bifaces. Three find horizons have been distinguished (A, B & C).

The bifacial tools at Königsaue were mainly present within the A and C find horizons ("*Keilmessergruppen*" with "Quina-affinities" Richter 1997, 2000), while the prepared cores were essentially found in the B horizon (MTA). Mammoth, woolly rhino, horse, red deer and reindeer were attested within the faunal assemblage. Two pieces of birch-pitch (A & B horizons), with a finger-print of a human, were also found (evidence of "dry-distillation" & "hafting").

- **Salzgitter-*Lebenstedt*** (Fig. 7.8.8. & Table 7.6.) *Niedersachsen*, Germany (*e.g.*, Tode 1982; Grote & Thieme 1985; Gaudzinski 1999; Pastoors 1999, 2001; Bocquet-Appel & Demars 2000), has been dated from 55,600 to 48,500 years ago. The site of Salzgitter-*Lebenstedt* is characterised by rich lithic and faunal assemblages. The lithic assemblage (n=4,200) was characterised by opportunistic and Levallois core reduction. The toolkit contained more than 400 pieces. More than 100 side-scrapers, 12 "*Keilmesser*" and 16 pointed handaxes were present. The presence of handaxes is quite remarkable. Several hand-axes with prolonged points bear a resemblance to the so-called "*Micoquian*". There were also 28 bone tools present (Gaudzinski 1999). Techno-typological comparisons between the Salzgitter-*Lebenstedt* artefacts and finds from other Weichselian Middle Palaeolithic assemblages have shown no clear parallels. On typological grounds, Bosinski (1963) considers the site to date from an earlier glacial cycle. The rich finds of Salzgitter-*Lebenstedt* show a great diversity or maybe a mixture of different typo-technological pieces. We think that the Salzgitter-*Lebenstedt* finds should be interpreted in a palimpsest scenario of occupation and re-occupation. The faunal assemblage of Salzgitter-*Lebenstedt* (n=5,000) was characterised by reindeer, mammoth, woolly rhino, bison and horse. However, the remains of reindeer represented more than 80% of the assemblage (Gaudzinski & Roebroeks 2000). The environment at Salzgitter-*Lebenstedt* has been described as a "grassy tundra", with scattered coniferous trees. The palaeoenvironment of Salzgitter-*Lebenstedt* is thus quite similar to the palaeoenvironment of the WFL *locus* at Veldwezelt-*Hezerwater*. However, the faunal assemblage at Salzgitter-*Lebenstedt* is dominated by reindeer, while at the WFL *locus*, it is dominated by horse. So, it seems that the more Southern WFL *locus* probably was slightly "warmer" than the Salzgitter-*Lebenstedt* site.

- **Veldwezelt-*Hezerwater* - WFL *locus*** (Fig. 7.8.9. & Table 7.6.), *Limburg*, Belgium (*e.g.*, Bringmans *et al*. 2003), is a Middle Weichselian site, which was mainly characterised by Levallois core reduction and by the presence of large Quina tools.

- **Attilly 1&2** (Fig. 7.8.10. & Table 7.6.), *Seine-et-Marne*, France (*e.g.*, Antoine *et al*. 2003) is a "*Pléniglaciaire inférieur*" site (MIS 3). The lithic assemblage was characterised by Levallois core reduction. The toolkit included several side-scrapers.

- **Hénin-sur-Cojeul** (Fig. 7.8.11. & Table 7.6.), *Pas-de-Calais*, France (*e.g.*, Marcy *et al*. 1993), is a late Middle Weichselian site (Gif-8868: 35,600 $\pm$1,100). The lithic assemblage was mainly characterised by Levallois core reduction and side-scrapers. The faunal assemblage included bones and teeth of reindeer, bison and mammoth.

The TL and WFL *loci* at Veldwezelt-*Hezerwater* were characterised by Levallois core reduction and the presence of Quina tools. However, techno-typological comparisons between the Veldwezelt-*Hezerwater* artefacts and finds from other Middle Weichselian open-air assemblages (Table 7.7.) have shown no clear parallels, because: (1) well-preserved Middle Weichselian Middle Palaeolithic open-air sites in Northwest Europe are few in number and (2) while virtually all sites were characterised by Levallois core reduction, not a single open-air site yielded typical Quina tools.

Table 7.6. Weichselian *s.s*. Key Open-air Sites in Northwest Europe

Site	**MIS**	**References**	**The "Weichselian *s.s*. Scheme"**
Beauvais 1 & 2 (F)	early 4	*e.g*., Locht *et al*. 1995	Early Weichselian
Hermies A (F)	early 4	*e.g*., Vallin & Masson 1996	Early Weichselian
Corbehem (F)	early 4	*e.g*., Antoine *et al*. 2003	Early Weichselian
Buhlen-*Level II* (G)	early 3	*e.g*., Bosinski/Kulick 1973	early Middle Weichselian
Veldwezelt-*Hezerwater*: TL (B)	early 3	*e.g*., Bringmans *et al.* 2003	early Middle Weichselian
Lichtenberg (G)	early 3	*e.g*., Veil *et al*. 1994	early Middle Weichselian
Königsaue (G)	mid 3	*e.g*., Koller *et al*. 2001a,b	Middle Weichselian
Salzgitter-*Lebenstedt* (G)	mid 3	*e.g*., Grote & Thieme 1985	Middle Weichselian
Veldwezelt-*Hezerwater*: WFL (B)	mid 3	*e.g*., Bringmans *et al*. 2003	Middle Weichselian
Attilly 1 & 2 (F)	mid 3	*e.g*., Antoine *et al*. 2003	Middle Weichselian
Hénin-sur-Cojeul (F)	late 3	*e.g*., Antoine *et al*. 2003	late Middle Weichselian

Legend: (B): Belgium (G): Germany (F): France

Fig. 7.8. Weichselian *s.s*. key open-air sites in Northwest Europe

Sites: 1. Beauvais; 2. Hermies; 3. Corbehem; 4. Buhlen; 5. Veldwezelt-*Hezerwater*: TL *loci*; 6. Lichtenberg; 7. Königsaue; 8. Salzgitter-*Lebenstedt*; 9. Veldwezelt-*Hezerwater*: WFL *locus*; 10. Attilly; 11. Hénin-sur-Cojeul

Table 7.7. Weichselian *s.s.* Open-air Sites in Northwest Europe & the TL and WFL *Loci*

Site	**MIS**	**Comparison with the TL and WFL Lithic Assemblages**
Beauvais 1 & 2 (F)	early 4	main difference: no Quina tools
Hermies A (F)	early 4	main difference: no Quina tools
Corbehem (F)	early 4	main difference: no Quina tools
Buhlen-*Level II* (G)	early 3	main difference: no Quina tools
Veldwezelt-*Hezerwater*: TL (B)	early 3	this assemblage
Lichtenberg (G)	early 3	main difference: hand-axes
Königsaue (G)	mid 3	main differences: *Micoquian* hand-axes & bifacial tools
Salzgitter-*Lebenstedt* (G)	mid 3	main difference: *Micoquian* hand-axes
Veldwezelt-*Hezerwater*: WFL (B)	mid 3	this assemblage
Attilly 1 & 2 (F)	mid 3	main difference: no Quina tools
Hénin-sur-Cojeul (F)	late 3	main difference: no Quina tools

Legend: (B): Belgium (G): Germany (F): France

7.4.5. Overview of the Middle Palaeolithic Key Cave Sites in the "Mosan Basin" dated to the Weichselian Ice Age

It is know that in the "Mosan Basin" [= Belgian *Meuse*/*Maas* Valley], which holds the most important concentration of Middle Palaeolithic cave-sites in Northwest Europe, the so-called "Ferrassie" and "Quina" Mousterian are attested (*e.g*., Ulrix-Closset 1975). More than forty Middle Palaeolithic cave sites are attested in the Mosan Basin. However, only 15 of these cave sites, which we will briefly discuss here, yielded substantial lithic assemblages (*e.g*., Toussaint *et al*. 2001). It is important to keep in mind that the majority of these older cave site excavations present challenging interpretation problems due to complex taphonomic histories, stratigraphical problems, post-depositional disturbances, changing excavation methods, uneven reporting of the different data sets, lost artefacts *etc*. We have the impression that many lithic cave assemblages were "mixed" and "contaminated" by more "recent" material. We usually have to rely on descriptive typo-technological analysis to make a distinction between "Lower", "Middle" and "Upper" Palaeolithic assemblages (*e.g*., Ulrix-Closset 1975). Moreover, there seems to exist a fundamental difference between "open-air" sites and "cave" sites. This makes balanced assessments quite difficult. That open-air and cave sites seem to represent two different lithic typo-technological "environments" has already been expressed by Bordes (1953), who made a distinction between the so-called "Cave Mousterian" and the so-called "Open-air Levalloisian". Although these terms may now seem to be too broad and too general, they still express a general trend, which is actually present within the European Middle Palaeolithic. Finally, when dealing with older cave site excavations, it is just impossible to escape the so-called "Mousterian Facies" (*e.g*., Bordes 1953, 1961a,b). Although the "Mousterian Facies" have not been consistently shown to correspond to cultural or environmental variations, different associated faunal assemblages, different activity sets or an "updated" chronology, we believe that some sort of re-evaluation of the "Mousterian Facies" is really necessary. Now we will briefly discuss the Middle Weichselian cave sites in the Mosan Basin.

- **Engihoul Cave - *Niveau 3*** (Fig. 7.10.1. & Table 7.8.) *Liège*, Belgium (*e.g.*, Vandebosch 1936; Ulrix-Closset 1975) probably is a Weichselian site. However, many problems concerning the stratigraphy remain to be solved here. Levallois core reduction is attested. The toolkit comprises many side-scrapers, Mousterian points, knives, many notched and denticulated pieces, Quina side-scrapers, limaces and bifaces. Some tools were made of "*Wommersom* Quartzite" (Vandebosch 1936). The lithic assemblage has been interpreted as a "Denticulated Mousterian of Levallois Facies" or as "Mousterian of Quina type" (Ulrix-Closset 1975).

- **Engis Cave or *"La Grotte Schmerling" aux Awirs*** (Fig. 7.10.2. & Table 7.8.), *Liège*, Belgium (*e.g.*, Becker 1992) is another Weichselian site. The Middle Palaeolithic assemblage of Engis Cave is mainly characterised by Levallois core reduction. The toolkit contained side-scrapers, convergent scrapers, Mousterian points, notched and denticulated pieces and bifacial tools. The lithic assemblage has been labelled "Typical Mousterian of Levallois Facies" (Ulrix-Closset 1975).

- **Fonds de Forêt Cave** (Fig. 7.10.3. & Table 7.8.), *Liège*, Belgium (*e.g.*, Danthine 1949-1950; Ulrix-Closset 1975) probably is a Weichselian site. More than 600 cores were found. However, only 12 of these cores were Levallois cores. Thousands of flakes were present, but again only a few Levallois flakes and points were found. The toolkit was mainly characterised by the more than 50 side-scrapers and 100 knives that were found. Mousterian points, notched and denticulted pieces were also found together with 25 small bifaces. Many Quina scrapers, Quina transverse scrapers and limaces were also excavated (Fig. 7.9.1.). Several tools were made of "*Wommersom* Quartzite" (Danthine 1949-1950). This lithic assemblage has been assigned to the "Mousterian of Quina type" (*e.g.*, Ulrix-Closset 1975).

- **Goyet Cave** (Fig. 7.10.4. & Table 7.8.), *Namur*, Belgium (*e.g.*, Becker *et al*. 1999) should probably also be dated to the Weichselian. The lithic assemblage contained 12 Levallois flakes and only a few Levallois points. The toolkit included 23 bifaces, many side-scrapers, knives, Mousterian points and Quina scrapers. We are possibly dealing here with an another "Mousterian of Quina type" (*e.g.*, Ulrix-Closset 1975) assemblage. However, it is also possible to attribute this assemblage to the so-called "Evolved Mousterian" (Ulrix-Closset 1975), which shows affinities with the "Mousterian of Acheulean Tradition" or MTA.

- ***Grotte du Docteur* at *Huccorgne*** (Fig. 7.10.5. & Table 7.8.), *Liège*, Belgium (*e.g.*, Ulrix-Closset 1975; Miller *et al*. 1999) can also be dated to the Weichselian. Only 17 Levallois flakes, several side-scrapers, notched and denticulated pieces, points, knives, bifacial tools and a few bifaces were found. This assemblage has been labelled "Mousterian with bifacial retouch" (Ulrix-Closset 1975).

- ***Grotte de l'Hermitage* at *Moha, Huccorgne*** (Fig. 7.10.6. & Table 7.8.), *Liège*, Belgium (*e.g.*, Ulrix-Closset 1975) probably is another Weichselian site. Several Levallois flakes, 480 side-scrapers, 18 Mousterian points, 63 large bifaces, notched and denticulated pieces have been excavated. This assemblage has been attributed to the "Mousterian of Acheulean Tradition" or MTA (*e.g.*, Ulrix-Closset 1975).

- ***Grotte de Ramioulle*** (Fig. 7.10.7. & Table 7.8.), *Liège*, Belgium (*e.g.*, Ulrix-Closset 1975) also is a Weichselian site. More than 70 side-scrapers, several knives, points, bifacial tools and hand-axes were present within the lithic assemblage, which has been labelled "Mousterian with bifacial retouch" (Ulrix-Closset 1975).

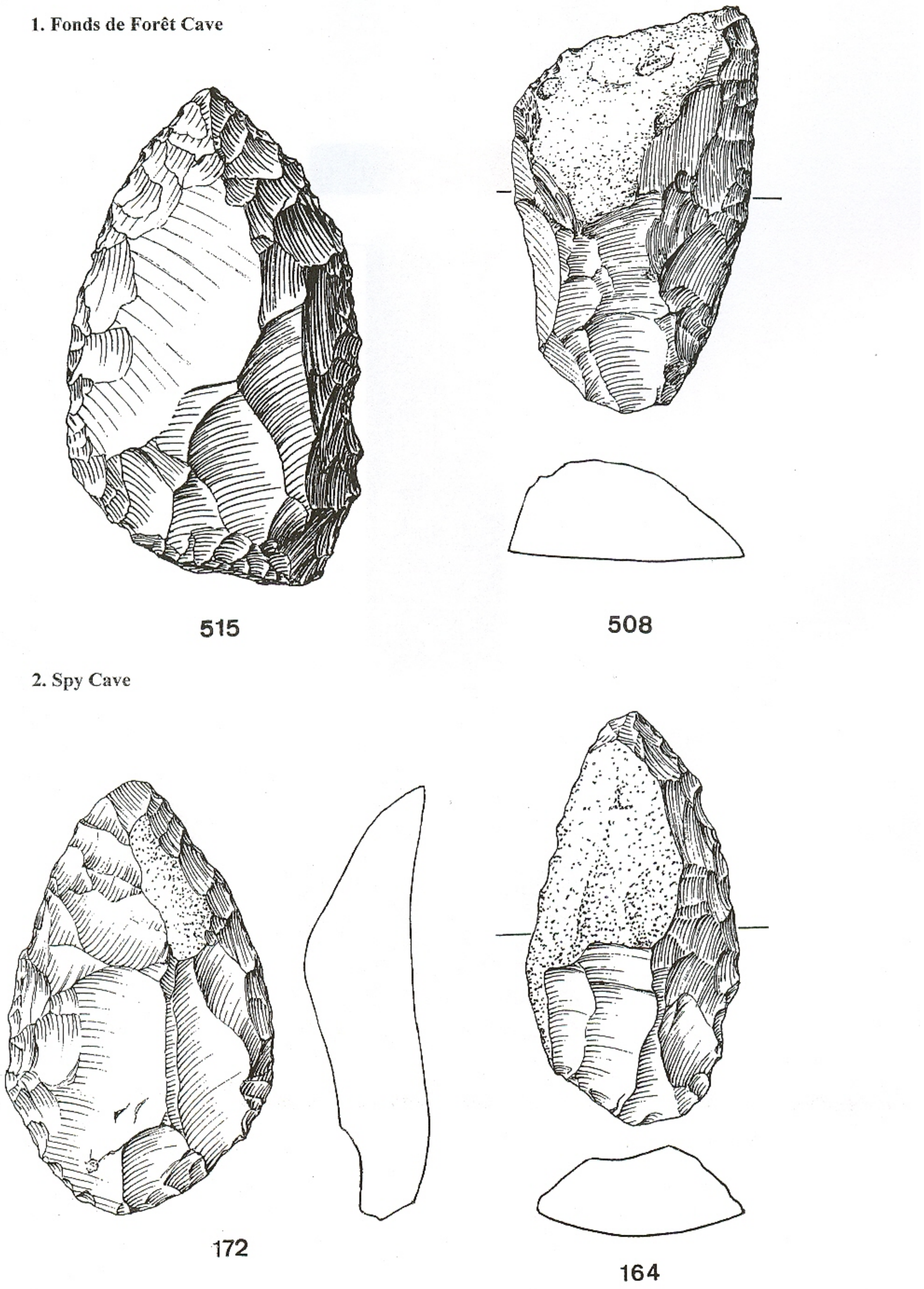

Fig. 7.9. Quina tools (Scale 1:1) at (1) Fonds de Forêt & (2) Spy (Ulrix-Closset 1975)

- **Scladina Cave - Horizon 1A** (Fig. 7.10.8. & Table 7.8.), *Namur*, Belgium (*e.g.*, Otte *et al*. 1988, 1998; Moncel 1998) is a Weichselian site (Lv-1377: 38,560 ±1,500). More than 1,900 artefacts have been recovered from the important Horizon 1A. Unipolar Levallois core reduction and Quina core reduction have been attested in Horizon 1A at Scladina Cave. Within the lithic assemblage of Scladina Cave (Horizon 1A), 62 cores and 455 flakes (> 2 cm) were present. The toolkit comprised 27 tools: 22 scrapers, 2 convergent scrapers, 1 notched and 1 denticulated piece and 1 biface. This assemblage has been attributed to the "Charentian" (Moncel 1998).

- **Spy Cave** (Fig. 7.10.9. & Table 7.8.), *Namur*, Belgium (*e.g.*, Ulrix-Closset 1975; Dewez 1981) is another Weichselian site. Just as is the case with many other cave sites, the complete data set has not been published yet. So, it is impossible to say how many artefacts and tools there actually were. However, a few Levallois flakes, many side-scrapers, knives, Mousterian points, many thick Quina side-scrapers, Quina transverse scrapers, limaces and a few bifaces were present within the lithic assemblage (Fig. 7.9.2.). The lithic assemblage has been attributed to the "Mousterian of Quina type" (*e.g.*, Ulrix-Closset 1975). Spy Cave is a very important site, which yielded a lot of evidence concerning the presence of Quina tools within the Mosan Basin, in association with Neanderthal bones.

- ***Trou de l'Abime II* at *Couvin*** (Fig. 7.10.10. & Table 7.8.), *Namur*, Belgium (*e.g.*, Otte 1979, 1988) is another important Weichselian site (Lv-1559: 46,820 ±3,290). The lithic "Mousterian" assemblage of Trou de l'Abime at Couvin is clearly characterised by a laminar trend. However, several foliates were also present within the lithic assemblage. This site seems to represent some sort of "transitional" assemblage and has been labelled the "Couvin Facies" (Otte 1979).

- ***Trou du Diable* at *Hastière-Lavaux*** (Fig. 7.10.11. & Table 7.8.), *Namur*, Belgium (*e.g.*, Ulrix-Closset 1975) is a Weichselian site, which yielded more than 3,000 Middle Palaeolithic artefacts. Although there is some evidence of Levallois core reduction, only 6 Levallois flakes have been found. The toolkit comprised more than 400 tools, such as side-scrapers, knives, Mousterian points, Quina side-scrapers and a few hand-axes. It is interesting to note that one convex side-scraper was made of "*Wommersom* Quartzite" (Ulrix-Closset 1975). The lithic assemblage has been interpreted as "Typical Mousterian" (*e.g.*, Ulrix-Closset 1975). However, affinities with the so-called "Mousterian of Ferrassie type" do exist.

- ***Trou Magrite - Niveau 2, Pont-à-Lesse* at *Anseremme*** (Fig. 7.10.12. & Table 7.8.), *Namur*, Belgium (*e.g.*, Ulrix-Closset 1975; Otte & Straus 1995) is another site, which has been dated to the Weichselian. However, the Middle and Upper Palaeolithic horizons were mixed. Though, Levallois core reduction has been recognised. More than 600 tools have been attributed to the Middle Palaeolithic on typological grounds only: 350 side-scrapers, 40 bifaces, 30 knives, Mousterian points, notched and denticulated pieces, Quina transverse scrapers, limaces, *etc*. This lithic assemblage could be classified as "Mousterian of Acheulean Tradition" (MTA) or as "Mousterian of Quina Type" (Ulrix-Closset 1975).

- ***Trou du Sureau* at *Montaigle*** (Fig. 7.10.13. & Table 7.8.), *Namur*, Belgium (*e.g.*, Ulrix-Closset 1975) probably is a Weichselian site. Evidence of Levallois core reduction is not really present within this assemblage. The toolkit has been characterised by side-scrapers, Quina side-scrapers, limaces and bifaces. This lithic assemblage has been interpreted as "Mousterian of Quina Type" (Ulrix-Closset 1975).

Table 7.8. Middle Weichselian Key Cave Sites in the Mosan Basin, Belgium

Site	**"Mousterian Facies"**	**References**
Engihoul Cave - *Niv. 3*	"Denticulated Mousterian of Levallois Facies" or "Mousterian of Quina type"	*e.g.*, Ulrix-Closset 1975
Engis Cave	"Typical Mousterian of Levallois Facies"	*e.g.*, Becker 1992
Fonds de Forêt Cave	"Mousterian of Quina type"	*e.g.*, Ulrix-Closset 1975
Goyet Cave	"Mousterian of Quina type" or "Evolved Mousterian"	*e.g.*, Becker *et al*. 1999
Grotte du Docteur	"Mousterian with bifacial retouch"	*e.g.*, Miller *et al*. 1999
Grotte de l'Hermitage	"Mousterian of Acheulean Tradition" (MTA)	*e.g.*, Ulrix-Closset 1975
Grotte de Ramioulle	"Mousterian with bifacial retouch"	*e.g.*, Ulrix-Closset 1975
Scladina Cave - 1A	"Charentian"	*e.g.*, Otte *et al*. 1998
Spy Cave	"Mousterian of Quina type"	*e.g.*, Dewez 1981
Trou de l'Abime II	"Couvin Facies"	*e.g.*, Otte 1979, 1988
Trou du Diable	"Typical Mousterian" or "Mousterian of Ferrassie type"	*e.g.*, Ulrix-Closset 1975
Trou Magrite - Niv. 2	"Mousterian of Acheulean Tradition" (MTA) or "Mousterian of Quina Type"	*e.g.*, Otte & Straus 1995
Trou du Sureau	"Mousterian of Quina Type"	*e.g.*, Ulrix-Closset 1975
Trou Walou C8	"Mousterian"	*e.g.*, Draily 1998
Trou Al'Wesse	"Mousterian of Quina Type"	*e.g.*, Otte *et al*. 1998

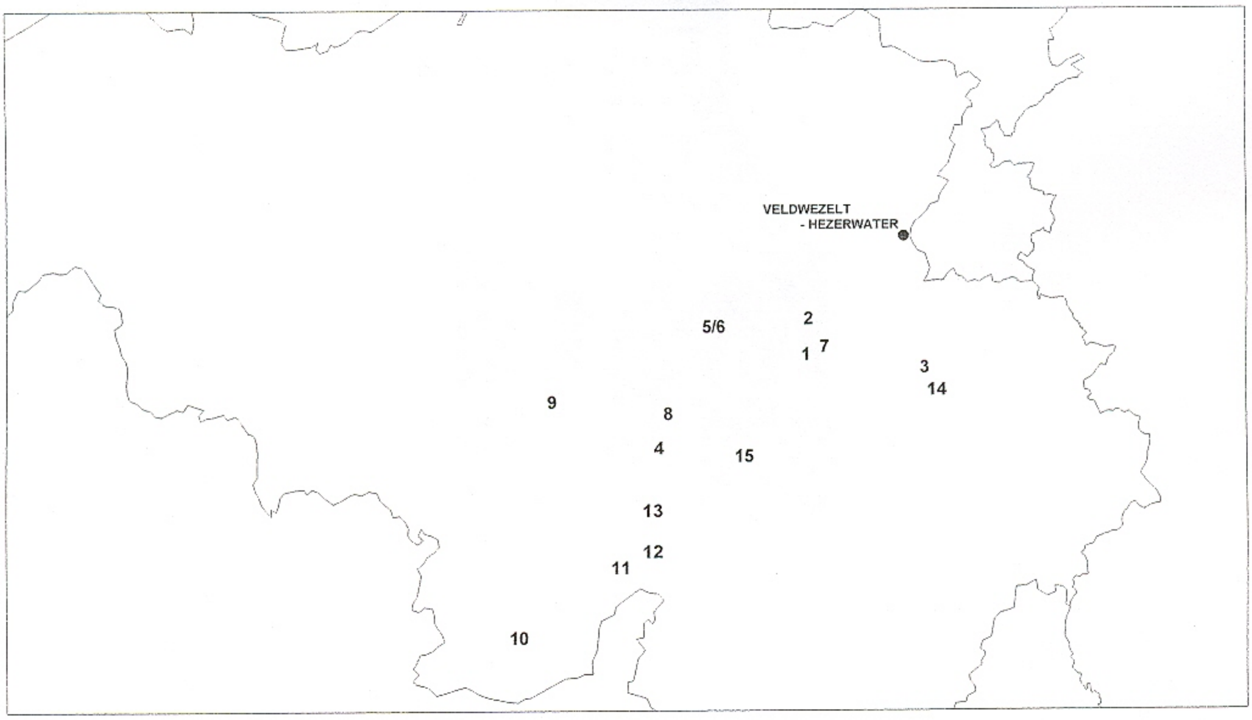

Fig. 7.10. Middle Weichselian key cave sites in the Mosan Basin, Belgium

Sites: 1. Engihoul Cave; 2. Engis Cave; 3. Fonds de Forêt Cave; 4. Goyet Cave; 5. *Grotte du Docteur*; 6. *Grotte de l'Hermitage*; 7. *Grotte de Ramioulle*; 8. Scladina Cave; 9. Spy Cave; 10. *Trou de l'Abime*; 11. *Trou du Diable*; 12. *Trou Magrite*; 13. *Trou du Sureau*; 14. *Trou Walou*; 15. *Trou Al'Wesse*

- ***Trou Walou C8* at *Trooz*** (Fig. 7.10.14. & Table 7.8.), *Liège*, Belgium (*e.g.*, Draily 1998, 2004; Pirson *et al*. 2004) is yet another Middle Weichselian site (> 42,000). Twelve Middle Palaeolithic artefact-bearing horizons were present. Most of these horizons were quite "poor" and probably not *in situ*. However, in horizon C(I)8, more than 1280 artefacts have been found. Unfortunately, this relatively "rich" horizon has also been reworked by the activities of cave bears and cave hyenas. The toolkit (n=48) contained side-scrapers, Mousterian points, end-scrapers and burins. The assemblage has been labelled "Mousterian".

- ***Trou Al'Wesse* at *Petit Modave* (**Fig. 7.10.15. & Table 7.8.), *Liège*, Belgium (*e.g.*, Ulrix-Closset 1975) probably is a Middle Weichselian site (OxA-7497: 41,100 ± 2,300) (*e.g.*, Otte *et al*. 1998b). Levallois core reduction is virtually absent. The toolkit contained side-scrapers, 5 Mousterian points, a few denticulated and notched pieces, Quina side-scrapers, Quina transverse scrapers, 2 limaces and 1 biface. The lithic assemblage has been attributed to the "Mousterian of Quina Type (Ulrix-Closset 1975).

Table 7.9. Middle Weichselian Cave Sites in the Mosan Basin & the TL and WFL *Loci*

Site	"Mousterian Facies"	Comparison with the TL & WFL lithic assemblages
Engihoul Cave - *Niv. 3*	"Denticulated Mousterian of Levallois Facies" or "Mousterian of Quina type"	main difference: bifaces
Engis Cave	"Typical Mousterian of Levallois Facies"	main differences: Mousterian points & no Quina tools
Fonds de Forêt Cave	"Mousterian of Quina type"	main difference: size of the lithic assemblage
Goyet Cave	"Mousterian of Quina type" or "Evolved Mousterian"	main difference: bifaces
Grotte du Docteur	"Mousterian with bifacial retouch"	main differences: bifacial tools & no Quina tools
Grotte de l'Hermitage	"Mousterian of Acheulean Tradition" (MTA)	main difference: the presence of bifaces
Grotte de Ramioulle	"Mousterian with bifacial retouch"	main difference: bifacial tools & no Quina tools
Scladina Cave - 1A	"Charentian"	main difference: size of the lithic assemblage
Spy Cave	"Mousterian of Quina type"	main differences: the presence of bifaces & knives
Trou de l'Abime II	"Couvin Facies"	main differences: the presence of Laminar products & foliates
Trou du Diable	"Typical Mousterian" or "Mousterian of Ferrassie type"	main difference: assemblage size
Trou Magrite - Niv. 2	"Mousterian of Acheulean Tradition" (MTA) or "Mousterian of Quina Type"	main difference: bifaces
Trou du Sureau	"Mousterian of Quina Type"	main differences: presence of bifaces & side-scrapers
Trou Walou C8	"Mousterian"	main difference: the absence of Quina tool
Trou Al'Wesse	"Mousterian of Quina Type"	main difference: Mousterian points

7.4.6. Discussion

7.4.6.1. The Middle Weichselian Cave Sites in the Mosan Basin

While we were reviewing the Middle Weichselian Middle Palaeolithic cave sites in the Mosan Basin, we have observed that very often, the post-depositional disturbances were so intense that researchers had to rely heavily on descriptive typo-technological analysis to make a distinction between “Lower”, “Middle” and “Upper” Palaeolithic assemblages (*e.g*., Ulrix-Closset 1975). The so-called “Mousterian Facies” also had literally to be reconstructed from collections of lithic artefacts. The attribution of an assemblage to one or the other “Mousterian Facies” is thus usually not based on stratigraphic observations. Notwithstanding these inconveniences, it was found that in most of the lithic cave assemblages, core reduction strategies in general and Levallois core reduction strategies in particular, were usually quite marginal. The toolkits were usually very rich and diverse. However, we have the impression that many lithic cave assemblages were “mixed” and “contaminated” by more “recent” material. Notwithstanding these observations, our overview of the Middle Weichselian Middle Palaeolithic key-cave sites of the Mosan Basin in Belgium showed that the so-called “Charentian Mousterian” is very prominently present there (Table 7.8.). Indeed, the assemblage of Scladina Cave 1A has been attributed to the “Charentian” and except for the lithic assemblage excavated at “*Trou du Diable*” at Hastière, which has been attributed to the “Ferrassie Mousterian”, all the other lithic assemblages containing Quina tools, such as Engihoul Cave - *Niv*. 3, Fonds de Forêt Cave, Goyet Cave, Spy Cave, *Trou Magrite* - *Niv*. 2, *Trou du Sureau* and *Trou Al’Wesse*, have all been attributed to the “Quina Mousterian”. It seems that more than 60% of all the Middle Weichselian lithic assemblages, which have been found in the Mosan Basin, show clear affinities with the “Charentian Mousterian” (*e.g*., Bordes 1953, 1961a,b).

One of the most remarkable discoveries within the WFL lithic assemblage, which has been excavated at Veldwezelt-*Hezerwater*, was the occurrence of a denticulated tool that had been made of so-called “*Wommersom* Quartzite”. The use of “*Wommersom* Quartzite” during the Middle Palaeolithic is indeed quite exceptional. As far as we know of, “*Wommersom* Quartzite” artefacts have only been discovered at the Middle Palaeolithic open-air sites of Zemst (Bogemans & Caspar 1984) and Rotselaar (Van Peer 1982). However, it seems that the Middle Palaeolithic humans, who were occupying some of the caves in the Mosan Basin, have also used “*Wommersom* Quartzite” to produce tools. Indeed, “*Wommersom* Quartzite” tools have been attested: (1) at *Engihoul* (Vandebosch 1936) in a “Quina Mousterian” assemblage, (2) at *Fonds de Forêt* (Danthine 1949-1950) in another “Quina Mousterian” assemblage and finally (3) at *Trou du Diable* (Ulrix-Closset 1975) in a “Ferrassie Mousterian” assemblage. Between these so-called “Charentian” sites there thus seems to exist some sort of connection with the Wommersom area in Brabant, Belgium.

The “Mousterian Facies” as they present themselves in the Mosan Basin, appear to be a typo-technological phenomenon, which only seems to occur in “rich” palimpsest cave site assemblages. The “Mousterian Facies” are usually not attested at open-air sites and even when they “emerge” at these open-air sites, their appearance is very different from what we find in cave sites. Even in cave sites, it seems that the “Mousterian Facies” do not form discrete entities, but they actually seem to “intergrade” with one another. For example, in almost every cave in the Mosan Basin some Quina tools were present and the attribution of a lithic assemblage to one or the other “type” of “Mousterian” is largely arbitrary. The fact of the matter is that several lithic assemblages of the Mosan Basin could be attributed to two or even three different “Mousterian Facies”.

The "Mousterian Facies" (*e.g*., Bordes 1953, 1961a,b) were initially created to delineate and partition Mousterian lithic variability in Europe. While the "Mousterian Facies" have provided a useful means of describing lithic assemblages, the basis of "Mousterian" variability has been a major point of discussion for decades. This discussion is of course of great importance, because behavioural interpretations are usually invoked to explain the variability of the "Mousterian Facies". However, the extent to which the "Mousterian Facies" are really indicative of human behaviour is still deeply problematic. Nevertheless, lithic assemblages are often viewed as direct sources of information about the past "lifeways" of Middle Palaeolithic humans. Principal issues about human evolution and human adaptation are related to this discussion.

Some scientists have argued that the "Mousterian Facies" are essentially arbitrary divisions within a continuum of morphological variability (*e.g*., Clark 2002a,b). We think that the "Mousterian Facies" are largely the unplanned, unintended and thus "natural" outcome of the dynamics of flint knapping under specific environmental conditions. The fact of the matter is that not the strict typo-technological composition of the five "Mousterian Facies" diverges, but the number and frequency of tools of any "tool-type" within a particular lithic assemblage. In other words and according to the original definition of the five "Mousterian Facies" (*e.g*., Bordes 1953, 1961a,b), Levallois products, side-scrapers, denticulated and notched pieces, Quina tools and bifaces can be present in each of the five "Mousterian Facies", varying from a presence, which could be called "rare", "low", "moderate" or even "common". So, in the traditional view of the "Mousterian Facies", it is actually the proportional typo-technological composition between assemblages that oscillates and not the presence or absence of certain "tool-types". The truth of the matter seems to be that under certain circumstances the dynamics of flint knapping converge to one or the other of the five "extreme" typo-technological configurations, the so-called "Mousterian Facies". It seems that the Middle Palaeolithic dynamic system of flint knapping "migrated" back and forth between these "extreme" typo-technological configurations continuously, at the same time creating many so-called "transitional" Middle Palaeolithic assemblages in between the five big "extreme" "Mousterian Facies". While the Middle Palaeolithic typo-technological pattern similarities and differences between the various lithic assemblages are not contested, what is supposedly causing them to occur, remains a point of intense debate.

How does this add up to the big picture? Jelinek (1988, 1994) has suggested that rigorous climatic intervals would have resulted in more intensive use of caves and rock shelters, more reduction of lithic assemblages and a higher incidence of formal retouched pieces ["curated tools"] than those of milder climatic episodes. There would thus be a tendency for Quina, Ferrassie and MTA assemblages to be found in cave sequences corresponding to cold episodes, and a tendency for Typical and Denticulate assemblages to be found in open-air sites and in cave sequences corresponding to warmer episodes. Indeed, we believe that stress, caused by climatic and environmental change, led to changing food habits. Changed food habits would have required immediate technological action, because food is the *sine qua non* of human life. However, typo-technological change always is a process, not an event. In addition to the obvious importance of food for daily survival, a particular food supply profoundly influences many other adaptations. Food does not just influence an individual's health, but also population size, ranging patterns and lithic and other technologies. Middle Palaeolithic technology almost certainly constituted a wide range of options very broadly distributed in time and space, held in common by most contemporary humans and invoked differentially according to context (*e.g*., Clark 2002a,b). To determine what contextual factors constrained choice amongst these options is the real challenge.

7.4.6.2. The Middle Weichselian Open-Air Sites in Northwest Europe

In our overview in Table 7.6, the Middle Weichselian Middle Palaeolithic key open-air sites in Northwest Europe were enumerated. It is immediately clear, that very few well-preserved Middle Weichselian open-air sites are actually known in Belgium, The Netherlands, the United Kingdom and even in Northern France. This observation is really quite surprising. However, in Western Germany, there seems to be more evidence for a more intense Weichselian occupation. Nonetheless, we have to keep in mind that many German sites actually lack good stratigraphical evidence. As a result of this, numerous chrono-stratigraphic problems remain controversial and obscure at these sites. Very often it is not clear whether or not these German sites are effectively Weichselian or Last Interglacial or even Saalian. Many German lithic assemblages have been assigned to one or the other era based solely on the presence or absence of certain typo-technological markers such as hand-axes and Levallois core reduction.

One of the best examples is the site of Salzgitter-*Lebenstedt*. The dating of Salzgitter-*Lebenstedt* (*e.g*., Bosinski 1963; Tode 1982; Grote & Thieme 1985; Gaudzinski 1999; Pastoors 1999, 2001) has been a real enigma for many years. Earlier on, the lithic assemblage of Salzgitter-*Lebenstedt* was dated to the "Late Saalian" and attributed to the "Late Acheulean" (*e.g*., Bosinski 1963). This was done primarily due to the presence of large, pointed hand-axes and Levallois core reduction. However, this "Late Saalian" age did not agree with the datings of the sediments, which apparently pointed to the "Middle Weichselian". Pastoors (2001) has argued, that in spite of the presence of reworked fluvial sediments, the radiometric readings and the prominent presence of Levallois core reduction indicate that the lithic assemblage of Salzgitter-*Lebenstedt* should be dated to the first half of the Middle Weichselian. Bosinski (1963) as well as Pastoors (2001) allude to the uncertainties of assigning a date to lithic assemblages based on the presence or absence of typo-technological markers. However, both approaches do actually rely on the presence of typo-technological markers such as hand-axes and Levallois core reduction, whose reliability as chronological markers is becoming ever more doubtful. It seems that in Germany, many differences of opinion exist between scholars who place primacy with typo-technological arguments and researchers who emphasize the stratigraphical and chronological arguments over typo-technological similarities. As a matter of fact, we have actually the impression that not only Salzgitter-*Lebenstedt*, but many other German open-air sites lack good stratigraphical evidence and we believe that many of these assemblages were probably redeposited, "mixed" or "contaminated" by more "recent" material.

On the other hand, most of the attested Middle Weichselian open-air lithic assemblages in Northwest Europe do not seem to have many technological features in common. The only constantly recurring feature is the presence of Levallois core reduction. However, different core reduction strategies seem to have coexisted within a single lithic assemblage. Usually, the toolkits were also very small. Most tools were side-scrapers and sometimes a few hand-axes were also present within a toolkit. Finally, it seems that Quina tools, notched and denticulated pieces were also quite rare at open-air sites. Nevertheless, the Quina tools were usually quite big (> 7 cm). Generally speaking, the Middle Weichselian open-air lithic assemblages contained "medium-sized Levallois blanks in association with big unifacial or bifacial tools". This particular technological "mix" clearly sets these Middle Weichselian open-air lithic assemblages apart technologically from the Last Interglacial *s.l.* open-air lithic assemblages. Finally, a controversial group of lithic assemblages, which also occurred in our overview (*e.g*., Lichtenberg, Königsaue, Salzgitter-*Lebenstedt*), belong to the so-called "*Micoquian*" or "*Keilmessergruppen*" (*e.g*., Veil *et al*. 1994; Richter 1997, 2000).

7.4.7. The Weichselian "*Micoquian*" or "*Keilmessergruppen*" in Germany

Most of the German "*Micoquian*" or "*Keilmessergruppen*" (*e.g*., Veil *et al*. 1994; Richter 1997, 2000) assemblages have been dated to the Late Pleistocene. However, some "Micoquian" assemblages seem to date to the late Last Interglacial *s.l*. or to the very Early Weichselian or to the Middle Weichselian. In most cases, these sites remain poorly dated. However, the "*Micoquian*" horizons at La Micoque in France seem to be much older than the German "*Micoquian*" assemblages (*e.g*., Schwarcz & Grün 1988). In order to get an idea of the place the German "*Micoquian*" holds within the Middle Palaeolithic, the recent work of J. Richter (1997, 2000) on the so-called "*G-Komplex*" of the *Sesselfelsgrotte* in the valley of the *Altmühl* river, which is a tributary to the Danube in Bavaria, is of particular importance. Richter argues that the "*Micoquian*" of the *Sesselfelsgrotte* could best be described as "*Mousterian with Micoquian Option*".

The "*G-Komplex*" of the *Sesselfelsgrotte* (Richter 1997, 2000) yielded one of the longest Middle Palaeolithic cave sequences in Central Europe. The study of the more than 85,000 artefacts and the 1,759 tools, which have been excavated in the "*G-Komplex*" of the *Sesselfelsgrotte*, posed an remarkable problem. This difficulty came to be known as the "*G-Komplex Problem*" (Richter 1997). The dilemma was that, if the classification of the tools was based primarily on the "bifacial" tools, most of the "*G-Komplex*" assemblages could be attributed to the "*Micoquian*", while the same assemblages could also easily be attributed to the "Mousterian", if the classification was primarily based on the "unifacial" tools. The "*Micoquian*" and "*Mousterian*" turn out to be "intergrading" phenomena, which cannot really be divided into discrete groups. Within all of the 13 or so find horizons of the "*G-Komplex*", Levallois flakes, side-scrapers, denticulated and notched pieces, bifaces and Quina tools were present. However, the "*G-Komplex*" assemblages have been divided into 4 typo-technological cycles (Richter 1997). The lithic assemblages of Cycle 1 (Layer I/H: Ses-G-A13 to Ses-G-A10) have been mainly characterised by Quina tool reduction ("*Charentian*"). During Cycle 2 (Layer G4: Ses-G-A08 and Ses-G-A09), the assemblages were dominated by Quina tool reduction and Levallois core reduction ("*Charentian*"). The assemblages of Cycle 3 (Layers G3 & G2: Ses-G-A07 to Ses-G-A04) were dominated mainly by Levallois core reduction. Finally, during Cycle 4 (Layer G2/G1: Ses-G-A03 to Ses-G-A01), Levallois core reduction mainly characterised the lithic assemblages.

The "*Charentian*" find horizons of the lower "*G-Komplex*" (Richter 1997, 2000) have been dated to the first half of the Middle Weichselian. Another parallel to the WFL *locus* is the presence of mammoth, reindeer and horse within the faunal assemblages of the "*G-Komplex*" (Richter 1997, 2000). However, no hand-axes or "*Keilmesser*" were present at Veldwezelt-*Hezerwater*. Though, this should not come as a surprise since the "*Micoquian*" and the "*Mousterian*" have turned out to be "intergrading" phenomena, which cannot be divided into discrete groups. Kind (1992) has also argued that many of these so-called "*Micoquian*" assemblages appear to be "mixtures" of "*Micoquian*" and "*Mousterian*". We believe that Richter is correct in stressing the apparent close relationship between the two phenomena. This is particularly true in assemblages where "*Keilmesser*" and other bifacial tools are rare. However, the really big surprise is the presence of so many Quina tools in the so-called "*Micoquian*" assemblages of the "*G-Komplex*" in the *Sesselfelsgrotte*. It seems that many "*Micoquian*" and "*Charentian*" assemblages are virtually identical. After all, hand-axes were also present within the "*Charentian*". It also seems that the different "types" of bifaces in the "*Micoquian*" just seem to represent stages along a continuum of tool reduction. Finally, Richter (1997, 2000) further argues that typical "Micoquian" assemblages like Bockstein and La Micoque VI are also mainly characterised by Quina tool production.

7.4.8. Middle Palaeolithic Studies in a "United Europe"

We have seen how J. Richter (1997) argued that the "*Micoquian*" and the "*Mousterian*" were virtually identical. Richter says that the "*Micoquian*" of the *Sesselfelsgrotte* could best be described as "*Mousterian with Micoquian Option*". This means that the lithic assemblages of the *Sesselfelsgrotte* are essentially "*Mousterian*" with "*Micoquian*" accents. However, these so-called "*Micoquian*" accents have also been attested in France (*e.g*., Richter 1997, 2000), the United Kingdom (*e.g*., Wymer 1985), Belgium (*e.g*., Ulrix-Closset 1975), The Netherlands (*e.g*., Roebroeks 1988) and of course in Eastern Europe (*e.g*., Richter 1997, 2000). So, the "*Micoquian*" is thus essentially a Pan-European phenomenon. Just like the "*Mousterian*", the "*Micoquian*" was also characterised by a series of "Facies" or so-called "*Formengruppen*" (Bosinski 1967). However, the four "*Micoquian* Facies" ("*Bockstein*", "*Klausennische*", "*Schambach*" & "*Rörshain*") have been rejected by Jöris (1994) and Richter (1997). What is true for "*Micoquian*" might also be true for the "*Mousterian*". In both cases, we are probably dealing with arbitrary divisions within a continuum of morphological variability. Richter (1997, 2000) has further argued that the "*Micoquian*" and the "*Mousterian*" are "intergrading" phenomena, which cannot really be divided into discrete clusters. So, it seems that in the whole of Europe we are generally dealing with generic "Middle" Palaeolithic assemblages that were usually spiced up with some local character.

It seems that many of these "local characteristics" have been interpreted differently by disconnected "national" schools of research. Indeed, L. Binford (1989) has argued that our knowledge of the past is actually "constructed" in the present, out of (1) the static material residues of once-dynamic processes, (2) the observations we choose to make and (3) general contemporary knowledge about the World that guides our observations and interpretations. This state of affairs probably led to the "construction" of several "nationalistic" Palaeolithic "cultures", which seemingly obeyed to the boundaries of the 19th Century European "nation-states". Several causes were responsible for this development. First of all, the geopolitical division of Europe after World War II and secondly, the fact that the United Kingdom, Western Europe, Eastern Europe and Southern Europe still dwell in different "scientific spheres" in terms of ontological, epistemological and methodological presumptions. Finally, the accessibility of research results (*e.g*., physical access to unpublished reports, language and other barriers) and the limitations of financial resources also add to the problem. However, new media such as the internet and new forms of cooperation facilitate two-way communication among researchers. The on-going process of institutional "unification" of Europe also provides major opportunities and challenges for European researchers (Papagianni 2003).

In this context, regional research traditions and their alternative perspectives hopefully will find their place within integrated "European Middle Palaeolithic Studies". However, we actually believe that if we want to make this endeavour a long-term success, we should not be afraid to leave behind the "culture-area-grid" to frame research issues. We need better hypotheses. We should first of all break away from the portrayal of "Middle" Palaeolithic societies as social and cultural segregated entities. Middle Palaeolithic people and societies did not exist in isolation. So, it seems that the so-called "Myth of the Primitive Isolate" (Lesser 1961), which is the view of "early" and "primitive" human life as a world of closed social aggregates each out of contact with others, should be put to rest. We should adopt as a working hypothesis the universality of contact and influence as a fundamental feature of human existence. We should think of social life and human Pre-history as a time and space continuum of human association, a web-like field of social relations (Lesser 1961). Indeed, the world is a large matrix of interactions in which everything is connected (Simon 1973).

7.4.9. The "Climatic Pendulum" and the Changing Settlement Patterns of Middle Palaeolithic Humans in Northwest Europe during the Weichselian

As the "climatic pendulum" swung backwards and forwards during the Weichselian, Northwest Europe has witnessed frequent and often dramatic environmental changes. The long-term and short-term effects of these fluctuations (*e.g*., Dansgaard *et al*. 1993; van Andel & Davies 2003) on the Middle Palaeolithic populations in Northwest Europe must have been very dramatic, if not catastrophic, occasionally sweeping out entire Middle Palaeolithic groups of people, who were inhabiting Northwest Europe. We suppose that Middle Palaeolithic humans were unable to sustain continuous occupation in Northwest Europe during the second half of the Early Weichselian (MIS 4). However, the situation during the Middle Weichselian (MIS 3) must have been more complex, because then climatic improvements have been recorded repeatedly.

The question arises how settlement patterns of Middle Palaeolithic people evolved under shifting climates during the Weichselian in Northwest Europe. Crucial here is as to how Middle Palaeolithic populations did adapt to new, "unfamiliar" and possibly "hostile" environments. We believe that new "uncomplicated" and "solid" tools were designed to serve Middle Palaeolithic humans as hunting and butchering aids in hazardous environments. The use of "solid" and "safe" technologies and the use of local lithic raw materials may actually have allowed Middle Palaeolithic resettlers more "freedom of movement" in these high-risk environments. However, technological change always is a process, not an event. We have to lay emphasis on the dynamic nature of these processes. Indeed, new tools were probably "fine-tuned" through a critical phase of "trial-and-error". This would entail that some Middle Palaeolithic groups may not have been as successful as other groups. The so-called "frontiers-of-settlement" probably advanced in a variable manner. Many pioneering groups of resettlers, who led the way for others to follow, did not necessarily survive their incursions into the Northern territories of Europe.

The lithic assemblages and the associated faunal assemblages, which were excavated at the TL and WFL *loci* at Veldwezelt-*Hezerwater*, provide evidence of Middle Palaeolithic occupation of Northwest Europe during the first half of the Middle Weichselian (MIS 3). Indeed, the Middle Palaeolithic people who were living at the TL and WFL *loci* at Veldwezelt-*Hezerwater*, must have represented groups of these "resettlers". The climate, which reigned at the TL and WFL *loci*, could be labelled as "continental" in the sense of the "Köppen System" (*e.g*., McKnight & Hess 2000). This means that the climate was characterised by long, cold winters and short relatively cool summers. Although the annual precipitation was always small, precipitation increased during the summer months. However, the presence of the badger at the WFL *locus* indicates that this "continental" climate was not really "cold". The environment could be characterised as a so-called "Mammoth Steppe", which fostered the growth of enough grasses, mosses, shrubs and trees to support a mammalian community including horse, woolly rhino, mammoth, bison, reindeer, arctic fox, cave hyena and cave lion.

Based on the faunal finds from the WFL *locus* at Veldwezelt-*Hezerwater*, these Middle Palaeolithic humans likely were skilled hunters of horses, bison *etc*. At the same time, the inhabitants of the WFL *locus* were also capable of keeping hyenas and other wild creatures at bay, while processing the hunted meat. The mammals, which have been attested at the WFL *locus* could survive a relatively broad range of climatic conditions. However, these species do not indicate extremely cold climatic conditions. The presence of these animals seems to imply that the TL and WFL *loci* were inhabited by Middle Palaeolithic occupants during periods of "interstadial" climatic conditions.

An "interstadial" occupation of the TL and WFL *loci* is also supported by the presence of "interstadial" soils in which the TL and WFL lithic assemblages were found. However, during the intermediary "stadial" loess accumulation phases, no humans were present at Veldwezelt-*Hezerwater,* since no artefacts have been found within these "cold" loessic sediments. It seems that Middle Palaeolithic humans must have retreated from Northwest Europe during the Weichselian "stadials". This retreat of Middle Palaeolithic humans was probably forced by the pulling out of the relatively "warm" temperatures from Northwest Europe. Most food animals were probably retreating to the South, while they were followed by the Middle Palaeolithic hunters, who were also heading out of Northwest Europe. This "exodus" would seem to call into question the longstanding belief that these Middle Palaeolithic humans were "cold-adapted".

It seems that we could put forward the hypothesis that Middle Palaeolithic humans generally failed to move into Northwest Europe during fully "glacial" and "stadial" conditions. Indeed, there are no sites know in Northwest Europe, which were without any doubt inhabited during the extreme cold periods. At times of extreme cold and dry conditions, most of the mammal species, Middle Palaeolithic humans included, must have left Northwest Europe for regions with more favourable climatic conditions. Although these Middle Palaeolithic humans had adapted to diverse climatic and environmental conditions, there is thus no evidence to suggest continuous occupation of Northwest Europe during the Weichselian. Nevertheless, there is no doubt that Middle Palaeolithic humans were present in Northwest Europe during the more temperate phases of the Last Glacial, with climatic conditions "intermediate" between those of fully interglacial and fully glacial periods. This has already been argued earlier by C. Gamble (1986, 1995). Indeed, Middle Palaeolithic humans had successfully adapted to "interstadial", "open" steppe environments. This environmental setting was typically characterised by cold winters and relatively warm summers. However, these unstable environmental conditions were quite near the human tolerance limit and long, cold winters and cool summers could have led to precarious food provisioning situations.

We suppose that "solid" tools were reliable safeguards against the risk of tool breakage. These tools may in fact have allowed the Middle Palaeolithic resettlers more "freedom of movement" in these high-risk environments. The "secret weapon" of these people, who were living in hazardous environments, was the "Quina Tool" [= a thick tool with very pronounced "stepped" or "multi-tiered" so-called "Quina" retouch]. The technological adaptation of "medium-sized Levallois blanks in association with heavy-duty Quina tools" at the TL and WFL *loci*, was probably not the result of a "cultural" shift, but probably a response to changing needs and constraints under perilous environmental settings. Most of the technological adaptations we observe (*e.g*. Quina tools), seem to reflect the responses of Middle Palaeolithic people towards changing "niche" resource opportunities. Since it is just impossible to make thick Quina tools on thin Levallois flakes, we suppose that the so-called "salami-slice technique" (*e.g*., Turq 1989) was also known to the inhabitant of the TL and WFL *loci* to produce the thick flakes on which the Quina tools were actually made. However, not only at Veldwezelt-*Hezerwater*, but throughout the Mosan Basin and beyond, Quina tools were used extensively. Indeed, during the Middle Weichselian, more than 60% of the lithic assemblages, which have been attested in the Mosan Basin, have been attributed to the "*Charentian*". However, the true "*Charentian*" is unknown in the loess region. Nevertheless, at many open-air sites we are dealing with some sort of "*Ferrassie Mousterian*", which is mainly characterised by Levallois core reduction. However, most open-air lithic assemblages are further characterised by extreme small toolkits, which make the term "*Ferrassie*" not really suitable. We would like to make use of a more generic name, namely: "Levallois Core Reduction in association with Quina Tools".

7.4.10. The Nexus between Levallois and Quina Reduction at the Middle Weichselian TL and WFL *Loci* at Veldwezelt-*Hezerwater*

The (re-)emergence of Quina tools during the Weichselian was a technological adaptation, which was probably the result of shifts in various aspects of Middle Palaeolithic foraging strategies. Not the appearance of "innovative" lithic technologies, but the recognition of their usefulness in "new" environmental contexts was the "ground-breaking" phenomenon that occurred. For example, Torrence (1983) has shown that hunters who were living at higher latitudes usually created more diverse tool assemblages than those manufactured by hunters at lower latitudes. Many of these higher latitude hunters used "specialised" tools only for short intensive bursts. Torrence (1983) further argues that the limited time that resources (*e.g.*, big game) were available at higher latitudes, required hunters to use a greater variety of "prefabricated", "specialised" and "curated" tools. A "curated tool" has come to mean: (1) a tool made long before it was used, (2) a tool transported between sites and used over a long period of time, (3) a tool regularly maintained during its use-life, (4) a tool designed for many uses, or (5) a tool reshaped for other uses. Torrence (1983) suggests that the production of "curated" tools long in advance of use is due to "time stress" among hunters, especially while hunting in colder and thus more dangerous environments. As Kelly (1988) has suggested, lithic cores can also be "curated" for many of the same reasons.

At the TL and WFL *loci*, "time stress" probably was one of the major factors, which led to Quina-dominated toolkits. However, many other contextual factors seem to have influenced lithic variability at the TL and WFL *loci*. Some of these contextual factors we may never fully understand, such as the *ad hoc* response to local situations. Nevertheless, at the TL and WFL *loci*, some general trends have been observed: (1) high raw material quality seems to have led to more formal core and tool designs, whereas (2) low raw material quality seems to have led to more informal designs. Indeed, it seems that at TL and WFL *loci*, Middle Palaeolithic humans varied their reduction strategies according to the initial shape and quality of the flint nodules. After usable tool blanks had been produced, retouch was usually applied to transform these tool blanks into formal tools. It appears that two major objectives lie behind the application of systematic retouch to the edges of the tool blanks (*e.g.*, Mellars 1964, 1996): (1) to secure the maximum possible length of working edge and (2) to impose a regular, smooth form on the working edge. Retouch was thus applied not merely to rejuvenate worn and damaged edges, but as a deliberate policy to maximise the inherent potential of the available blanks for the specific functions envisaged. Retouch thus seems to have been applied essentially to enhance the functional aspects of the tools.

However, the "Commont Effect" or the "Frison Effect" (*e.g.*, Dibble & Rolland 1992) was probably always working in the "background", but it cannot account for all variation in the tool forms. It is obvious that, for example, most "transverse scrapers" could never have started life as conventional lateral side-scraper forms. Indeed, the tool edges are frequently oriented at almost 90° to the main flaking axis of the original blank (*e.g.*, Turq 1989). Many of these transverse scrapers have been worked into so-called "Quina" transverse scrapers. Overall, the "Quina" techno-functional system (*e.g.*, Lenoir 1973; Turq 1989; Rolland 1996) seems to have emphasised (1) the preference for fine-grained lithic raw materials, (2) the preference for large, thick tool blanks ("cortical backed flakes") and (3) intensive scalar tool retouching. However, the recurring need to manufacture thick blanks may in some cases have overridden a preference for fine-grained flint. Typical "Quina" tools have been excavated only at the Middle Weichselian TL and WFL *loci*. The "Quina tools" (length: up to 10 cm), which were excavated, represented the biggest tools discovered at Veldwezelt-*Hezerwater*.

The forms of the early Middle Weichselian "over-sized" and "over-designed" Quina tools, which were excavated at the TL and WFL *loci* at Veldwezelt-*Hezerwater*, were probably mainly influenced by the fact that they were used under "stressful" and "high-risk" cool climatic conditions. Indeed, lithic technologies that were employed in high-risk environments can be expected to be "over-designed", because flint knappers usually wanted to maximise core or tool use-life in dangerous circumstances. So, big and thick "over-designed" Quina tools guard against tool breakage. This may be explained as a technological risk-reducing response to relatively cool and "hostile" environments. In more temperate and "friendly" environments, most toolkits are more casual and display little effort to extend tool use-life (*e.g*., VBLB *locus* at Veldwezelt-*Hezerwater*).

However, so-called "Quina" assemblages were excavated in Late Pleistocene as well as in Middle Pleistocene contexts. Geneste *et al*. (1997) point to several autonomous "Quina" developments in different regions (*e.g*., Les Tares 1, La Micoque 3, High Lodge, *etc*.). New research has claimed that for example the so-called "Charentian" assemblage at High Lodge (UK) is pre-Anglian in date, thus prior to MIS 12 (Rose 1992). These very old "Quina-like" assemblages are separated from Late Pleistocene "Quina" assemblages by time-gaps too substantial to indicate linear continuity. Evidence seems to point to multiple and independent developments by formal convergence. Notwithstanding this, one of the few tool forms of the Late Pleistocene that still seems to carry some sort of "chronological" information is the "Quina" tool. During MIS 4, a gradual shift from "Ferrassie" to "Quina" lithic assemblages is attested in Southwest France (Mellars 1969, 1986, 1996). However, "Ferrassie" and "Quina" assemblages do not seem to represent discrete "facies", but rather two etic "stages" in a continuum of decreasing "Levallois Index" (IL) percentages and increasing "Quina Index" (IQ) percentages. It appears that the Quina tools have replaced the Levallois blanks progressively during the first half of the Weichselian ice age. However, the progressive decrease in the Levallois component clearly cuts across the "Ferrassie-Quina" interface. The climate got colder and colder and the "Quina" tools became more and more important, while the "Levallois" blanks became less and less important. The gradual replacement of Levallois core reduction by Quina tool reduction constituted a sustained development underlying the Middle Palaeolithic technological evolution during the Weichselian. So, "Quina tools" have probably functioned as "*Ersatz*-Levallois-Blanks" under cool and "hostile" climatic conditions.

In the South of France during MIS 4 and in Northwest Europe during MIS 3, there seems to exists a clear nexus between "Levallois" core and "Quina" tool reduction, which actually seem to represent two complementary lithic reduction strategies. The integrated interaction between Levallois core and Quina tool reduction within a single subsistence system was the solution to the optimisation problem of maximising the tool design attributes (*e.g*., flexibility, versatility, maintainability, portability & reliability), while minimising the rate of raw material consumption under cool climatic conditions (Fig. 7.11.). Indeed, in the *Aquitaine* Basin, France (*e.g*., Mellars 1996; Rolland 1996), "Quina tools" largely correspond with the "stadial" climatic fluctuations correlated with MIS 4, which is characterised by the onset of more severe, continental conditions, the spread of steppe habitats and steppe faunal communities. These conditions created mosaic vegetational landscapes, which had a direct impact on Middle Palaeolithic technology, subsistence, land use and settlement organisation. At the TL and WFL *loci*, in the *Maas* Basin, the presence of "Quina tools" corresponds with the warmest phases of the interstadial climatic fluctuations during the first half of the Middle Weichselian (first half of MIS 3). It is important to keep in mind that the *Maas* Basin lies at higher latitudes than the *Aquitaine* Basin, which obviously implies that in the *Maas* Basin the climatic conditions have always been cooler than in the *Aquitaine* Basin.

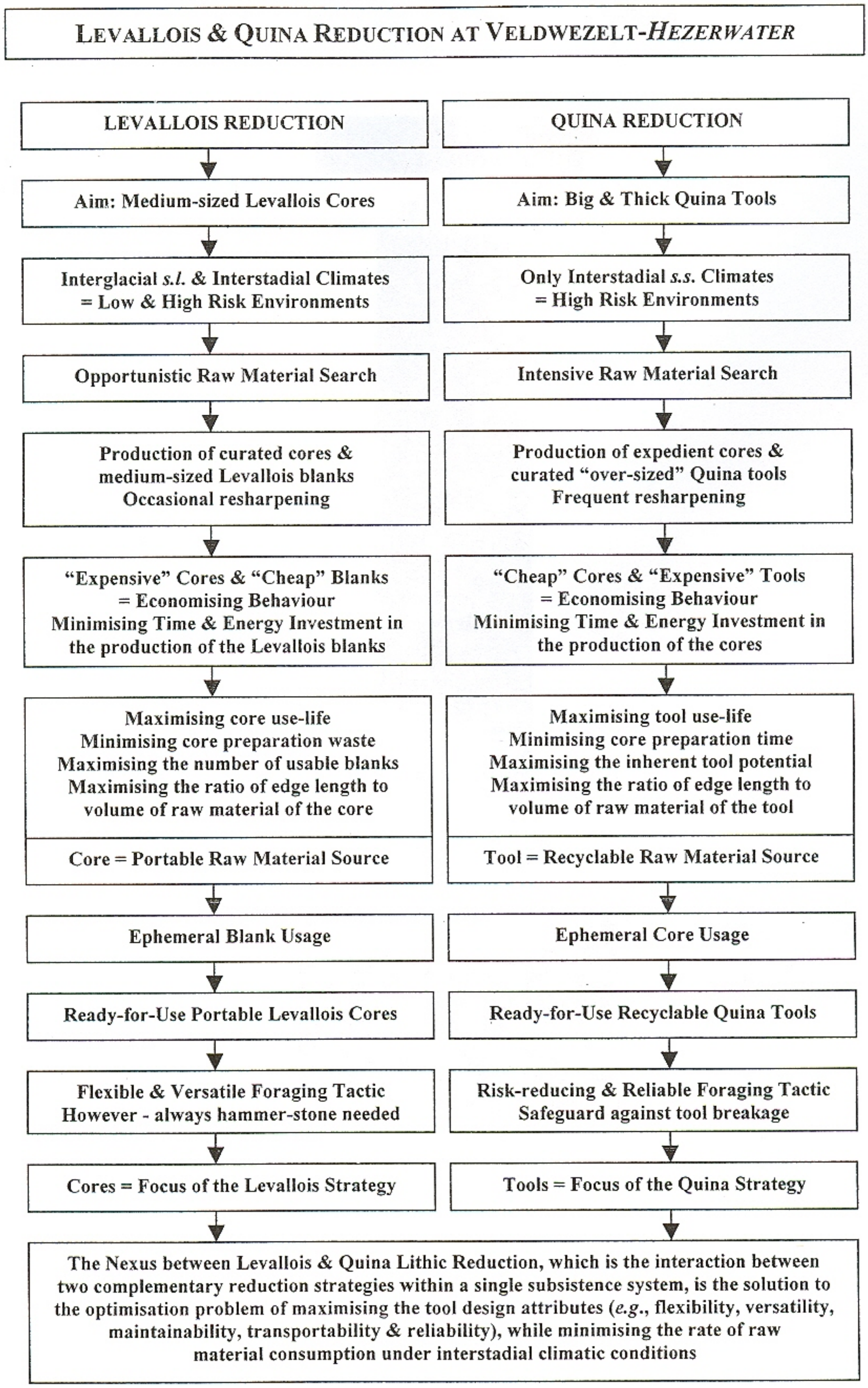

Fig. 7.11. The nexus between "Levallois" and "Quina" reduction at Veldwezelt-*Hezerwater*

In the *Maas* Basin, repeated interruptions of Middle Palaeolithic occupation must effectively have occurred during fully stadial episodes (*e.g.*, during the second half of MIS 4 and during the second half of MIS 3). During the cold interstadial and stadial periods of the Weichselian ice age, the *Maas* Basin was characterised by a cold climate, sparse tundra vegetation and low-density arctic fauna (*e.g.*, Cordy 1988). However, Middle Palaeolithic people were certainly present in Northwest Europe during the milder interstadials during the first half of the Middle Weichselian (first half of MIS 3). Indeed, the evidence from Veldwezelt-*Hezerwater* shows that there were at least two major Middle Palaeolithic interstadial occupation episodes during the first half of the Middle Weichselian (MIS 3) with habitat conditions slightly warmer than those of the Early Weichselian (MIS 4) in Southwest France. The interstadial vegetation at the TL and WFL *loci* must have been characterised by a steppe environment with mainly pine and birch. At the WFL *locus*, a typical steppe fauna was in place. The presence of the badger at the WFL *locus* indicates that the climate was not cold, but for a short period of time, quite warm. Middle Palaeolithic humans must gradually have reoccupied Northwest Europe by “natural migration”.

In the *Maas* Basin, camps were mostly installed in caves (*e.g.*, Toussaint *et al*. 2001; Jehs 2004), however ephemeral open-air butchering stations were also attested (*e.g.*, TL & WFL *loci*). Very often, low-quality flint is found in cave sites, whereas high-quality flint is attested in most open-air sites. These hunters probably combined semi-sedentary cave occupation during prolonged, cold winters, with warm season semi-nomadic mobility in the Northern *Maas* Basin. There, several game herd species were present together with opportunities for procuring fine-grained high-quality flint from Cretaceous limestone outcrops. Exploitation of imported high-quality flint in the base camps took place during the intensive winter occupation episodes. The repeated cave residence episodes and the frequent resharpening of thick tools resulted in the palimpsest accumulation of “Quina” tool assemblages at the cave sites. “Levallois” cores and “Quina” tools (Fig. 7.11.) were functioning alongside each other in the same subsistence system, because they were reliable safeguards against technological failure. “Levallois” cores and “Quina” tools were also exported to the ephemeral open-air hunting and butchering sites (*e.g.*, TL & WFL *loci*). “Levallois” and “Quina” reduction thus seem to represent two sides of the same coin. Finally, evidence of Middle Palaeolithic occupation in Northwest Europe decreases rapidly after 50.000 years ago. Stadial and even interstadial climatic conditions during the second half of the Middle Weichselian were probably no longer warm enough to allow humans to migrate from the Southern *refugia* to the Northern fringes of glacial Europe.

7.4.11. Conclusion

The TL and WFL lithic assemblages, which probably date to the first half of the Middle Weichselian (first half of MIS 3), were characterised by Levallois cores and flakes in association with big Quina tools. At the same time, we see the appearance of many Quina-dominated lithic assemblages in the caves of the Mosan Basin. During the Early Weichselian (MIS 4), Quina-dominated assemblages were already present in Southern France. However, lithic assemblages with some Quina tools have also been observed in Northwest Europe at the time of the transition from the late Last Interglacial *s.l.* to the Early Weichselian (MIS 5a-4): *e.g.*, at Vollezele-Congoberg (*e.g.*, Vynckier *et al*. 1985, 1986) and Remicourt (*e.g.*, Bosquet *et al*. 1998). These lithic assemblages, which were characterised by the presence of “solid” Quina tools, were probably produced in response to the cooling climate. During these “climatic-stress” situations, “reliable” Quina tools probably functioned as “risk-reducing” tools in “hazardous” environments.