Chapter 20

SCLADINA I-4A IN THE CHRONOLOGICAL CONTEXT OF THE NEANDERTALS FROM THE BELGIAN MEUSE VALLEY AND NORTHWEST EUROPE

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1. Introduction

The anthropological discoveries made over the past quarter of a century at Scladina Cave are far from being the only Neandertal remains discovered in the Belgian Meuse River Basin.

Apart from Scladina, at least seven other sites have yielded Neandertal fossils (Figure 1; Toussaint et al., 2011). Five of them were found during the 19th century, at a time when the quality of available contextual information was far below the standards of modern prehistorical research. Most of them were assigned to simplistic stratigraphic records, without exact distribution plans or contextual analyses. These include Engis (1829-30), La Naulette (1866), Goyet (~1870), Spy (1886), and Fonds de Forêt (1895). Three of these finds (Engis, La Naulette, and Spy) have played a major role in the genesis and initial developments of palaeoanthropology and prehistory (Toussaint, 1992; 2001).

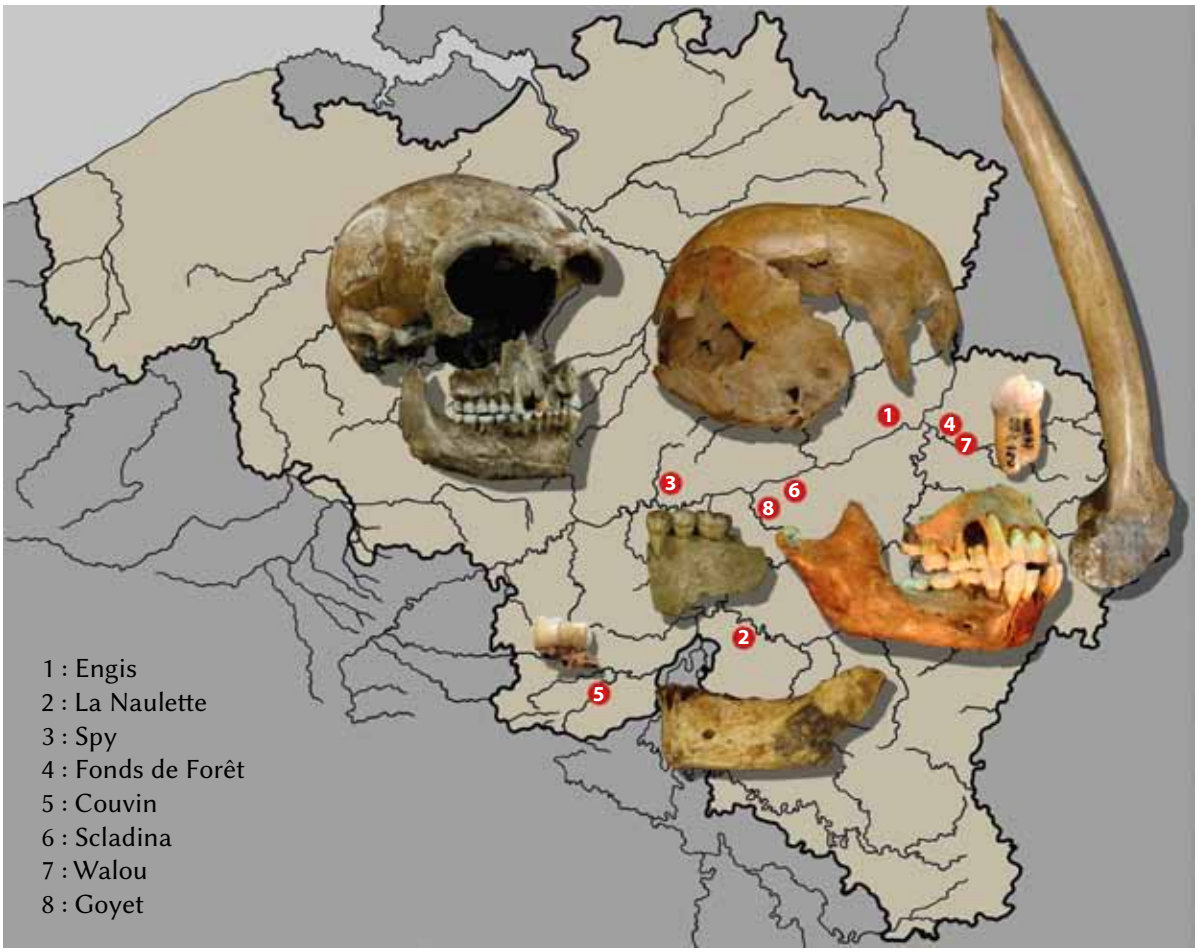

Figure 1: Location of the sites which have yielded unquestionable Neandertal remains in Belgium (graphics Semal & Toussaint, after Toussaint et al., 2011).

During the last three decades of the 20th century, there was a revival of prehistoric research in karstic areas, both in terms of excavation methods and the development of multidisciplinary approaches. This was initiated during the excavation of Remouchamps Cave in 1969 and 1970 by the University of Liège, in contexts dating back to the end of the Upper Palaeolithic (Dewez et al., 1974; Toussaint & Pirson, 2007). In this new research context and after nine decades without the discovery of any Neandertal remains, the end of the 20th and the beginning of the 21st centuries were marked by three findings, all of them associated with more precise information due to newly developed methods. These include: an isolated deciduous tooth from Trou de l'Abîme in Couvin (1984); isolated teeth, a mandible, and a maxilla found in former Layer 4A of Scladina Cave (1990–2006), and a premolar discovered in Walou Cave in 1997.

This chapter solely provides anthropological context to the juvenile of Scladina from a chronological perspective, both in the Belgian Meuse Basin as well as neighbouring regions. It only briefly presents the contextual archaeological and anthropological data of these discoveries. These data are available in full in previous synthetic contributions (Toussaint et al., 2001, 2011; Toussaint & Pirson, 2006), as well as in more specific detailed works (e.g. Toussaint et al., 1998, 2010; Crevecoeur et al., 2010) and monographs (Draily et al., 2011; Pirson et al., 2011; Rougier & Semal (eds.), 2013, 2014 in press).

2. Methodological limits of the chronological approach

The quality of available information varies greatly for the stratigraphic, archaeological, and palaeoenvironmental contexts of the Neandertal fossils found in the Meuse River Basin cave sites.

From our perspective, to optimally guarantee the accurate context of the fossils found in all these sites, the conjunction of three main pieces of information is essential:

— human remains must be taxonomically well-attributed,
— large sedimentary sequences must be established with detailed stratigraphic surveys, and
— chronostratigraphic frameworks must be accurately established.

In addition, two other kinds of information are also extremely valuable:

— direct dating of the fossils (^{14}C AMS, gamma spectrometry), and
— typical lithic artefacts found in the same context as the remains.

In the Meuse River Basin, these criteria are rarely met. There are several possible causes for this. The first is the antiquity of most excavations. Even when new analyses were undertaken as thoroughly as possible, such as the direct dating and anthropological analyses of fossils at Spy (Rougier & Semal (eds.), 2013), the deficiencies in precise contextual data make rigorous correlations between the results of all involved disciplines difficult. The second is the lack of

Cave	Town	Date of discovery	Taxonomy	Precise stratigraphy	Palaeo-environmental data	Good chronostratigraphy	Direct dates of the fossils	Association of characteristic lithic material		
								Good	Problematic	Absence
Engis	Flémalle	1829–1830	+	–	–	–	(AMS)		+	
La Naulette	Houyet	1866	+	(+)	–	–	–			+
Goyet	Gesves	around 1870	+	–	–	–	AMS		+	
Spy	Jemeppe-sur-Sambre	1886	+	–	–	–	AMS		+	
Fonds de Forêt	Trooz	1895	+	–	–	–	–		+	
Couvin	Couvin	1984	+	+	+	(+)	–	+		
Scladina	Andenne	from 1990	+	+	+	+	γ spectrometry			+
Walou	Trooz	1997	+	+	+	+	–	+		
Montigny-le-Tilleuls	Montigny-le-Tilleuls	1889	–	–	–	–	–		+	
Tiène des Maulins	Rochefort	2002–2008?	–	–	–	–	–			+

Table 1: Assessing the quality of data on Neandertals from the Belgian Meuse River Basin.

sites in which complex sedimentary situations are thoroughly addressed by geological analyses. The third is the scarcity of sedimentary sequences where a reliable chronostratigraphic framework exists. In most cases, the only chronological indicators are a limited number of ^{14}C dates. However, the results have to be considered with caution due to problems inherent to that technique, such as contamination or taphonomic disturbances of the dated samples (Higham, 2011). Recent radiocarbon analyses have shown that the initial ages of the fossils from Mezmaiskaya, Vindija, and Zafarraya were significantly underestimated (see Higham et al., 2006; Pinhasi et al., 2011; Wood et al., 2013). To be reliable, ^{14}C dates should be obtained through a replicable protocol, they should be numerous enough to compose a continuous sequence, and should be cross-checked with independent datasets, e.g., from climatostratigraphy, the study of tephras, or pedostratigraphic markers.

Based on this, only three Neandertal fossils (or series of fossils) from the Belgian Meuse River Basin are well positioned stratigraphically, allowing detailed chronostratigraphic and palaeoenvironmental studies (Table 1): Walou, Couvin, and Scladina. Some human remains from Spy and Goyet were directly dated with ^{14}C AMS. The radiocarbon dates in the case of the Engis 2 skull were clearly too young. The chronological position of the two other sites is more speculative.

Chronology of the Belgian 3. Meuse River Basin Neandertals

Despite all the problems evoked above, the Neandertal remains from the Meuse River Basin can tentatively be classified into different groups, combining the ^{14}C chronology of the Neandertal remains themselves (AMS), the ^{14}C chronology of the associated fauna, and, when possible, contextual data (Toussaint & Pirson, 2006; Pirson & Di Modica, 2011).

3.1. The La Naulette problem

In 1866, the discovery of the famous La Naulette mandible in the Lesse Valley by the geologist Édouard Dupont marked an important step in the history of palaeoanthropology. The antiquity of the fossil was confirmed by a relatively precise stratigraphic context—clearly the best for the discovery's time period—and its probable association with large, extinct prehistoric mammals.

Dating the La Naulette mandible is challenging. The stratigraphic sequence of the cave is over 11 m high. In his second description, Dupont (1867; Figure 2) identified three "ossiferous levels"

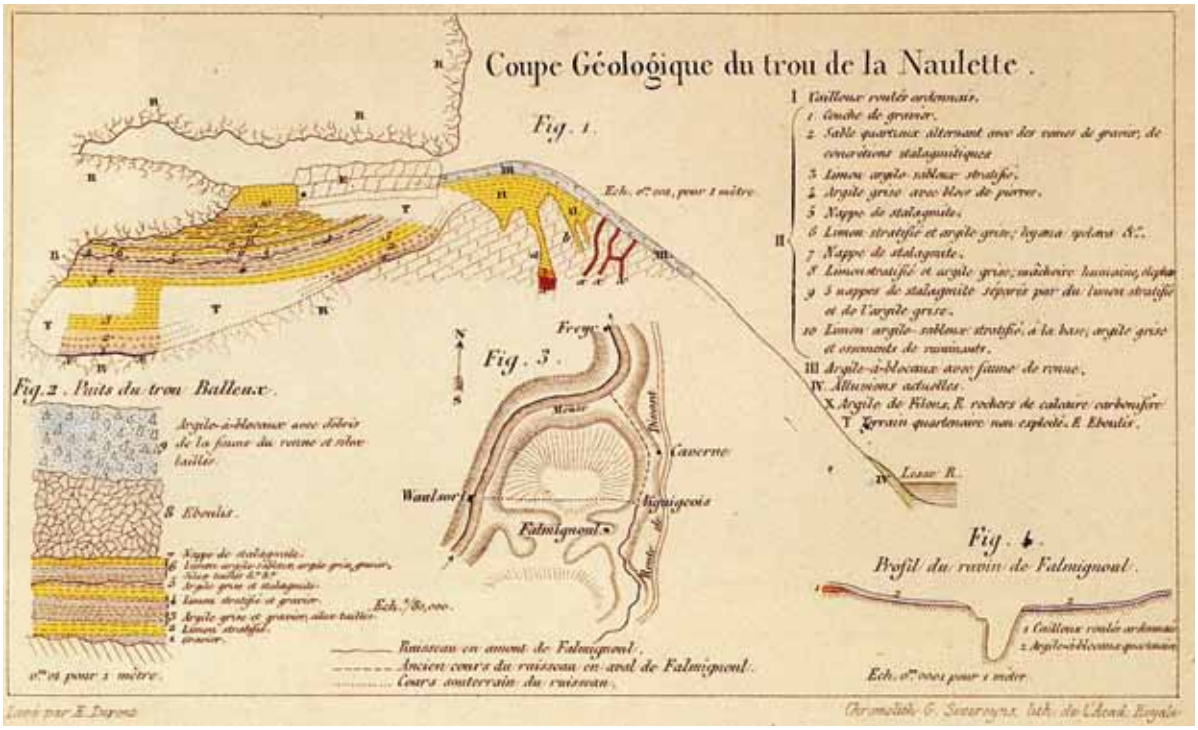

Figure 2: La Naulette: sedimentary profile, after Dupont (1867).

Figure 3: La Naulette: ulna, mandible (lateral and superior views) and third metacarpal.

and seven "stalagmitic sheets". Three human bones - and an isolated tooth - were found in the second ossiferous level, between the stalagmitic sheets 2 and 3, without any associated lithic material. The mandible (Figure 3) is thought to have belonged to a young female (Leguebe & Toussaint, 1988); it is comprised of the left side of the mandibular body, the symphyseal region and the anterior part of the right side of the body. The three other remains are an ulna, a damaged third metacarpal as well as a tooth now lost. The human remains from La Naulette have never been directly dated. However, stratigraphic and palaeoanthropological evidence suggest they may be older than Classic Neandertals.

The age of the fossils is supported by the presence of five overlying stalagmitic levels, considering both their thickness and quantity. They point to interglacial or early glacial conditions, suggesting MIS 5 or some temperate phase of Middle Pleistocene. The mandible has archaic features and fits within the biometric variability of Neandertals and their pre-Neandertal ancestors. Although the ulna and metacarpal show modern morphological and metric characters, it does not change the likelihood of the mandible's antiquity.

Two hypotheses can be proposed to explain the presence of an archaic mandible and modern-like postcranial bones. One explanation is that Dupont may have mistakenly associated an ancient mandible with modern postcranial remains because of the absence of an accurate stratigraphic record. However, the overall accuracy and precision of his stratigraphic observations contradicts this hypothesis, especially when added to other evidence, such as the absence of modern human bones inside the main section of the cave. The second hypothesis is that all the remains are from the same layer and the same individual, suggesting they are from a very early Neandertal. Neandertal characteristics were progressively acquired mosaically, resulting in classical specimens around the Eemian interglacial (Dean et al., 1998; Condemi, 2000). In some of their anatomical details, earlier fossils may be morphologically closer to anatomically modern humans than to Classic Neandertals. As a consequence, the seemingly modern features of the postcranial bones from La Naulette could be interpreted as plesiomorphies. Since 1999, a few short excavations have occurred at La Naulette, notably to look for evidence that addresses the hypotheses presented above (Toussaint & Pirson, 2002). New direct dates and some palynological analyses are being done on some of the recovered speleothems.

Regardless of these two assumptions, in the present state of research the La Naulette mandible may be the oldest human fossil from the Meuse River Basin, dating to at least MIS 5.

3.2. MIS 5 fossils

Until now, and if La Naulette is older than MIS 5 (cf. supra), only the 8-year-old Neandertal from Scladina Cave appears to belong to MIS 5 and even possibly to MIS 5a or b (see this volume, Chapter 5).

3.3. MIS 4

In the current stage of research, and if the Scladina Child does date to MIS 5b or 5a, no human remains that date to MIS 4 (± 78–60 ka BP) have been found. This lack of human fossils could be related to the current absence of archaeological occupations in Belgium during the second half of the Weichselian Lower Pleniglacial (second part of MIS 4), which corresponds to a major climatic deterioration, starting with the development of continuous permafrost followed by the first major Weichselian loess cover (Haesaerts, 1984; Pirson et al., 2009; Pirson & Di Modica, 2011).

3.4. MIS 3 fossils

Based on the quality of available contextual data, the Neandertal remains that date to the Weichselian Middle Pleniglacial (MIS 3) can be ordered in three sub-groups.

3.4.1. MIS 3 on the basis of good multidisciplinary context

This sub-group is comprised of the Couvin and Walou teeth, i.e., fossils unearthed in recent decades with good stratigraphical and palaeoenvironnemental information, as well as ^{14}C dates for the associated fauna.

The right dm_2 (Figure 4), discovered in 1984 in front of the main entrance of Trou de l'Abîme in Couvin during a multidisciplinary program of excavation, has been determined as Neandertal due to its occlusal morphology and enamel thickness (Toussaint et al., 2010). It has good stratigraphical context. A new archaeological study (Flas, 2008) established that the associated lithic material is definitely Mousterian rather than transitional, as previously hypothesized (Otte, 1984). However, even if the stratigraphic context is well defined, no analyses regarding the origin of the sediments or the sedimentary dynamics have taken place. The chronostratigraphic framework of the site is only known because of two ^{14}C dates (46,820 ± 3,290 BP and 44,500 + 1,100/-800 BP) available from faunal remains found in Layer II, from where the Neandertal tooth was exhumed. These dates are consistent with the possible presence of a palaeosol in overlying Layer III, which might be an equivalent of "Les Vaux Soil" and therefore situated between 42,000–40,000 BP at the youngest (Pirson et al., 2009; Toussaint et al., 2010). Therefore, the Couvin tooth seems to date back to approximately 45,000 BP.

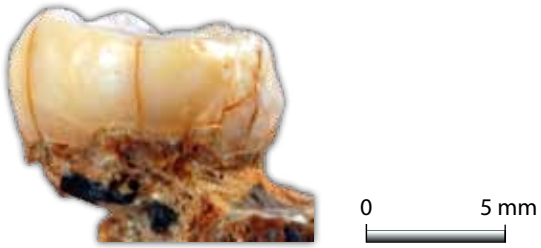

Figure 4: The Couvin mandibular deciduous right second molar (after Toussaint et al., 2011).

A mandibular left first premolar (Figure 5) was found in 1997 at Walou Cave during the second multidisciplinary excavation, which took place from 1996 to 2004 (Draily, 2011; Draily et al. (dir.), 2011; Pirson et al. (dir.), 2011). Despite being the only human remain discovered in the site (in Layer CI-8, which is dated around 40,000-38,000 BP), relatively to the recent Neandertal fossils of northwest Europe, it has the best context: an accurate stratigraphic position, a strict association with a well-characterized archaeological lithic industry (i.e., Mousterian), and a well-established chronostratigraphic framework based on tephrostratigraphy, climatostratigraphy, pedosedimentary markers, as well as several dates (^{14}C, ESR/U-Th, and TL).

3.4.2. MIS 3 on the sole basis of direct AMS radiocarbon dates

This sub-group of fossils is composed of the Spy (Figure 6) and Goyet Neandertals, respectively discovered in 1886 and ~1870, in conditions which do not correspond to current standards of archaeological fieldwork. Nevertheless, these fossils are extremely valuable for anthropological research.

In recent years, new research on the archaeology and palaeoanthropology of Spy has occurred at the Royal Belgian Institute of Natural

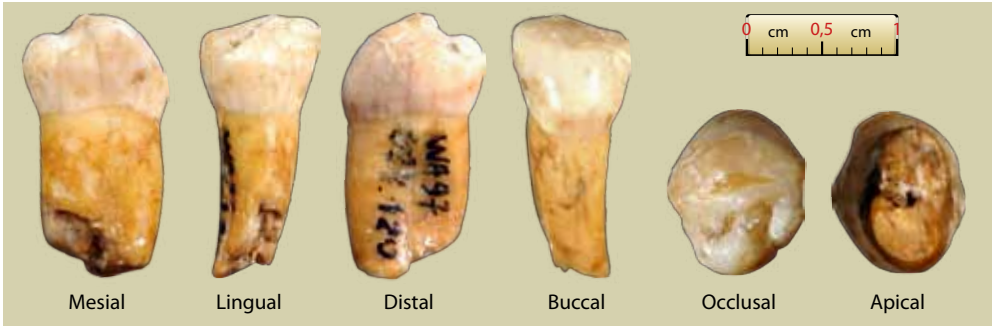

Figure 5: Walou: mandibular left first premolar (after Toussaint et al., 2011).

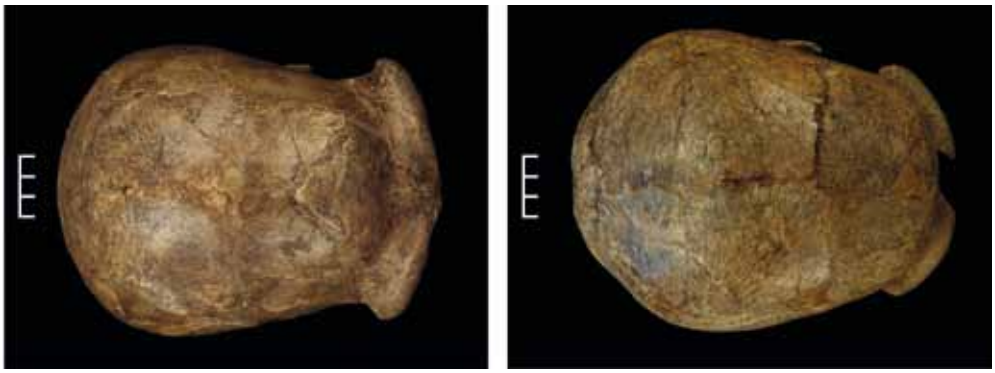

Figure 6: Spy: two skullcaps (after Toussaint et al., 2011).

Sciences, which houses most of the site material (Fraipont & Lohest, 1887; Rougier & Semal (eds.), 2013, 2014 in press). Concurrently, three direct AMS radiocarbon dates were performed directly on fragments of the two Neandertal adults in two different laboratories (Groningen and Oxford), which indicated that the skeletons date back to around 36,000 BP, (Toussaint & Pirson, 2006; Semal et al., 2009, 2013). Unfortunately, the stratigraphical, palaeoenvironmental, and archaeological context of the fossils is not precise enough. Therefore, linking the Spy fossils to the end of the Middle Palaeolithic or to the Lincombian-Ranisian-Jerzmanowician (LRJ; Flas, 2008) transitional industry is difficult, even if the LRJ hypothesis is the most attractive.

At Goyet, a fragment of mandible (Figure 7) and numerous fragments of human bone with anthropogenic traces were recently identified in the collections of the Royal Belgian Institute of Natural Sciences in the assemblage unearthed around 1870 by É. Dupont in the third cave (Rougier et al., 2012, 2014). They were identified as Late Neandertals on the basis of a morphometric study supported by radiocarbon dating. The absence of a precise stratigraphic record makes it difficult to reliably associate the fossils to the lithic industry found in the cave.

3.4.3. Possible MIS 3 Neandertal remains

The third group is composed of apparently recent fossils - or sets of fossils - found during the 19th century in conditions, which, like the fossils of Spy and Goyet discussed above, do not correspond to current standards of archaeological research.

The first, Engis 2 (Figure 8), found by Ph.-Ch. Schmerling during the winter of 1829-1830 in a highly inaccurate stratigraphic position, exhibits clear Neandertal attributes (Tillier, 1983). The recently acquired ^{14}C dates at 26,830 ± 340 BP and 30,460 ± 210 BP seems to be too young when compared to the regional archaeological context, probably due to sample contamination (Toussaint & Pirson, 2006). An attribution to MIS 3 is the most probable hypothesis.

The second, a femur found in 1895 in the caves of Fonds de Forêt, was shown to be Neandertal (Figure 9; Twiesselmann, 1961); however, the conditions of its discovery do not allow it to be precisely positioned in a stratigraphical layer, so no chronological information is available. The possibly associated archaeological industry seems to be from the Middle Palaeolithic.

Other arguments often used to support the recent dates from Engis and Fonds de Forêt, are observations made by excavators of the stratigraphic proximity of the fossils and the Mousterian and early Upper Palaeolithic (e.g. Ulrix-Closset, 1975, 1990). The structural complexity of cave stratigraphy highlighted in recent studies done at Walou and Scladina, with frequent erosive boundaries, large gullies and other disturbances, clearly

Figure 7: Goyet: fragment of mandible found by E. Dupont around 1870 (after Rougier et al., 2009).

Figure 8: Engis 2 skullcap, found by P.-C. Schmerling in the second cave of Engis during the winter 1829–1830 (from Toussaint et al., 2011).

limits the scope of this argument (Pirson, 2007; Pirson & Di Modica, 2011).

3.5. Other Neandertal remains?

In addition to the eight above-mentioned caves, other karstic sites of Wallonia may have also yielded Neandertal remains, but serious analysis have to be carried out before accepting or rejecting them into the collection of Neandertal sites of the Meuse River Basin. This is the case in Montignies-le-Tilleul and in Eprave.

A femur fragment and three metacarpals were discovered in 1889 in Rotches de D'Gennly Cave, at Montignies-le-Tilleul, in the Sambre Valley (Otte, 1986); their possible association with the Mousterian industry is interesting, but the absence of anthropological studies prevents further interpretation.

The oldest sediments of Tiène des Maulins Cave, in Éprave along the right bank of the Lomme River, could date back to 75,000–60,000 years ago (Groenen, 2005; Groenen et al., 2013), but without any association with typical Mousterian

Figure 9: Fonds de Forêt: the Neandertal femur (after Toussaint et al., 2011).

lithic material (Di Modica, 2011). Some bone and dental remains have also been attributed to the Middle Palaeolithic at this site and were interpreted as Neandertals (Groenen, 2010). However, no detailed stratigraphic study has been conducted to confirm or refute the stratigraphic position of these remains and no anthropological study was so far made to test their current allocation as Neandertals (Toussaint et al., 2011).

4. Northwest European context

In addition to the concentration of Neandertal remains in the Meuse River Basin, the northwest European regions surrounding Belgium (i.e. Great Britain, The Netherlands, north France, and northwest Germany) have also yielded some fossils. Within the context of the Scladina discoveries, those dating back to the Upper Pleistocene (MIS 5–3; Figure 10) are interesting, although they do not offer the best opportunities for dating and palaeoenvironment, similar to most of the sites of the Meuse River Basin that were excavated long ago. Middle Pleistocene remains such as Biache 1 and 2 or Boxgrove are not included here.

Found in 1856, the Neandertal type specimen site, Feldhofer Cave in Germany, is just about 100 km northeast of the Belgian sites. In fact, Feldhofer provided the only Neandertal remains of North Rhine-Westphalia that have been directly dated by ^{14}C AMS, which produced dates of approximately 40-39 ka BP (Bonani, 2006; Street et al., 2006). However, no rigorous in situ stratigraphic context was established due to the antiquity of the discovery. During field research in 1997 and 2000 (Feine, 2006; Schmitz et al., 2006), Mousterian artefacts were found with new Neandertal remains in sediment that was anthropogenically removed, at least in part, during the time of industrial use of the quarry (Hillgruber, 2006). The original association of the lithic artefacts and the Neandertal fossils, either found in 1856, 1997, or 2000, cannot be demonstrated, as the new findings are from a disturbed context. The chronostratigraphical position of the fossils relies solely on direct ^{14}C dates; the bones are positioned within disturbed sediment that has neither climatic markers nor other chronostratigraphic data from layers associated to the Neandertal remains.

In the Netherlands, no Neandertal remains have been found in situ at an archaeological site.

Figure 10: Location of the sites which have yielded Classic Neandertal remains in nortwestern Europe discussed in this chapter: 1. Feldhofer Cave, the Neandertal type site; 2. North Sea, the Zeeland Ridges area; 3. Grotte du Renne at Arcy-sur-Cure, Yonne department; 4. Kent's Cavern; 5. La Cotte de Saint-Brelade, Jersey; in green, the geographical area of the eight Meuse River Basin sites (graphics Sylviane Lambermont, AWEM & J.-F. Lemaire, SPW).

The only specimen discovered is a portion of human frontal bone found in 2001 within sediments extracted from the bottom of the North Sea in the Zeeland Ridges area, 15 km off the coast (Hublin et al., 2009). The remains have neither context nor associated lithic material, and therefore have no chronostratigraphic data. The fossil itself has not been dated directly with ^{14}C AMS. However, the details of the supraorbital morphology and the shape of the external surface of the squama, allow the bone to be assigned to *Homo neanderthalensis*.

In the northern third of France, i.e. north of the Seine River, recent Neandertal remains have not yet been found. The northernmost French Classical Neandertals are those of the Grotte du Renne at Arcy-sur-Cure, in the Yonne department, Burgundy. They were mainly found in Châtelperronian contexts but some teeth are from Mousterian layers (Leroi-Gourhan, 1958; Bailey & Hublin, 2006).

In Great Britain, there are very few human fossils with a chronostratigraphic context that dates from MIS 5 to 3. Found in 1927 in an imprecise stratigraphic position, the Kent's Cavern-4 maxilla with deeply worn teeth was originally interpreted as modern. Its direct ^{14}C AMS date of 30,900 ± 900 BP (OxA-1621) is now considered contaminated and much too recent. A new reassessment of the specimen suggests that its teeth possess more modern human than Neandertal characteristics (Stringer et al., 2007; Higham et al., 2011). According to AMS radiocarbon dates obtained using ultrafiltration on animal bones and teeth found above and below the reported stratigraphic context of the object, the maxilla would be much older, with a modelled age of 44,180-41,530 cal BP (approximately between 40,000 and 37,000 BP; Higham et al., 2011). Based on this data, this find would represent the oldest anatomically modern human discovered in northwest Europe, demonstrating the large and rapid dispersal of Early Modern Humans across all Europe more than 40 ka ago. However, these dates have been challenged on the grounds that the sedimentary context is not well controlled due to poorly executed excavations (White & Pettitt, 2012).

A total of 13 Neandertal teeth from one individual and an occipital fragment from a juvenile human skull were recovered at the Palaeolithic site of La Cotte de Saint-Brelade, Jersey, at the beginning of the 20th century (Stringer & Currant, 1986). Recent in situ research provided optically stimulated luminescence (OSL) dates of the sediments, which could indicate that the Neandertal fossils date to between MIS 5 and 3 (Bates et al., 2013).

5. Conclusion

Eight karstic sites have yielded Neandertal remains in Belgium, which represents a unique concentration in northwest Europe. Even if several gaps remain, this allows a hypothetical chronological model for the Late Neandertals of the Meuse River Basin. Dating back to MIS 5, the Scladina Child has a special place in this scheme, as, like apparently La Naulette, they are older than the other remains. In the current state of research, the following pattern emerges as the best hypothesis for Neandertals (Figure 11):

- during MIS 5b or 5a (or less likely early MIS 4) Early Classic Neandertals, with the Scladina Juvenile, are present;
- during the second part of MIS 4 there currently is no evidence for occupation of the Belgian Meuse River Basin, deduced from the lack of human fossils and of archaeological occupations, which corresponds to a major climatic deterioration;
- at approximately 45 ka BP Late Neandertals with late Mousterian industries are present, represented by the Couvin dm_2;
- at approximately 40–38 ka BP or slightly after some Neandertals with late Mousterian industries, represented by the Walou P_3 from Layer CI-8 and consistent with the age of the youngest Mousterian assemblage from Scladina Cave, i.e., Unit 1A (40–37 ka BP) are present;
- at approximately 36 ka BP Neandertals still are present at Spy where the associated lithic industry is imprecise: possibly transitional LRJ, or even late Mousterian; and
- at approximately 33 ka BP probably only modern humans are present, since after then the only known dated industries are Aurignacian, e.g., Maisières-Canal and Spy (Semal et al., 2009; Pirson et al., 2012) and the only proven fossil humans associated with those industries in northwest Europe are *Homo sapiens sapiens,* represented mainly by isolated teeth (Bailey et al., 2009).

Such a model is obviously not precise enough. Firstly, it is based on too few sites: just eight,

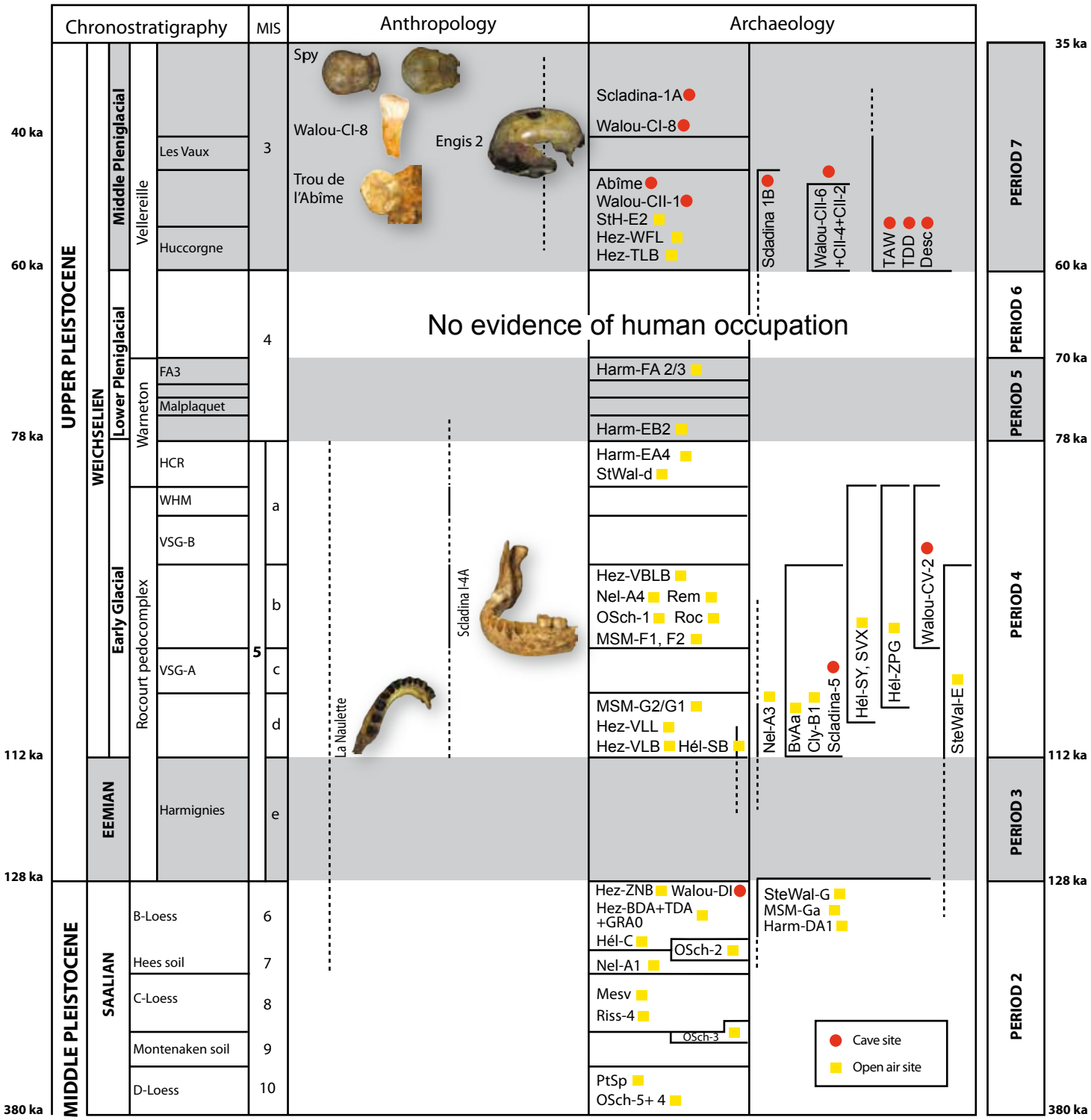

Figure 11: Hypothetical chronology of the Meuse River Basin Neandertals (modified from Pirson & Di Modica, 2011). **Chronostratigraphy**: FA3 = Harmignies FA3 soil; HCR = Humiferous Complex of Remicourt; VSG-A = Villers-Saint-Ghislain A soil; VSG-B = Villers-Saint-Ghislain B soil; WHM = Whitish Horizon of Momalle.

Archaeology: Abîme = Trou de l'Abîme; BvAa = Bos van Aa; Cly-B1 = Le Clypot-B1; Desc = Grotte Descy; Harm = Harmignies; Hél = Hélin; Hez = Hezerwater; Mesv = Mesvin (Mesvin IV, Petit-Spiennes III); MSM = Mont-Saint-Martin; Nel = Nelissen; OSch = Op de Schans; PtSp = Petit-Spiennes; Rem = Remicourt; Riss-4 = Le Rissori-4; Roc = Rocourt; Scladina = Scladina Cave; StH-E2 = Station de l'Hermitage-E2; StWal = Sainte-Walburge;TAW = Trou Al'Wesse; TDD = Trou du Diable; Walou = Walou Cave.

The letters and numbers following the abbreviations refer either to a specific stratigraphic layer or to a different concentration.

with only three found within modern multidisciplinary excavations and only two others having delivered direct reliable ^{14}C AMS dating of Neandertal remains. It does not provide a reliable date for the La Naulette mandible and for the Fonds de Forêt and Engis fossils. Secondly, this model does not explain precisely what happened in Belgium between 36 and 33 ka BP, so the question of the possible overlap and contacts between Neandertals and Early Modern Humans in the Meuse River Basin cannot be properly addressed in terms of chronology.

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