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The Middle to Upper Paleolithic transition at Trou Al'Wesse: A preliminary overview of stratigraphic units 17 to 15

Rebecca MILLER, John STEWART, Monika KNUL,
Yann WAERSEGERS, Pierre NOIRET & Keith WILKINSON

1. Introduction

The objective of current excavations at Trou Al'Wesse (Modave, Prov. of Liège, Belgium) is to elucidate the climatic and environmental context and the chronology of the presence/absence of humans during the Middle to Upper Paleolithic transition. Trou Al'Wesse is one of the few large cave sites remaining in Belgium that contains deposits for this period; it thus has the potential of providing significant information concerning Neandertal extinctions, the arrival of the first modern humans in Belgium and changes in human adaptations across this transitional period. Given that the Mousterian layers in Unit 17 were excavated during the 2015 field season, analysis and interpretation of the stratigraphic sequence in Units 17 to 15 are in progress. However, field data and the newly exposed profiles allow us to present a preliminary overview of this sequence, which ranges from the Late Mousterian (Unit 17) to the Aurignacian (Unit 15).

Analyses of the fauna from all three units are also being conducted to refine our understanding of the climatic oscillations occurring across the Middle to Upper Paleolithic transition and the timing of human presence in relation to cold and more temperate phases. Geological analyses, using field data and laboratory analyses, describe the stratigraphic sequence, the depositional processes and the context in which the archaeological material and other data were found. The sequence is being systematically dated by AMS on bone and charcoal samples and OSL dating on sediments. Analyses of the lithics and bone artifacts describe the Mousterian and Aurignacian lithic assemblage structure, raw materials, technology and tool production, as well as Aurignacian bone tools and evidence of Mousterian butchery.

2. Geological sequence on the terrace (from bottom to top)

This section briefly describes the three units and the distinct layers identified with each.

Unit 19
Overlying bedrock, Unit 19 is composed of fine well-sorted dark gray loess. Archaeologically sterile.

Unit 18
Yellowish to orange clayey silt, probably loess with the presence of clay indicating pedogenesis. Flowstone and stalagmitic fragments present. Fauna present, including horse, but no lithics as yet. 10-15 cm thick.

Unit 17
Unit 17 is divided into three clearly distinguishable layers (17a, b and c), with the addition of 17c.1. As noted by Pirson (1999; Pirson & Collin, 2005), Unit 17 contains several layers formed under multiple sedimentary conditions.

17c.1: Decimetric dolomite blocks visible in profile M5/4 overlying unit 18 and underlying 17c (formerly considered together as 17c).
17c: Brown silt without coarse fraction.
17b Gray-brown sandy silt with worn gravels 2-4 cm and blocks 5-10 cm. Localized zone rich in granular charcoal fragments (sand-sized) and burned bone. Contains Mousterian lithics (unworn) and fauna.
17a: Light brown sandy silt with a minor coarse fraction and subangular dolomite fragments 2-10 cm. Contains Mousterian lithics (unworn) and fauna.

Unit 16
Excavated by half-square (50 x 100 cm) in squares M6 to M10, this ca. 75 cm thick unit also contains several distinct layers. Given provisional names in the field, examination of the profiles is in progress to describe each layer and to interpret the processes involved in their deposition. Archaeologically sterile, but layers contain fauna in varying densities.

Unit 15
Unit 15 contains at least ten layers. Preliminary deposition order based on stratigraphic analysis is interpreted as follows. The earliest layers (15.8-BE, 15.9, 15.4, 15.5, 15.3 and 15.2) are present in profile N/O 4, but not further away from the cave entrance. Small Aurignacian lithic assemblages are present in 15.8-BE, 15.9, 15.4 and 15.5, and have been interpreted as reworked artifacts washed out of the cave. After the truncation episode, subhorizontal layers 15.8, 15.6 and 15.1 were deposited starting in row 5, with layer 15.1 overlying 15.2 and 15.6.

3. Chronology

At present, a single date is available for unit 17: 41100 ± 2300 uncal BP (OxA-7497; Otte *et al.*, 1998) or 49619-42261 cal BP (to 2σ). A series of samples for AMS dating of each layer in Unit 17 is currently being analyzed and sediment samples for OSL dating were collected and dosimeters installed in August 2015. Samples from layers in Unit 16 are also being dated by AMS. AMS dates obtained for the Unit 15 sequence are coherent with the proposed deposition order and indicate a range from 38-33000 uncal BP (Miller *et al.*, submitted). In addition, sterile Units 19 and 18, as well as layers 15.8-BE and 15.4 and Unit 12 were sampled for OSL dating.

4. Archaeological assemblages

4.1. Mousterian

The Mousterian assemblages in layers 17a and 17b were excavated in squares L4, M4, L6 and M6 in 2015. At the end of the season, the top of Unit 17 was reached in squares M9 and M10, indicating that the Mousterian will be present zone from row 4 to at least row 10, and likely from at least row L to N. It should be noted that after row N, rows O-Q were removed by the tunnel dug by Fraipont, Braconnier and Lohest in 1885-1887 (Fraipont, 1901).

Initial lithic analysis of the Mousterian assemblages is in progress to describe the general structure (Tab. 1). The categories (1-7) have been defined to differentiate between the different broad categories of artifacts produced during the different stages of core reduction and tool production. Most of the lithic material comes from a limited zone that includes subquares L6D and M6A-D (n = 673), with lithics also found in layer 17a in the L4B-M4A column (n = 21) and single spits thus far in M9C-D (n = 8) and M10C-D

Layer	17		17a		17b			Total
	n	%	n	%	N	%	n	%
General assemblage structure								
1 - Tools	2	0.8	13	3.4	0	0.0	*15*	*2.1*
2 - Cores	1	0.4	4	1.1	1	1.0	*6*	*0.8*
3 - Blank, intentional products	1	0.4	9	2.4	1	1.0	*11*	*1.5*
4 - Reduction debris	184	75.1	53	14.1	31	31.0	*268*	*37.1*
5 - Tool production by-products	0	0.0	0	0.0	0	0.0	*0*	*0.0*
6 - Core preparation by-products	57	23.3	296	78.5	66	66.0	*419*	*58.0*
7 - Percussors	0	0.0	2	0.5	1	1.0	*3*	*0.4*
Total	*245*	*100.0*	*377*	*100.0*	*100*	*100.0*	*722*	*100.0*

Tab. 1 – *Trou Al'Wesse*, Unit 17, Mousterian. General assemblage structure (2005 and 2015 excavations, plotted artifacts only). Note: Unit 17 was not differentiated by layer in 2005 (M6A-B); artifacts are listed as layer 17 but are now known to come from both 17a and 17b.

(n = 20). While the few cores (type 2) found are all exhausted, the presence of abundant core preparation flakes (type 6) and small reduction debris (type 4) as well as intentional products, retouched or not, indicates active core reduction activity. The range in artifact size, from small debris flakes recovered by water sieving to large flakes, as well as the freshness of most of the edges and ridges, suggest little sorting or transport, although some movement is likely. The tools number 15 and are primarily retouched flakes, as well as a denticulate and a sidescraper made on Levallois flakes and a notch. In addition, there are six unretouched Levallois flakes (Tab. 2).

As previously observed (Di Modica *et al.*, 2005), a range of lithic raw materials was exploited dur-

Layer	17	17a	17b	Total
Tools				
Denticulates	1			*1*
Sidescrapers		1		*1*
Retouched flakes		9		*9*
Retouched or used flakes		1		*1*
Notches	1	1		*2*
Possible retouch		1		*1*
Unretouched intentional products				
Levallois flakes		5	1	*6*
Total	*2*	*18*	*1*	*21*

Tab. 2 – *Trou Al'Wesse*, Unit 17, Mousterian. Frequencies of tools and intentional products.

Raw material types	*General description*
1 - medium-grained "Hesbaye" flint	fine- to medium-grained flint with slightly coarser inclusions, dark gray and whitish specks, gray to brown, opaque but can be translucent
2 - coarse-grained beige flint	coarse-grained, beige to pale tan, can be translucent
3 - coarse-grained beige-gray flint	coarse-grained, beige-gray (similar to type 2 but darker), opaque
4 - fine-grained black flint	fine-grained, black, no inclusions (note: not Obourg)
5 - phtanite	fine-grained, black, matte, opaque, no inclusions (source: Ottignies-Mousty region)
6 - fine-grained light gray quartzite	fine-grained, light gray
7 - fine-grained translucent "Hesbaye" flint	fine-grained, color varies from gray to brown to black, smooth, translucent
8 - chert	black, anisotropic
9 - coarse-grained brown flint	coarse-grained, brown
10 - Brussels sandstone	pale gray to tan, coarse-grained, micaceous
11 - coarse-grained brown flint	coarse-grained, brown, translucent
12 - fine-grained black flint	fine-grained, black, opaque
13 - fine-grained beige flint	fine-grained, beige to tan, uniform color, no inclusions, very smooth
14 - banded flint	fine to medium-grained, alternating gray/dark gray bands
15 - yellowish-brown banded flint	yellowish-brown flint, fine-grained, banded, smooth
16 - black-dark grey flint	black-dark grey flint, fine-grained, smooth, non-translucent (may be a gradation of type 12)

Tab. 3 – Trou Al'Wesse, Unit 17, Mousterian. Preliminary description of lithic raw material types.

ing the Mousterian at Trou Al'Wesse. Our initial analysis has identified several different types (Tab. 3), of which refitting could potentially demonstrate variability within a single type such that some types would then be regrouped. These types include several variants of flint, phtanite, quartzite and Brussels sandstone. Of these, the most common are types 1 and 7 (the two "Hesbaye" flint types), followed by types 13 (good quality translucent beige flint) and 5 (good quality phtanite; Tab. 4, Fig. 1).

Layer	17		17		17b		Total	
	n	%	n	%	n	%	n	%
Raw material type								
1	19	41.3	122	45.0	21	29.6	*162*	*41.8*
7	18	39.1	77	28.4	28	39.4	*123*	*31.7*
13			20	7.4	10	14.1	*30*	*7.7*
5	2	4.3	9	3.3	4	5.6	*15*	*3.9*
8			10	3.7	1	1.4	*11*	*2.8*
4			6	2.2	2	2.8	*8*	*2.1*
10			5	1.8	3	4.2	*8*	*2.1*
14	4	8.7	3	1.1			*7*	*1.8*
16			7	2.6			*7*	*1.8*
12	1	2.2	4	1.5	1	1.4	*6*	*1.5*
6	1	2.2	2	0.7			*3*	*0.8*
9			1	0.4	1	1.4	*2*	*0.5*
11			2	0.7			*2*	*0.5*
15	1	2.2	1	0.4			*2*	*0.5*
2			1	0.4			*1*	*0.3*
3			1	0.4			*1*	*0.3*
Total	*46*	*100.0*	*271*	*100.0*	*71*	*100.0*	*388*	*100.0*

Tab. 4 – Trou Al'Wesse, Unit 17, Mousterian. Frequencies of lithic raw material types.

Fig. 1 – Trou Al'Wesse, Unit 17, Mousterian. Common raw material types.
1-2: type 1, medium-grained "Hesbaye" flint (M6.61 and M6.15). 3: type 7, fine-grained "Hesbaye" flint (M6.14).
4: type 13, fine-grained translucent beige flint (M6.105). 5: type 5, phtanite (M6.80).
6: type 15, yellowish-brown banded flint (M6.102).

General sourcing regions can be proposed for certain of these types (Fig. 2). A few artifacts have neocortex, indicating procurement in the form of cobbles, probably on the Meuse terraces a minimum of 20 km from the site. Types 1 and 7 are considered to be variants of "Hesbaye" flint, a general term referring to Cretaceous flint found across the Hesbaye Plateau. However, use of this term is imprecise and does not indicate specific geographic locations for these flint types. An estimate of distance would give a minimum of 20-25 km (to outcrops available in the Mehaigne Valley north of the Meuse) but could reach 50-60 km (to the Maastricht region). The source of type 13 has not yet been determined, but this is a very good quality flint. Phtanite (type 5) is represented by a large retouched flake as well as reduction by-products and an exhausted core fragment. Its source is about 60 km west in

the Ottignies-Mousty region. Brussels sandstone (glazed sandstone or *grès lustré*; type 10) has been identified for two fairly large flakes and four core preparation flakes, and comes from the Landen region about 45 km to the north. It should be noted that small chunks of chert are common in both Mousterian layers, but do not appear to have been knapped. Most of the artifacts have fresh edges and ridges and are not worn or crushed.

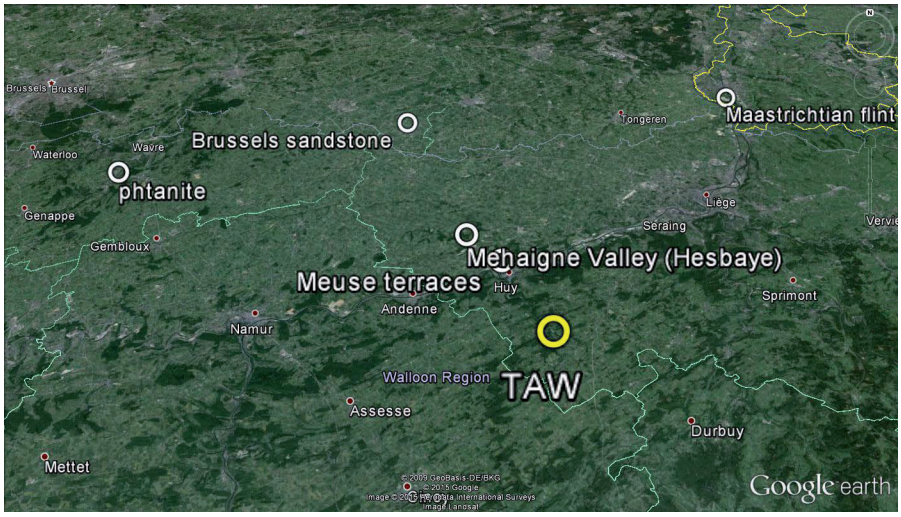

Fig. 2 – Map showing Trou Al'Wesse and general locations of the lithic sources exploited Google Earth courtesy.

4.2. *Aurignacian*

The Aurignacian lithic assemblages on the terrace are much less abundant than those in the Mousterian layers, but include bladelets, reduction flakes and small debris. In addition to these smaller sized artifacts, a larger composite tool on a thick flake (carinated endscraper/carinated burin) and a bone point fragment were found in the upper concentration (layer 15.5; Fig. 3). In 2015, in test pit TP2013, below 19th century backfill (from Dupont's 1860s trench) and adjacent to the eastern wall of Fraipont's 1885-87 tunnel, intact (i.e., previously unexcavated) Pleistocene deposits were found. An Aurignacian endscraper on a long, thick blade was discovered in these deposits (Fig. 4). These observations and the preliminary geological interpretation of the depositional processes operating at Trou Al'Wesse would suggest that the smaller artifacts found on the terrace had been washed out from inside the cave while the deposits remaining in the cave could contain larger artifacts.

Fig. 3 – Trou Al'Wesse, Aurignacian. Left: composite tool, carinated endscraper/carinated burin (N4.37). Right: bone point fragment (N5.67; see also Miller *et al.*, 2007 : 46, fig. 3).

Fig. 4 – Trou Al'Wesse, TP2013. Aurignacian endscraper on blade.

5. Fauna

The largest preserved bones from Unit 17 were found in squares M4-L4, closest to the cave entrance. These include horse, rhinoceros and cave bear, among others. Other species present in the Mousterian layers are reindeer, red deer/giant deer, fox, mustelids, voles, fish and birds (*Lagopus* in layer 17a), identified during the field season. Much of the faunal material is broken or fragmentary. Many fragments are burnt.

One of the axes of analysis at Trou Al'Wesse is the study of faunal ancient DNA. At present, a range of species is being analyzed to provide a more complete view of Pleistocene environments and the chronology of climatic oscillations: collared lemming (*Dicrostonyx torquatus*; Brace *et al.*, 2012), Norway lemming (*Lemmus lemmus*), water vole (*Arvicola terrestris*), red deer (*Cervus elaphus*; Meiri *et al.*, 2013), reindeer (*Rangifer tarandus*), brown bear (*Ursus* sp.), horse (*Equus sp.*), willow grouse and rock ptarmigan (*Lagopus* sp.). The domestication of different species during the Holocene is also being addressed: aurochs/domestic cattle (*Bos* sp.), wild boar/pig (*Sus scrofa*) and wolf/dogs (*Canis sp.*).

6. Conclusion

This brief overview of the Pleistocene archaeological, geological, and faunal data, particularly from the 2015 field season in Units 16 and 17, shows that both Neandertals and modern humans occupied Trou Al'Wesse but not continuously and not simultaneously. Humans were absent from the site, although not necessarily from Belgium entirely, during the period represented by Unit 16. Environmental and climatic analyses in progress, as well as refinement of the chronology of the Middle to Upper Paleolithic transition and climatic oscillations, will address the role of climate as a factor affecting human presence or absence across the transition in Belgium and more largely, in Northwest Europe. Archaeological analysis of lithic technology, raw materials and economy will clarify the nature of the occupations at Trou Al'Wesse and the territorial ranges exploited. Finally, continued excavations on the terrace in 2016 in Units 16 and 17 and in the test pits inside

the cave will provide further information on the depositional context of the different human occupations and will increase the size of the lithic and faunal assemblages to study the organization of activities occurring at the site.

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Abstract

Units 17, 16 and 15, currently being excavated on the terrace, cover the Middle to Upper Paleolithic transition at the site of Trou Al'Wesse. These include Late Mousterian layers (Unit 17), an archaeologically sterile unit (Unit 16) that contains fauna that will clarify environmental and climatic changes across the transition, and Aurignacian layers (Unit 15). In addition, the discovery of an Aurignacian endscraper on a large blade in previously unexcavated deposits and an undisturbed cave bear den inside the cave suggests that the cave deposits will contain evidence of Mousterian and Aurignacian occupations untouched by the 19th century excavations of Dupont and Fraipont. This paper presents a preliminary overview of the stratigraphic sequence and chronology on the terrace as well as the lithic and faunal assemblages recovered so far.

Keywords: Trou Al'Wesse, Modave, Prov. of Liège, Belgium, excavation, Units 17 to 15, Late Mousterian, Middle Paleolithic, Upper Paleolithic, environmental and climatic changes, Aurignacian, chronology, lithic and faunal assemblages.

Résumé

Les unités 17, 16 et 15, actuellement en cours de fouille sur la terrasse, couvrent la transition entre le Paléolithique moyen et le Paléolithique supérieur au site du Trou Al'Wesse. Ces unités comprennent des niveaux du Moustérien récent/final (unité 17), une unité archéologiquement stérile (unité 16) avec de la faune qui apportera des éléments de réponse à la problématique des changements environnementaux et climatiques à travers cette période transitionnelle, et des niveaux aurignaciens (unité 15). De plus, la découverte d'un grattoir aurignacien sur lame dans des dépôts non fouillés et d'une tanière d'ours des cavernes intacte à l'intérieur suggèrent que les dépôts conserveront des occupations du Moustérien et de l'Aurignacien non perturbées par les fouilles du XIX^{e} siècle de Dupont et Fraipont. Nous présentons ici un aperçu préliminaire de la séquence stratigraphique et de la chronologie sur la terrasse, ainsi qu'une description des ensembles lithiques et fauniques mis au jour jusqu'à présent.

Mots-clés : Trou Al'Wesse, Modave, Prov. de Liège, Belgique, fouille, Unités 17 à 15, transition, Moustérien récent/final, Paléolithique moyen, Paléolithique supérieur, changements environnementaux et climatiques, Aurignacien, chronologie, ensembles lithiques et fauniques.

Rebecca MILLER
Pierre NOIRET
Yann WAERSEGERS
Service de Préhistoire
Université de Liège
7, place du XX août, bât. A1
BE – 4000 Liège
rmiller@ulg.ac.be
pnoiret@ulg.ac.be
yann_waersegers@hotmail.com

John STEWART
Department of Life and Environmental Science
Faculty of Science and Technology, Bournemouth University
Talbot Campus, Fern Barrow Poole
UK – Dorset BH12 5BB
jstewart@bournemouth.ac.uk

Monika KNUL
Science and Technology, Bournemouth University
Talbot Campus, Fern Barrow Poole
UK – Dorset BH12 5BB
monika.knul@bournemouth.ac.uk

Keith N. WILKINSON
Department of Archaeology
University of Winchester
UK – Winchester SO22 4NR
keith.wilkinson@winchester.ac.uk