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Trou du Renard and the Belgian Aurignacian

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*A wealth of cave sites makes southern Belgium the most important area for understanding the north-western European Early Upper Palaeolithic. However, despite their abundance, the interpretation of many assemblages remains problematic. Here we present a new study of lithic material from layer B of Trou du Renard (Furfooz, Namur Province) and consider its place in the Belgian Aurignacian. The assemblage is typical of Late Aurignacian assemblages found across western Europe, underscoring the contrast between the Aurignacian and the periods that pre- and post-date it, when we instead see profound differences between north and south. The assemblage is apparently unmixed, distinguishing Trou du Renard from other key Belgian Aurignacian cave sites. A large proportion of the site's lithic assemblage documents the production of small bladelets from carinated/*busqué *burin cores, suggesting that Trou du Renard served as a short-term hunting camp. Radiocarbon dating cannot pinpoint the assemblage's age, though here it is argued to be* c. *32–33,000* BP *(*c. *36–37,000 cal* BP*) on the basis of its similarity to the well-dated Aurignacian assemblage from Maisières Canal (*Atelier de Taille de la Berge Nord-Est *area). For the same reason a third assemblage – Trou Walou layer CI-1 – is also argued to be contemporaneous. Trou du Renard, Maisières Canal and Trou Walou may represent three points in the same Late Aurignacian landscape. Differences between their lithic assemblages can be explained by the acquisition and transport of flint, and by a desire to produce small bladelets of highly standardised form irrespective of the size and shape of available blanks.*

Keywords: Early Upper Palaeolithic, Aurignacian, north-west Europe, lithic technology, bladelet production

The southern Belgian cave record of late Neanderthal and early modern human occupation is unparalleled in north-western Europe, both in terms of the density of sites and the size of assemblages at the larger sites. For this reason Otte's (1979) detailed study of the Belgian Early Upper Palaeolithic remains a benchmark text for the archaeology of this period anywhere in northern Europe. Especially important is the substantial record of Aurignacian occupation, generally regarded as left by western Europe's earliest modern human occupants (eg, Dewez 1993; Miller *et al*. 2004; Flas *et al*. 2013; Flas 2015).

Yet despite the wealth of evidence, much remains unclear, even at the most basic level. A recent consensus sees the region's Aurignacian, the preceding Lincombian-Ranisian-Jerzmanowician (LRJ) and the later Maisierian[1] as chronologically and culturally unrelated (eg, Jacobi 2007; Flas 2008; Jacobi & Higham 2011; Cooper *et al*. 2012; Dinnis 2012; Pettitt & White 2012; Pesesse & Flas 2012; Pope *et al*. 2013), but a lack of clear stratigraphy of these different assemblage types means this consensus has been a long time coming (McBurney 1965; Campbell 1977; 1980; 1986; Otte 1979; 1981; 1990; 2002; Desbrosse & Kozlowski 1988; Allsworth-Jones 1990; Aldhouse-Green 1998; Aldhouse-Green & Pettitt 1998; Flas 2002). Northern Europe also lacks any well-stratified site that clearly documents change within the Aurignacian. Most key Aurignacian sites (notably Spy Cave, Goyet, Trou Magrite and Paviland Cave) were excavated a century ago or more, and the extent to which Aurignacian material was internally stratified (if at all) is either unclear or unknown. Diachronic

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change within the north-western European Aurignacian must therefore be inferred from sites and sequences elsewhere. For some this is a questionable methodological leap, inevitably resulting in differences of opinion regarding, among other things, the likely timing of the region's earliest Aurignacian occupation (Straus 1995; Djindjian *et al.* 1999; 2003; Flas 2008; Pirson *et al.* 2012; White & Pettitt 2012; Flas *et al.* 2013; Dinnis 2015).

Recent years have seen renewed efforts to interpret Belgium's Early Upper Palaeolithic record, including excavations at old and new sites, and new studies of old collections (Otte & Straus 1995; Miller *et al.* 2004; Flas 2008; 2015; Rougier & Semal 2013; Draily 2011; Pirson *et al.* 2011a). Reassessment of Aurignacian material has been influenced by improved understanding of Aurignacian lithic technology, most notably the realisation that small bladelets (*c.* 1–4 cm in length) and their parent carinated (or 'keeled') artefact cores are particularly sensitive chronological/cultural indicators (Bordes & Lenoble 2002; Le Brun-Ricalens *et al.* 2005; 2009; Flas *et al.* 2006; 2013; Pesesse & Michel 2006; Dinnis 2009; 2011; Chazan 2010; Michel 2010). The Belgian site of Maisières Canal (*Atelier de Taille de la Berge Nord-Est* area, Hainaut Province) has here played a role – a small open-air Aurignacian assemblage documents the production of small bladelets from cores typologically classified as carinated and *busqué* burins (Fig. 1) (Miller *et al.* 2004; Flas *et al.* 2006).

From this new perspective attempts have been made to interpret technological difference and similarity within assemblages and between sites, teasing apart material that may relate to different Aurignacian occupations (Dinnis 2011; 2015; Flas *et al.* 2013). This requires identification and characterisation of assemblages that represent single or short-term occupation episodes, against which potentially mixed sites can then be assessed.

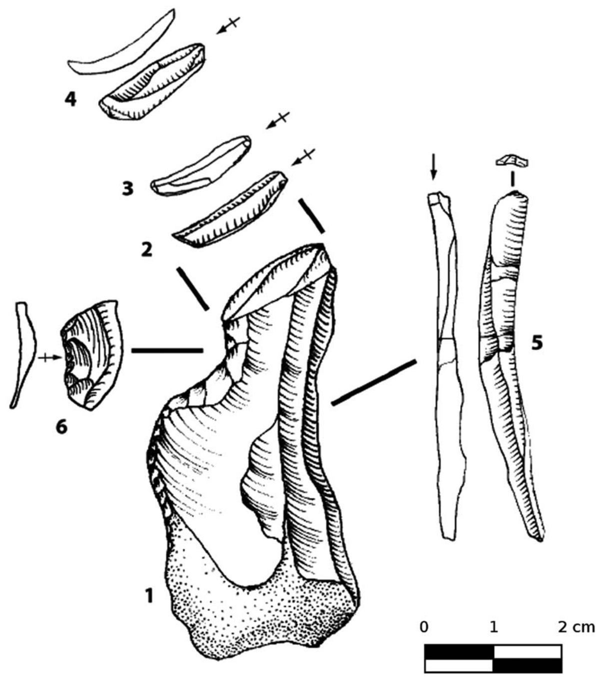

Fig. 1.
Bladelet debitage and by-products from a *busqué* burin bladelet core at Maisières Canal: 1: Core (*busqué* burin); 2: and 3: Bladelets (that were subsequently retouched); 4: Substantial plunging bladelet, probably struck to renew the bladelet debitage surface; 5: Burin spall (bladelet core tablet); 6: Notch renewal flake. The notch controls the length of the bladelets, and is the defining feature of a *busqué* burin. Similar bladelet cores without this notch are carinated burins. During bladelet production the notch becomes less and less pronounced, until it requires renewal. Carinated and *busqué* burins can therefore be part of the same technological process (from Flas *et al.* 2006, 65)

TROU DU RENARD

One such potentially unmixed Early Upper Palaeolithic assemblage, last studied 40 years ago, comes from Trou du Renard (Furfooz, Namur Province), a small cave excavated at the turn of the 20th century. The cave lies at the base of a limestone cliff on the right bank of the Lesse, a tributary of the River Meuse (Fig. 2), in an area particularly rich in Palaeolithic and Neolithic cave archaeology. Preceded by an elongated terrace, the cave's west-facing entrance is narrow (*c.* 1.5 m) before opening up into two successive chambers linked by a short gallery (Rahir 1914) (Fig. 3).

Trou du Renard was excavated by Rahir, Van den Broeck and de Loë in 1900 (Van den Broeck 1901; Rahir 1914). The terrace deposits outside the cave yielded little archaeological material and were at least partly reworked (Rahir 1914, 21), but the cave's first chamber contained richer deposits, with two palaeolithic horizons separated by a substantial thickness of archaeologically sterile sediments (Fig. 3, Table 1). The higher and more substantial archaeological horizon (layer B) was found at a depth of *c.* 80 cm, and, according to Rahir (1914, 22), in association with two hearths. Rahir (*ibid.*, 23) initially believed this

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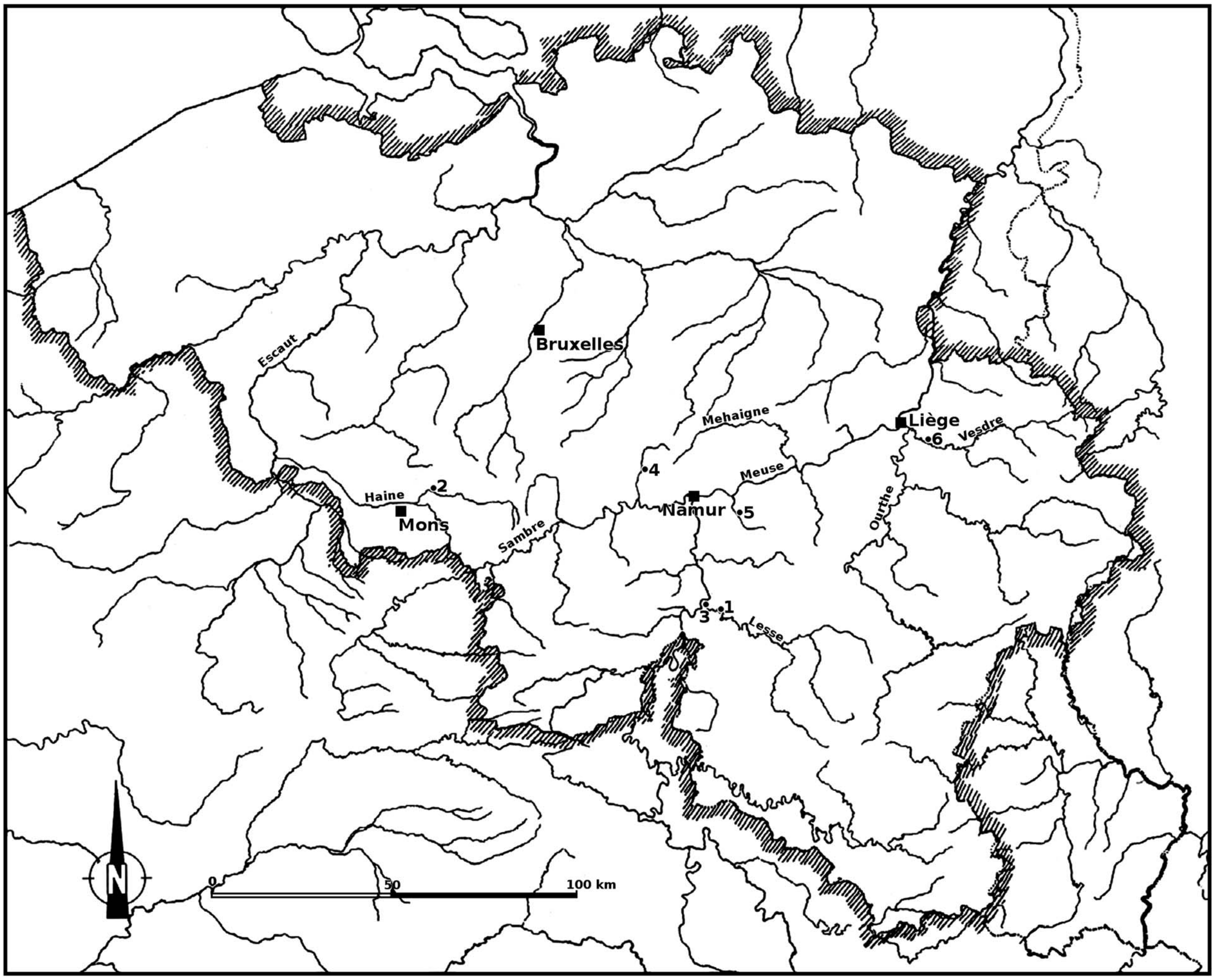

Fig. 2.
Location of Trou du Renard and other Belgian Aurignacian sites discussed in the text. 1: Trou du Renard; 2: Maisières Canal; 3: Trou Magrite; 4: Spy; 5: Goyet; 6: Trou Walou

occupation to date to the end of the '*age du renne*', and compared the lithic material to that from Remouchamps (Liège Province), a site now considered to be Final Upper Palaeolithic Ahrensburgian (Dewez 1987). At a depth of 3.4 m a second archaeological horizon with a meagre lithic industry was found (layer E), similarly described as being associated with a hearth, and tentatively assigned by Rahir (1914, 24) to the beginning of the Aurignacian.

Subsequent work has clarified the cultural status of the two assemblages. The lithic industry from layer B was first described as Aurignacian by Claerhout (1911–12), although at that time 'Aurignacian' described assemblages positioned between the Mousterian and Solutrean. Otte (1976; 1979) confirmed it as Aurignacian as it is understood today, and placed it in his third group of Belgian Aurignacian assemblages, corresponding to the Late Aurignacian. Otte's attribution of the lithic industry agreed with Cordy's (1976) analysis of the faunal remains, which concluded that the layer corresponded to the Arcy Interstadial. The small lithic assemblage from layer E was recognised as Mousterian by Ulrix-Closset (1975).

Radiocarbon dates for Trou du Renard are given in Table 2. The date for layer B published by Otte (1976) was produced from a bulk sample of bone fragments, and is superseded by AMS dates produced later. Dates from two bone retouchers are in excess of

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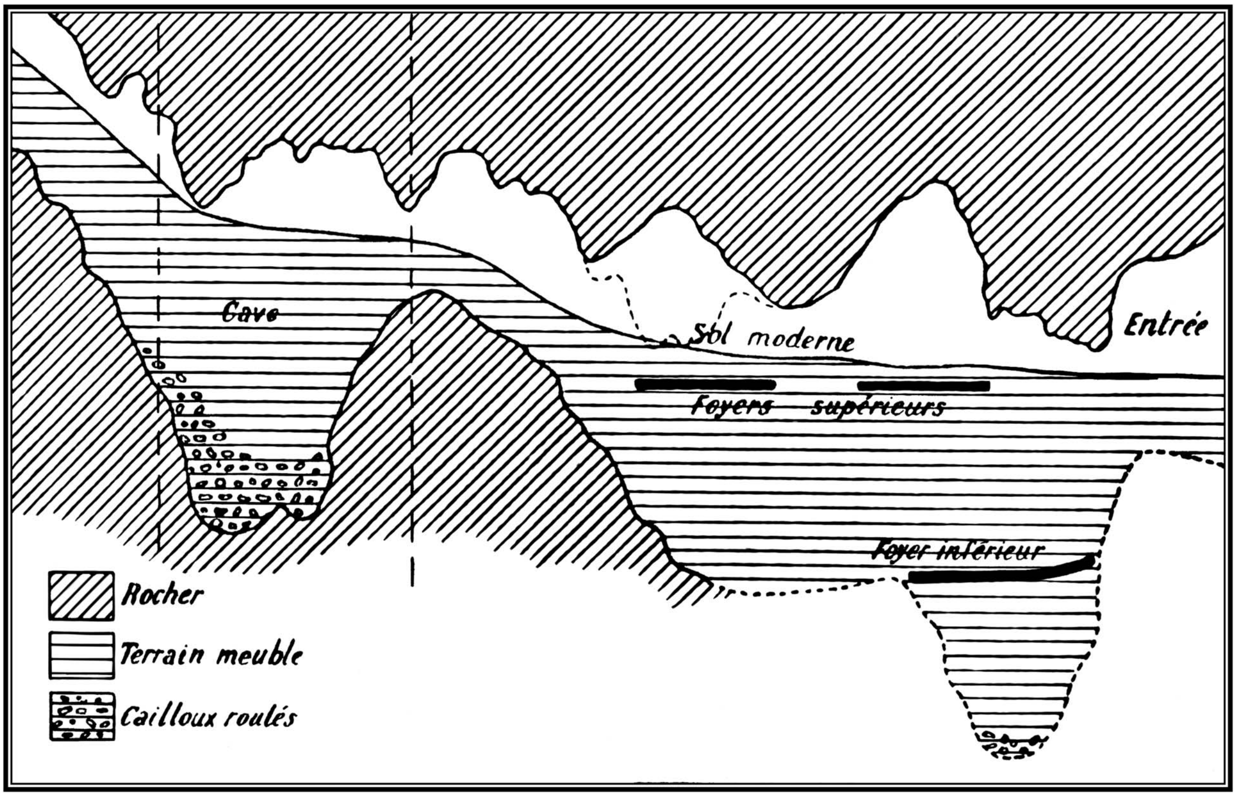

Fig. 3.
Section through the first and second chambers of Trou du Renard, showing the locations of the hearths/archaeological horizons (Rahir 1914, 19)

40,000 BP. Their age makes it likely that both come from the Mousterian layer E, and these two dates broadly agree with dates from other Mousterian sites in the Meuse basin (Trou Walou, Scladina, Trou de l'Abîme and Trou du Diable: Toussaint 1988; Pirson *et al*. 2012). Three dates from two cut-marked bones from layer B give a range of *c*. 25,500–28,000 BP (*c*. 30–32,000 cal BP). This age range corresponds to the Belgian Maisierian/Gravettian (Haesaerts 2000; 2004; Haesaerts & Damblon 2004; Jacobi *et al*. 2010) rather than to the Aurignacian (Haesaerts 2004; Pirson *et al*. 2011b; Flas *et al*. 2013; Flas 2015). The surfaces of both bones show evidence of treatment with preservatives, and contamination may therefore be a problem. These dates do not help us to pinpoint the age of the Trou du Renard Aurignacian, but we return to the issue in more detail below.

Although stored in a box labelled 'Trou du Renard B', a human fibula from the site is of Neolithic age (Table 2). An accompanying note indicates it was found in a different area of the cave from the layer B lithic assemblage (Table 2), but the existence of Neolithic-age bone recorded as deriving from layer B obviously calls into question the homogeneity of material ostensibly from that layer. According to the faunal list of Cordy (1976, 142) layer B contained hyaena and woolly rhino, species that would be consistent with an Early Upper Palaeolithic age for the lithic assemblage (Currant & Jacobi 2011; Stuart & Lister 2012; Stuart & Lister 2014). However, it also contained species from more recent periods: Saiga antelope probably dates to the Late Glacial Interstadial and wild boar to the Holocene (Dujardin & Tymula 2005; Currant & Jacobi 2011). As layer B lies close to the surface of the cave under the thin layer A (Table 1; Fig. 3), the presence of younger material is perhaps unsurprising, particularly as Cordy (1976, 142) also records the presence of badger bones in this level.

Although the fauna from Trou du Renard layer B is heterogeneous, there is little *a priori* reason to think that the stone tool assemblage is similarly mixed. Rahir (1914, 22; see also Fig. 3) explicitly recorded the

TABLE 1: STRATIGRAPHY OF TROU DU RENARD'S FIRST CHAMBER ('SALLE D'ENTRÉE') AS DESCRIBED BY RAHIR (1914) & VAN DEN BROECK (1901)

Depth (m)	*Description*	*Correlation to layer*
0–0.4	Humic layer	A
0.4–1	Silt with limestone blocks. The first archaeological horizon was at a depth of *c.* 80 cm: a lithic industry, non-local flat stone slabs & a few pieces of worked bone were found in association with 2 'well-marked' fireplaces. From this layer Rahir notes bones of horse, reindeer, fox, wild cat, bear, red deer, & *Bos*	B
1–?	Oxidised/altered silt	?C
?–1.8	Yellow silt	?C
1.8–?	Oxidised/altered silt	?C
?–2.7	Yellow silt	?C
2.7–?	Oxidised/altered silt, but with more limestone blocks than in the overlying layers	?D
?–3.4	Silt with many limestone fragments	?D
3.4	The second archaeological horizon: a lithic industry, of different character & meagre in comparison to that which is higher in the stratigraphy, & rock slabs, in association with a fireplace. From this layer Rahir notes remains of cave bear, wolf, hyaena, horse, chamois, & reindeer	E
3.4–?	Stalagmite fragments	–
?–4	Oxidised/altered silt	–
4–6	Limestone blocks and stalagmite fragments	–

Stratigraphic information provided by Rahir & Van den Broek is incomplete, & neither numbers the different stratigraphic units in their publications. Today material from the cave is separated into five different stratigraphic assemblages labelled A–E, as indicated by notes in the storage boxes written shortly after the excavations & during Rahir's tenure at the Musées royaux d'Art et d'Histoire. Probable correlation between these stratigraphic labels & the stratigraphy as described by Rahir (1914) & van den Broeck (1901) is given in the right-hand column.

TABLE 2: RADIOCARBON DATES FOR TROU DU RENARD

Lab no.	*Layer*	*Material*	*Date* BP	*Source*	*Notes*
OxA-26772	?B	*Homo sapiens*, fibula	4580 ± 31	This paper	Accompanying handwritten note indicates the specimen came from layer B, but from the gallery connecting the two chambers
Lv-721	B	Bone fragments (bulk sample)	24,530 ± 470	Otte 1976	
GrA-28196	B	Large mammal rib frag., cut-marked	27,920 ± 210	Flas 2005	Glossy surface
OxA-25771			27,090 ± 240	This paper	OxA-25771 is a repeat date of GrA-28196
OxA-25510	B	Large mammal rib frag., cut-marked	25,720 ± 210	This paper	Glossy surface
OxA-26311	?B	Large herbivore bone frag., retoucher	>48,400	This paper	Note left by M. Otte in the early 1970s questions attribution to layer B
OxA-26773	E	Large herbivore bone frag., retoucher	40,800 ± 1300	This paper	

lithics as deriving from close to the base of layer B, and from two discrete areas associated with hearths, rather than being distributed throughout the layer and throughout the cave. Four burnt lithics in the collection support Rahir's assertion.

THE WORKED STONE ASSEMBLAGE

Raw materials

The Trou du Renard lithic raw materials can be grouped into at least eight different categories

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according to texture, cortex, and type of patina, but this probably over-estimates the variety of sources actually exploited. The majority of the assemblage (98%; n = 493 of 501) may instead correspond to three flint types: fine-grained black flint, probably Campanian and from the Mons basin, Hainaut Province, *c.* 60 km to the north-west; *silex à glauconie*, which, according to Otte (1976, 121), probably also comes from Hainaut Province; and locally available drift flint from the Meuse river or nearby. Seven of the remaining eight pieces are a dark grey/black chert, suggested by Otte (*ibid.*) to be local to the site. The final piece was thought by Otte to be pthanite from Walloon Brabant, *c.* 50 km to the north of Trou du Renard, although it should be noted that there is current discussion about the uniformity of material historically referred to as 'pthanite' (Di Modica 2010, 181–3).

Typological overview

The Trou du Renard layer B lithic assemblage contains 68 retouched pieces (Table 3; Fig. 4). For the sake of convention the count in Table 3 includes carinated/*busqué* burins, although these are illustrated along with other debitage pieces in Figures 5 and 6. Retouched

TABLE 3: TYPOLOGICAL COUNTS OF RETOUCHED PIECES, INCLUDING CARINATED/BUSQUÉ BURIN BLADELET CORES

Burin	Carinated burin	16 (of which 3 busqué)
	Dihedral	2
	On break	1
	On truncation	2
	Simple	2
	Multiple	2
	Fragment	1
Indet. carinated piece		1
Scraper	Endscraper	2
Piercer		1
Notched piece		2
Denticulated piece		1
Truncated piece		4
Splintered piece		6
Edge retouched pieces	Dufour bladelet (Roc-de-Combe subtype)	4
	Small bladelet	1
	Flake	9
	Blade/large bladelet/laminar flake	9
	Indet.	2
Total		68

artefacts are all consistent with an Aurignacian assemblage – there are no characteristically Mousterian, LRJ, Maisierian, or Gravettian tool types.

As was noted by Otte (1976; 1979), the assemblage contains a high proportion of burins. In addition to the 16 carinated/*busqué* burins (discussed below) are those best classified as dihedral, on break and on truncation (Table 3). The numerous burin spalls in the assemblage (Table 4) demonstrate on-site burin reduction. The assemblage also contains two end-scrapers, one on a cortical blank and one on a crested blade, one piercer on a small laminar flake, one denticulated and two notched pieces, four truncated pieces, and six splintered pieces (Fig. 4). As can be seen in Figure 4, these retouched pieces are generally irregular or atypical in form. Among these tool classes there is no series of any one specific, standardised type.

However, one such standardised series of artefacts is represented by a group of five previously undocumented retouched small bladelets,[2] which serve to confirm Otte's (1976; 1979) cultural attribution of the assemblage. The blanks for all five have been struck from carinated/*busqué* burins. Four of the five are Dufour bladelets of the Roc-de-Combe sub-type (Demars & Laurent 1989, 102–3), the most convincing lithic index fossil of the Late Aurignacian. Two of these four are complete, and measure 13 mm and 20 mm in length. The widths of all four lie in the range 2.5–4.5 mm. All are curved in profile and are twisted anti-clockwise through their length. Three of the four bear fine, semi-abrupt ventral retouch on their right edge, with the fourth bearing bifacial retouch on its left edge. In all of these features (size, morphology, position of retouch) they find precise equivalents in other western European Late Aurignacian assemblages (Demars & Laurent 1989, 102–3; Lucas 1997; Chiotti 2003; Bordes 2005; Flas *et al.* 2006; Michel 2010). The fifth retouched bladelet bears fine dorsal retouch on its left edge.

Other typological features of the Trou du Renard assemblage are likewise consistent with a Late Aurignacian attribution. Carinated/*busqué* burins are characteristically Late Aurignacian (Demars & Laurent 1989; Lucas 1997; Chiotti 2003; Bordes 2005; Flas *et al.* 2006), and carinates more typical of Early Aurignacian assemblages, such as large carinated/nosed scrapers, are absent. Also absent are Early Aurignacian-type heavily retouched blades. Furthermore, there are no long, straight Dufour bladelets (sub-type Dufour: Demars & Laurent 1989) or Font-Yves bladelets (Pesesse 2011) characteristic of

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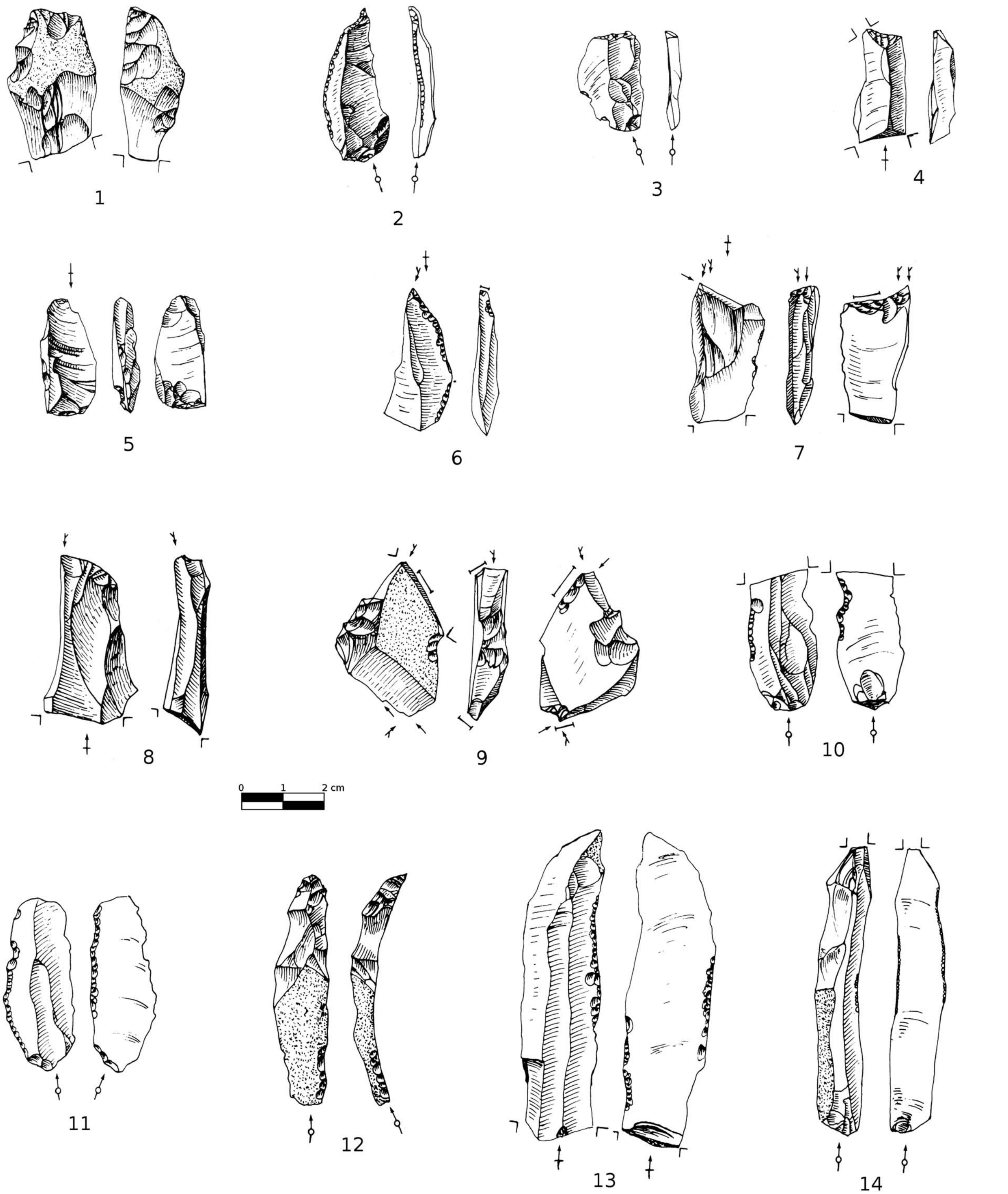

Fig. 4.
1: Endscraper; 2: piercer; 3–4: truncated pieces; 5: splintered piece; 6–9: burins; 10–14: retouched blades (from Otte 1976)

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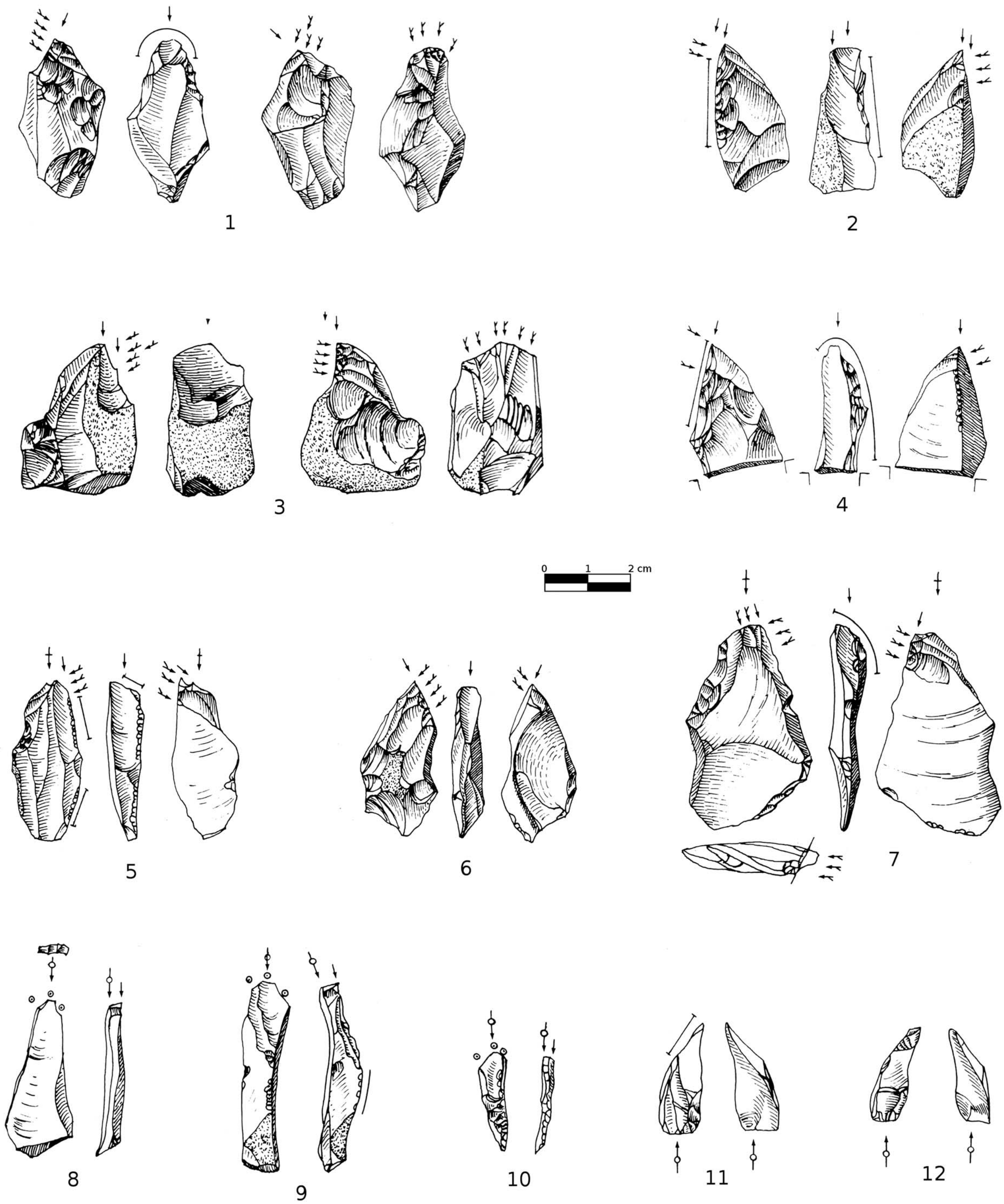

Fig. 5.
Carinated/*busqué* burin small bladelet production waste: 1–7: carinated/*busqué* burin bladelet cores; 8–10: Carinated/*busqué* burin spall (ie, bladelet core tablet); 11–12: large removals from carinated/*busqué* burin bladelet debitage surfaces (from Otte 1976)

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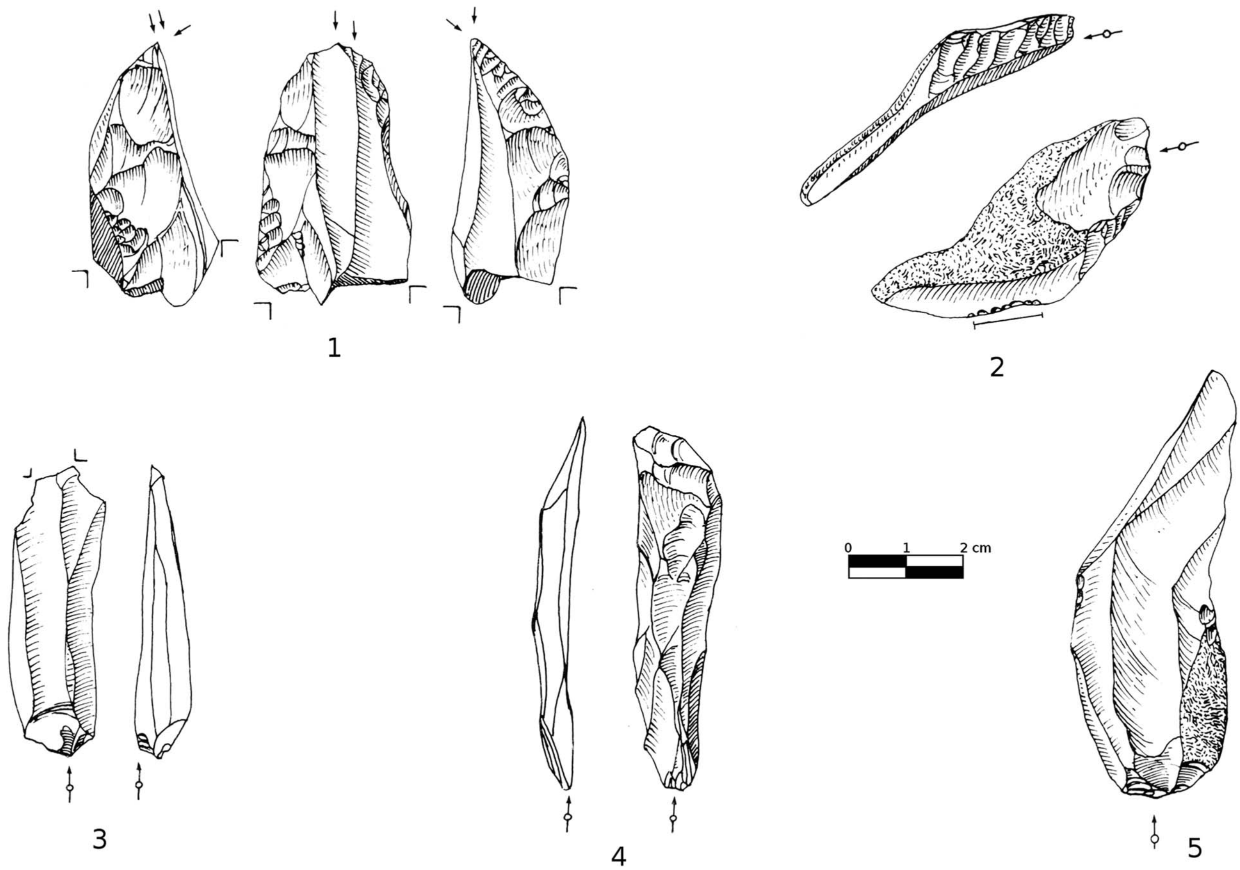

Fig. 6.
Blade/bladelet production waste/products: 1: blade/bladelet core fragment; 2: bladelet core tablet; 3: Blade; 4: *Lame sous crête*; 5: *Lame de flanc* (from Otte 1976)

Proto-/Early and Final Aurignacian assemblages. The small size of the bladelets that were recovered from Trou du Renard gives us confidence that this absence does not result from collection bias.

Technological character

The Trou du Renard assemblage is dominated by small, light blades and bladelets, with only a few larger blades. There are no complete blade cores and only two core fragments; one of these was subsequently reworked into a carinated burin. There is no evidence for systematic flake production.

Although there are several different blade and bladelet types, the approach to blank production is consistent. Fifty-nine per cent of discernible butts are flat (n = 141 of 237), rising to 70% when only blades and bladelets are considered (n = 61 of 87). Only 9% (n = 8 of 87) of blade/bladelet butts are dihedral or facetted, showing that platform preparation was not systematically directed towards the isolation of raised striking points. The small size of the butts and prevalence of lipping indicate preferential use of soft (organic) hammers – 84% of butts (n = 199 of 237) are ≤3 mm thick with a lip present on 72% (n = 171 of 237). Indicators of hard hammer percussion (prominent bulbs, impact marks) are restricted to three flakes and one splintered piece. The scar patterns on blades, bladelets and laminar flakes show blank production from cores possessing a single platform – 142 blanks are probably or certainly from uni-polar cores, compared to only three with a bi-directional scar pattern. Neo-crested blades[3] (Table 4, above) attest to the regulation of core shape during reduction.

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TABLE 4: UNRETOUCHED PIECES

Blade	
Complete	11
Proximal	29
Mesial	23
Distal	16
Lame de flanc	1
(Neo-)crested blade	
Complete	1
Mesial	1
Distal	1
Laminar flake	
Complete	10
Proximal	4
Mesial	1
Distal	3
Flake	
Complete	55
Fragment	38
Bladelet	
Complete	23
Proximal	23
Mesial	22
Distal	8
Chip	
>2 cm	6
<2 cm	85
Core fragment	1
Bladelet core tablet	2
Burin spall	
Complete	9
Proximal	10
Mesial	10
Distal	18
Carinated/*busqué* burin spall (ie bladelet core tablet)	10
Renewal flake/bladelet from carinated/*busqué* burin	11
Hammerstone fragment (?)	1
Total	433

To summarise, blade and bladelet blanks were produced via soft hammer percussion of single-platform cores, and platform modification was not geared towards isolating raised striking points. These features are common to Late Aurignacian assemblages elsewhere (e.g. Bordes 2005; Chiotti 2005; Flas 2006; Flas *et al.* 2013), but contrast with LRJ and Maisierian assemblages, where opposed platform cores were favoured, striking points often shaped prior to blade detachment and, at least in the case of the Maisierian of Maisières Canal, stone hammers were preferred (Jacobi 2007; Pesesse & Flas 2012).

Blades and bladelets in the Trou du Renard assemblage can usefully be grouped into five size categories (Table 5), which find some support in the width measurements in Figure 7. Cores and waste flakes from production of the largest blades are absent. These blades were probably made elsewhere and brought to the site, behaviour noted at other Aurignacian sites (eg, Le Brun-Ricalens 1993; Flas 2004). Their status as preferred, curated material may account for the relative prevalence of retouching (see Table 5). The paucity of evidence for on-site production of mid-sized blades may mean that they too arrived as ready-made blades, or perhaps as preformed cores. In contrast there is ample evidence for on-site manufacture of small blades and bladelets, and particularly small bladelets from carinated/*busqué* burins (Table 5).

Some pieces show the sequential production of bladelets and blades from the same core (*lamelles intercalées*: see Table 5). This reduction strategy has been considered an important feature of Proto-Aurignacian assemblages (Grotte du Renne layer VII, Le Piage layer K, Labeko Koba layer VII: Bon & Bodu 2002; Bordes 2006; Tafelmaier 2013), and is also described in assemblages ordinarily attributed to the Early Aurignacian (Abri Pataud layer 14; Geissenklösterle; Baden-Würtemberg: Chiotti 2003, 128–9; Teyssandier & Liolios 2003). Although Trou du Renard is, to our knowledge, the first northern European Late Aurignacian site at which it has been identified, this stone-working technique has previously been noted in the Late Aurignacian of Abri Pataud (layers 8 and 7 [lower] (Chiotti 2003, 132 & 142) and layer 6 (Michel 2010, 203–7)). As Chiotti cautions for Abri Pataud 8 and 7, the few pieces at Trou du Renard possibly document the intentional production of bladelets from blade cores, but may instead simply show the careful regulation of core shape during blade production.

The creation of small bladelets ≤25 mm in length is the most conspicuous process in the Trou du Renard assemblage (Tables 3–5; Fig. 5). Exhausted cores and waste products show that only the carinated/*busqué* burin method was used. Other carinated artefact types known also to have been cores for small bladelet production, such as carinated/nosed endscrapers, Paviland burins, and Vachons burins (*sensu* Pesesse & Michel 2006), are absent.

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TABLE 5: APPROACHES TO BLADE/BLADELET PRODUCTION IN THE TROU DU RENARD LAYER B ASSEMBLAGE (SEE ALSO FIG. 7)

Category	*Approx. width (mm)*	*Production/technological features*	*Evidence for production on-site*
Large blades	≥22	Few in number (n = 13), but a high proportion bear retouch: 7 of 13 are worked (retouched blades & burins) compared to only 10% of blades/ bladelets with widths <22 mm (n = 15 of 154)	None
Mid-sized blades	15–21	Blades apparently derive from dedicated prismatic cores. 4 blades bear dorsal scars indicating sequential bladelet-blade detachment from single cores (*lamelles intercalées*)	One *lame de flanc* (Fig. 6, no. 5) possibly belongs in this category
Small blades/ large bladelets	10–14	Seemingly deriving from dedicated prismatic cores, as well as a separate, less organised production from small blocks	One core fragment (Fig. 6, no. 1)
Mid-sized bladelets	6–9	Produced from different core types: some from small blocks & some apparently the result of the sequential blade-bladelet production (*lamelles intercalées*) also evidenced on mid-sized blades. Bladelets of this size may also come from heavily reduced cores previously used to produce larger blades/bladelets. 1 partially cortical crested blade & 2 partially cortical tablets attest to a prismatic core worked on the narrow surface of a small nodule	Crested blade (Fig. 4, no. 12), core tablets (Table 4; Fig. 6, no. 2)
Small bladelets	2–6	Produced from carinated/*busqué* burins– curved and most often twisted. The majority of carinated/*busqué* burins show ventral thinning close to their bladelet debitage surfaces (e.g. Fig. 5, nos 5 & 7)	17 carinated cores (Fig. 5, nos 1–7, Table 3) & numerous waste flakes from carinated/ *busqué* burin bladelet debitage (Fig. 5, nos 8–12; Table 4)

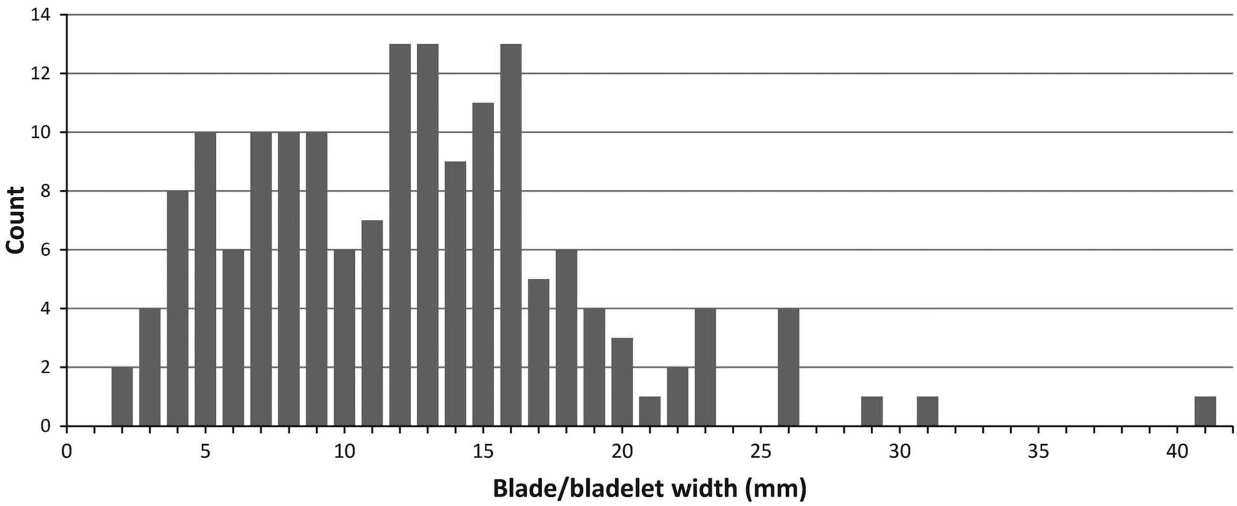

Fig. 7.
Blade/bladelet widths to the nearest millimetre

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A similar adherence to a single method for small bladelet production can also be seen in the unmixed Late Aurignacian assemblages from Maisières Canal (*Atelier de Taille de la Berge Nord-Est* area: Flas *et al.* 2006), Trou Walou layer CI-1 (Liège Province, Belgium; Kozlowski & Sachse-Kozlowska 1993; Flas 2008; 2015; Pirson *et al.* 2012), Gohaud (Loire Atlantique, France: Allard 1978; Dinnis 2011), and Abri Pataud layers 8 and 7 (lower) (Chiotti 2005; Dinnis 2011), with deviations from this method rare and always explicable by reference to the specific material/blank being worked. At Trou du Renard, as at these other sites, the technology of small bladelet production suggests that Aurignacian stone-working took place over a short period of time.

Blanks selected for small bladelet production included large (presumably imported) blades and thick flakes, and in one case a recycled core. In this regard Trou du Renard differs from some other sites at which the carinated/*busqué* burin method was employed, where only large blades/laminar flakes were selected (e.g. Maisières Canal (Flas *et al.* 2006), Abri Pataud 7 [lower] (Dinnis 2009; 2011), Spy Cave (Dinnis 2009; 2011; Flas *et al.* 2013), Gohaud (Dinnis 2009; 2011), and Trou Walou (Kozlowski & Sachse-Kozlowska 1993; Draily 2011)). As considered in detail below, this difference may simply relate to the lack of large flint nodules close to Trou du Renard. Despite this inconsistency of blank type, all were of good quality fine-grained flint. At other Late Aurignacian sites where a variety of raw materials were exploited, finer grained material was similarly preferred for small bladelet production (eg, Spy Cave, Abri Pataud 7 [lower], Paviland Cave, Kents Cavern: Chiotti 2005; Dinnis 2009).

THE WORKED BONE ASSEMBLAGE

As well as a lithic assemblage of *c.* 500 pieces Trou du Renard layer B contained a small number of modified bones and bone tools. According to Otte (1976; 1979, 99–100) the latter group comprises awls (n = 3), *lissoirs* (n = 5), and a burnisher, but it should be noted that these have not been the subject of detailed study to verify the extent of anthropic (rather than taphonomic) modification, and to better understand their manufacture and use. Although common in different Upper Palaeolithic assemblages, we note that an awl has also been recorded in the Late Aurignacian of Trou Walou (layer CI-1; Dewez 1993). In addition, Otte (1979, 100) describes a fragment of ivory rod – an artefact type found at other north-western European Early Upper Palaeolithic sites including Spy Cave, Goyet, Trou Magrite, Grotte de la Princesse Pauline, and Paviland Cave (Otte 1979; Aldhouse-Green 2000). The Trou du Renard assemblage contains no osseous points.

Trou du Renard layer B also yielded 11 bones bearing regular incisions, of which one is also a *lissoir* (Otte 1979, 100). This type of modification is paralleled at other Belgian sites, including Spy Cave and Trou Magrite (Otte 1979). Only one pendant was found – a perforated fox canine (Otte 1976; 1979). Such pendants are common to many Upper Palaeolithic sites, including Aurignacian sites in northern and central Europe and south-west France (Vanhaeren & d'Errico 2006). In Belgium, pierced fox canines are known from Spy Cave and Goyet (Otte 1979).

DISCUSSION

Trou du Renard and the north-western European Early Upper Palaeolithic

The archaeological assemblage from layer B at Trou du Renard is best described as Late Aurignacian with carinated/*busqué* burins, a conclusion broadly in agreement with Otte (1976). Artefacts and technological behaviours more typical of earlier Aurignacian phases (large, straight Dufour bladelets, large carinates, blades bearing heavy 'Aurignacian' retouch, intricate platform preparation) are absent. Like other Aurignacian sites (eg, Maisières Canal, Trou Walou, Kents Cavern, Trou Magrite), in its typological content and approach to stone-working Trou du Renard is very different from LRJ assemblages. It is similarly distinct from the region's earliest known Mid-Upper Palaeolithic industry – the Maisierian. Trou du Renard layer B therefore accords with the recent consensus that these three assemblage types are unrelated.

The similarity of the Trou du Renard Aurignacian to carinated/*busqué* burin assemblages further south in western Europe – including those from the French sites of Le Flageolet I layer IX (Lucas 1997), Abri Pataud layer 7 [lower] (Chiotti 2003), Roc-de-Combe layer 6, Caminade-Est layer D2, and Combemenue (Bordes 2005; Michel 2010) – is striking. Blades were produced from single platform cores via direct soft-hammer percussion, and the carinated/*busqué* method of small bladelet production used is consistent in its technological details. The small bladelets produced are

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impressively alike. This is especially true of the Dufour bladelets of Roc-de-Combe sub-type – 1–2 cm in length, curved, twisted anti-clockwise and bearing delicate ventral retouch ordinarily on their right edge.

This technological and typological unity between the north and south of western Europe contrasts markedly with the periods immediately prior to and following the Aurignacian. Before the Aurignacian, the LRJ of northern Europe and the Châtelperronian of central/southern France and northern Spain show profound technological and typological differences (Jacobi 2007; Flas 2008; 2014; Bachellerie 2011; Roussel 2011), despite the fact that chronological data and the lack of geographical overlap between the two technocomplexes suggests that they were (at least broadly) contemporary (Jacobi 2007; Cooper *et al.* 2012; Flas 2014; Talamo *et al.* 2012; Roussel 2014). Similarly, following the Aurignacian, the onset of the Mid-Upper Palaeolithic saw the appearance of several technologically and typologically distinct assemblage types, including the Maisierian of north-west Europe (Pesesse & Flas 2012) and the Bayacian/Early Gravettian farther south (Pesesse 2010). During the Late Aurignacian there is no such north–south distinction.

How should we interpret the archaeological similarity at this time? The large-scale circulation of lithic material in central/southern France suggests Late Aurignacian ranges were up to *c.* 300/400 km across; however, the lack of southern French flint identified north of the southern limit of the Paris basin, as well as the current absence of northern European flint recognised in southern France (Bordes *et al.* 2005; Caux 2015), suggest that ranges did not systematically include both Belgium and southern France. Archaeological similarities are therefore unlikely to reflect a single group exploiting both areas, but instead probably reflect different groups within a wider network with shared subsistence strategies and cultural traditions. Archaeological evidence certainly shows that similar tasks were routinely undertaken in both regions, making use of the same technologies.

One important aspect of the Trou du Renard layer B assemblage is that it is apparently unmixed. Despite the obvious raw material constraints, a single method for small bladelet production was faithfully adhered to, indicating that only one period of activity is represented. The assemblage may therefore be the product of a single visit, or a few visits by members of a single group. There is certainly no reason to conclude that the assemblage accumulated over the course of many decades.

This technological consistency at Trou du Renard has implications for other Belgian assemblages. In the three largest Aurignacian collections – from Spy Cave, Goyet, and Trou Magrite – multiple approaches to small bladelet production are apparent, reflected in the presence of carinated/*busqué* burins, Vachons burins, Paviland burins, and nosed/carinated scrapers (Otte 1979; Flas 2008; Dinnis 2011; Flas *et al.* 2013). The collections from all three sites also contain artefacts more typical of earlier Aurignacian assemblages. Two Aurignacian layers were recorded during early excavations at Trou Magrite, but no stratigraphy of different Aurignacian layers was recorded at Spy Cave or Goyet (Otte 1979; Flas *et al.* 2013). Opinion has differed as to whether the assemblages at these sites are mixed (eg, de Sonneville-Bordes 1961; Otte 1979; Flas 2008; Flas *et al.* 2013; Dinnis 2015). The evidence from Trou du Renard supports suggestions that these larger and technologically less uniform Belgian assemblages are mixtures from multiple Aurignacian occupations, possibly encompassing a long period of time (*sensu* Flas *et al.* 2013).

Trou du Renard: site function

In contrast to the prevalence of pieces relating to the uniform production of small bladelets, the remainder of the Trou du Renard lithic assemblage is made up of only a few makeshift tools. Production of small bladelets, including Dufour bladelets, was evidently the site's main flint-knapping activity.

Given their size these bladelets are usually seen as constituent parts of a composite technology, and probably as barbs in a hunting kit (Chazan 2001; Hays & Lucas 2001; Teyssandier *et al.* 2010), although evidence to corroborate this has proved frustratingly difficult to come by. No comparable implements have been documented ethnographically (Hays & Lucas 2001, 109), and no analogous lithic pieces have been found in an archaeological context that reveals their hafted arrangement (unlike for lithic barbs in later periods: see Pétillon *et al.* 2011). Establishing Dufour bladelet function has instead relied on micro-wear and breakage pattern studies, which, despite mixed results, have concluded that many examples were hafted laterally with their inversely retouched edge against the shaft of a spear or javelin (Hays & Lucas 2001; Broglio *et al.* 2005; O'Farrell 2005; Normand *et al.* 2009, but see discussion by Normand and colleagues).

With the exception of Hays and Lucas (2001) these studies looked at the longer, straighter Dufour bladelets

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of the Proto-Aurignacian, rather than the short and twisted bladelets found at Late Aurignacian sites like Trou du Renard. The difference between these two types deserves some comment. The ventral retouch on both serves to dull and strengthen the edge, but on Proto-Aurignacian examples it also straightens it (Normand *et al.* 2009) whereas on Late Aurignacian types it generally leaves a marked marginal curvature. If hafted laterally, we can therefore presume some difference in the arrangement of each type on the shaft. Hays and Lucas's (2001) experiments with Dufour bladelets comparable to those at Trou du Renard led them to conclude that only the bladelets' proximal ends were hafted, and that this explained the prevalence of proximal fragments at Le Flageolet I (but see Perpère 2000). In this regard their results agreed with Chazan's (2001, 86) prediction that the distal parts of these twisted bladelets may have been designed to break off, thereby inflicting greater damage.

Available evidence therefore indicates that Dufour bladelets were barbs in an Aurignacian hunting kit although, like Normand *et al.* (2009), we do not reach this conclusion with total confidence. More experimental work and use-wear studies on archaeological collections are clearly needed, particularly for Late Aurignacian-type Dufour bladelets. However, accepting this as their function, it follows that the Trou du Renard lithic assemblage primarily documents the manufacture, or perhaps repair, of hunting kit. The six splintered pieces (Table 3, Fig. 4) may be the result of working of hard organic materials, and therefore feasibly relate to the same activity. Viewed in this way the assemblage resembles a short-term hunting camp, where food was taken and damaged javelins renewed or replaced, but where other tasks were few and undertaken with makeshift tools.

On the other hand, the osseous tools described by Otte (1976; 1979) imply a greater range of activities, including those that would be considered 'domestic' (see Tartar *et al.* 2006), and more likely to be undertaken at longer-term camps. This is particularly the case for the *lissoirs* – a tool class thought to relate to hide working (Soressi *et al.* 2013). As suggested, a new study of the Trou du Renard bone industry may help to clarify this apparent contradiction. Unfortunately, long-term Late Aurignacian base-camps cannot be identified in the Belgian record, as the inadequacies of the early excavations at Belgium's larger sites (Spy Cave, Trou Magrite, Goyet) mean that only a few typological elements can identified as Late Aurignacian within their demonstrably mixed assemblages (Flas *et al.* 2013). Distinguishing evidence for longer-term occupations from that for repeated short-term visits is therefore impossible.

The Belgian Aurignacian: chronology

As stated at the outset, the age of the earliest Belgian Aurignacian remains unclear. Very early radiocarbon dates for Trou Magrite (Straus 1995) have no direct association with Aurignacian material from the site (Flas 2008; 2015; Dinnis 2009, 147), and a new date for a probable Early Aurignacian-type split base point from Spy Cave of 32,830 +200/– 190 BP (GrA-32619) is best regarded as a minimum age only (Flas *et al.* 2013). However, the occurrence of split base points at these sites (as well as at Goyet, Trou du Sureau, and Trou Al'Wesse: Otte 1977) does indicate an early Aurignacian presence. To the south, at Geissenklösterle and Abri Pataud, this artefact type dates to at least 33,500 BP (*c.* 38–39,000 cal BP) (Higham *et al.* 2011; 2012), and we see little reason to think that they would be a different age in Belgium.

The age of some Belgian Late Aurignacian sites is similarly unclear. As argued above, none of the radiocarbon dates for Trou du Renard layer B satisfactorily dates the site's Aurignacian occupation. Therefore the best way to establish the age of the Trou du Renard Aurignacian is through comparison with other Belgian sites. Late Aurignacian assemblages from Maisières Canal (*Atelier de Taille de la Berge Nord-Est* area) and Trou Walou (layer CI-1) in particular invite comparison.

The lithic industries from all three sites show the production of blades and bladelets, struck via soft hammer percussion of single platform cores whose shape was regulated by the detachment of neo-crested blades (Flas 2004; 2008). At all three sites, small bladelets were produced using only the carinated/*busqué* burin method. At Maisières Canal, and Trou du Renard some of these were then retouched into Dufour bladelets of the Roc-de-Combe subtype. Given the association of carinated/*busqué* burins and the same Dufour bladelets across western Europe, we can presume that these tools were also created at Trou Walou. As we have argued here for the stratigraphically much more problematic Trou du Renard, there are good reasons to regard the small assemblages from Maisières Canal and Trou Walou as unmixed (Kozlowski & Sachse-Kozlowska 1993; Draily 2011; Miller *et al.* 2004). Given the close resemblance of these three assemblages we argue that all are of a similar age.

Of the three, Maisières Canal is the most securely dated. The humic stratum within which the assemblage was found corresponds to the Huneborg II Interstadial (*c.* 33–32,000 BP = Greenland Interstadial 8?), a correlation supported by a radiocarbon date of 30,780 ± 400 BP (GrN-5690) higher in the sequence (Haesaerts 2004). This age is in agreement with the best dated carinated/*busqué* burin/Roc-de-Combe subtype Dufour bladelet assemblages from France – Abri Pataud layers 7 and 6 – where eight radiocarbon dates lie in the range 33,000 –31,000 BP (Higham *et al.* 2011).

Although well-stratified, the age of the assemblage from Trou Walou is less certain. Radiocarbon dates from the archaeological layer and from over- and under-lying units are given in Table 6. The younger two of the four dates from layer CI-1 have generally been considered unreliable, in light of acknowledged problems with dating humic sediment fractions (Pirson *et al.* 2011b, 201 and references therein; see also Pettitt *et al.* 2003). The remaining two dates are usually regarded as dating the archaeological material to *c.* 30,000 BP (Djindjian *et al.* 2003; Pirson *et al.* 2011b, 204). Highlighting the agreement of these two dates in support of their accuracy, Pirson *et al.* (2011b, 207) recently concluded that the humic layer CI-1 probably corresponds to the Denekamp I interstadial, *c.* 30,000–30,500 BP. These dates can, however, be interpreted differently. The reasons for rejecting layer CI-1's two younger dates are sound, but there is also reason to doubt the two older dates. The samples for both consisted of multiple fragments (bone/charcoal; Table 6), and the risks inherent in 'multiple entity' samples are well known (Pettitt *et al.* 2003). Furthermore, as has been demonstrated by recent re-dating of the lower part of the Abri Pataud sequence (layers 11–14), inaccuracies can be systematic (see Vogel & Waterbolk 1967; Higham *et al.* 2011). The fact that two of the four dates for Trou Walou layer CI-1 are in agreement does not necessarily mean that they accurately date that layer, particularly as the samples dated were less than ideal.

With this in mind we can note the date of 30,460 ± 700 BP (LV-1557) from higher in the stratigraphy (Table 6). Unlike the dates from the underlying layer CI-1 this is from a 'single entity' (and therefore less problematic) sample. Acknowledging its inconsistency with the radiocarbon dates for the layer beneath, Pirson *et al.* (2011b, 201) prefer to reject this date, suggesting that the bone may have been reworked upwards from layer CI-1 itself. Some fragments of speleothem in this overlying unit probably do come from layer CI-1 (Pirson & Draily 2011, 119), but as far as we are aware there is no independent reason to presume that this is the case for this bone.

An alternative interpretation is that LV-1557 accurately dates the unit from which it came, and that all four of the dates for the underlying archaeological layer CI-1 are underestimates (rather than only two of the four). If this is the case, the Trou Walou Aurignacian would be closer in age to that of the more securely dated Maisières Canal (ie, 32–33,000 BP; *c.* 36–37,000 cal BP), with the archaeological humic horizons at both sites feasibly relating to the same interstadial event. Given the well-documented problems of dating material of this age, as well as the similarity of the lithic assemblages from the two sites, we consider this likely.

Trou du Renard, Trou Walou and Maisières Canal: different points in a Late Aurignacian landscape?

Michel (2010) has recently proposed a new chronological scheme for the Late Aurignacian, based on evidence from south-western France. Documented in the stratigraphies of Le Flageolet I and Roc-de-Combe is a shift from the use of blades to less standardised

TABLE 6: RADIOCARBON DATES PERTINENT TO THE AGE OF THE TROU WALOU AURIGNACIAN (FROM PIRSON *et al.* 2011b, 199)

Layer/Unit	*Lab no.*	*Material*	*Date* BP	*Stratigraphic relationship to archaeological assemblage*
C0-C5A	LV-1557	Horse scapula	30,460 ± 700	Overlying archaeological layer
CI-1	GrN-22769	Humic fraction	28,010 ± 340	Archaeological layer
	GrN-22904	Humic fraction	27,760 ± 780/-710	Archaeological layer
	LV-1587	Wood charcoal (multiple pieces)	29,800 ± 760	Archaeological layer
	LV-1592	Bone fragments	29,470 ± 640	Archaeological layer
CI-2 to CI-5	LV-1641	Bone (rib fragments)	33,830 ± 1790	Underlying archaeological layer

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blanks (particularly thick flakes) for carinated/*busqué* burin bladelet cores. With this change, carinated/*busqué* burins were more intensively shaped prior to the debitage of bladelets, and core notching (and thus *busqué* burins) became less prevalent. Alongside this change was an increased use of local (rather than transported) lithic material, and greater prevalence of soft stone (over organic) hammer percussion. Michel refers to this phase as '*burins busqués déstructurés*', and suggests that other French and Belgian assemblages may belong to it, including Trou du Renard.

The Trou du Renard assemblage fits with Michel's description of *burins busqués déstructurés* industries, in that it shows intensive shaping of non-blade blanks for creating carinated/*busqué* burins, and a low prevalence of notching. However, these features are not by themselves chrono-culturally meaningful, and it should be noted that the (potentially more informative) prevalence of soft stone hammer percussion is not seen at Trou du Renard. These features of the Trou du Renard carinated/*busqué* burins, in addition to some differences between those at Trou du Renard, Maisières Canal, and Trou Walou, may instead be explained by the distance of each site from raw material sources.

Maisières Canal lies next to primary sources of large flint nodules, and during the Aurignacian blade cores were created and reduced at the site. Cortical, crested, and broken blades were left behind, and blades and cores taken away (Flas 2004). At Trou Walou at least a part of the assemblage was knapped at the cave – as evidenced by the presence of blade cores and waste products (tablets, crested blades, cortical pieces) – using locally available drift cobbles of Maastrichtian flint. These cobbles were generally smaller in size than those exploited at Maisières Canal (Kozlowski & Sachse-Kozlowska 1993; Draily 2011). As detailed above, Trou du Renard is far from any primary flint source, and apparently saw the import of large, ready-made blades. Smaller blades and bladelets were produced on-site from locally available cobbles and/or material imported in an already partially reduced form. The respective positon of each site in relation to raw material sources is therefore expressed in its technological signature.

Viewing these sites in this way can explain subtle differences in their carinated/*busqué* burin assemblages. Of the 16 Trou du Renard carinated/*busqué* burins, 13 show ventral flaking close to their bladelet debitage areas, thinning the blanks and thereby reducing the bladelet debitage platforms to a desired width (for clear examples see Fig. 5, nos 5 & 7, above). Elsewhere, such cores have been described as '*à tendance Vachons*' (Pesesse & Michel 2006, 151), as they superficially approach the form of Vachons burins. In contrast to Trou du Renard, none of the carinated/*busqué* burins from Maisières Canal and only one from Trou Walou are *à tendance Vachons*, or Vachons-like.

At Maisières Canal, large blades and blade core waste products were chosen for the creation of carinated/*busqué* burins. The site was littered with blanks of different sizes, so we can presume that those with specific thicknesses could be selected, negating the need to modify them with Vachons-like removals. Vachons-like modification at Trou Walou was similarly unnecessary, as carinated/*busqué* burins were made on blades of regular, consistent thickness (Fig. 8, also see figures in Kozlowski & Sachse-Kozlowska 1993). The knappers at Trou du Renard had greater raw material constraints. Careful modification of imperfect blanks is therefore to be expected, in order to bring bladelet cores in line with a preferred norm. Vachons-like removals would be one expression of this. Indeed, as a result of these removals, the width of the bladelet debitage striking platform on an impressive 14 of the 16 carinated/*busqué* burins is between 6 mm and 8 mm.

The Vachons-like appearance of the Trou du Renard carinated burins may thus be of no chronological or cultural significance. It may instead reflect a desire to produce bladelets of very specific size and morphology. This explanation finds support in the carinated/*busqué* burin assemblage from level 7 (lower) at Abri Pataud. There, Vachons-like removals were commonly used when the sometimes problematic local raw material was being worked, but not when more regular blanks of imported material were used (Dinnis 2011, 14; see also Chiotti 2005).

This line of reasoning can also explain another difference between the Trou du Renard, Trou Walou and Maisières Canal carinated/*busqué* burins. At Maisières Canal they have clear and sometimes pronounced notches, thus warranting their typological allocation as *busqué* burins (Fig. 8; see also Fig. 1, above). At Trou du Renard, only three of the 16 carinated burins are *busqué* (Table 3; Fig. 5, above). Some 'notch' retouching is evident on the Trou Walou carinated burins, although this is less invasive than on those from Maisières Canal (Fig. 8).

As can be seen in Figure 9, the blanks chosen for carinated/*busqué* burins at Maisières Canal were wider than those selected at Trou du Renard and Trou

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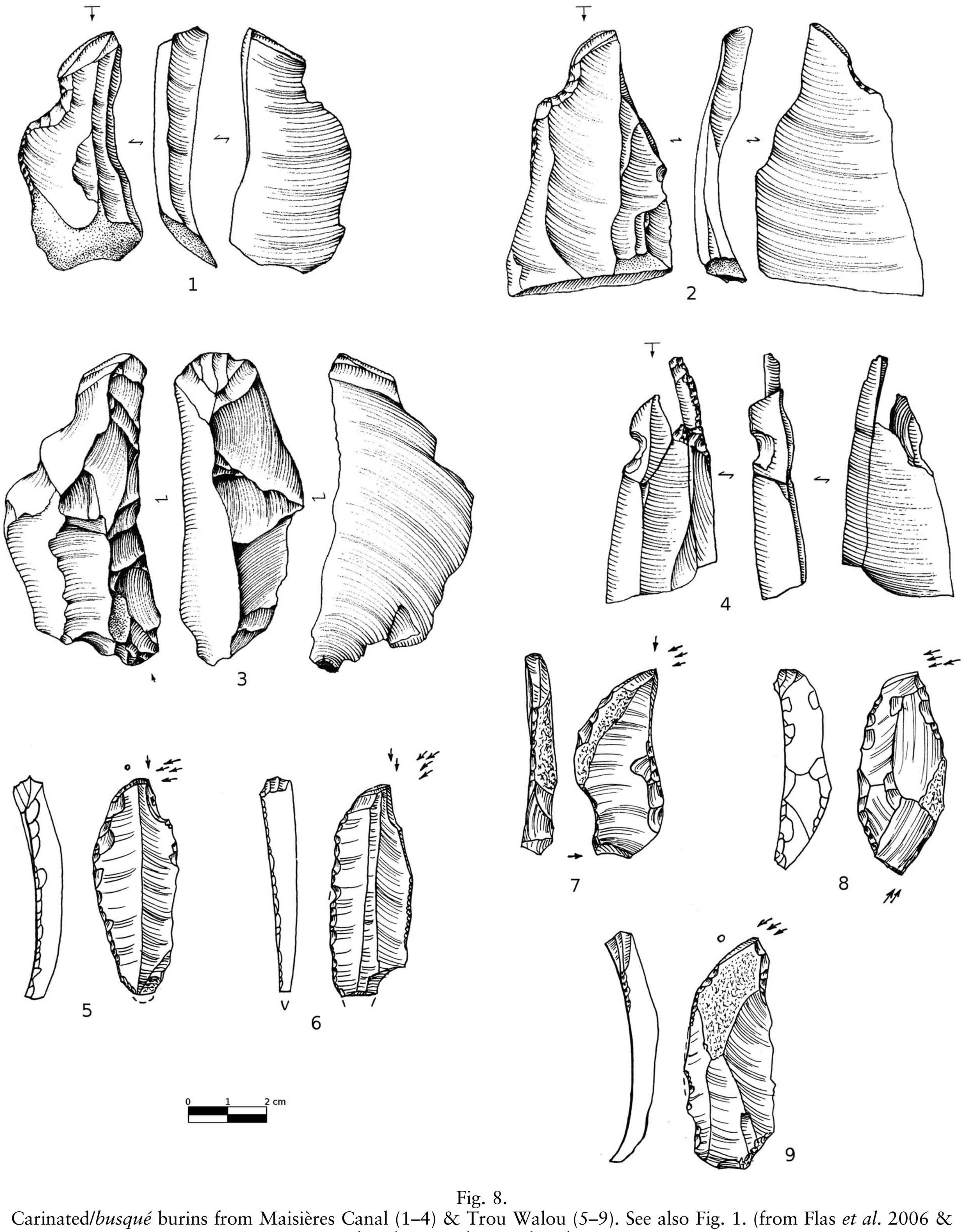

Fig. 8.
Carinated/*busqué* burins from Maisières Canal (1–4) & Trou Walou (5–9). See also Fig. 1. (from Flas *et al*. 2006 & Kozlowski & Sachse-Kozlowska 1993)

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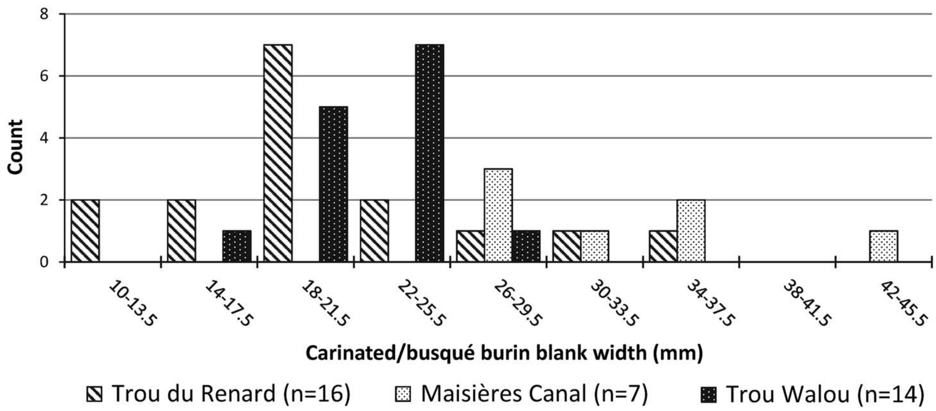

Fig. 9.
Maximum width measurements for carinated/*busqué* burin bladelet cores from Trou du Renard, Maisières Canal, & Trou Walou (data from Trou du Renard & Maisières Canal collected by the authors; data from Trou Walou calculated from illustrations in Kozlowski & Sachse-Kozlowska (1993) & Draily (2011)

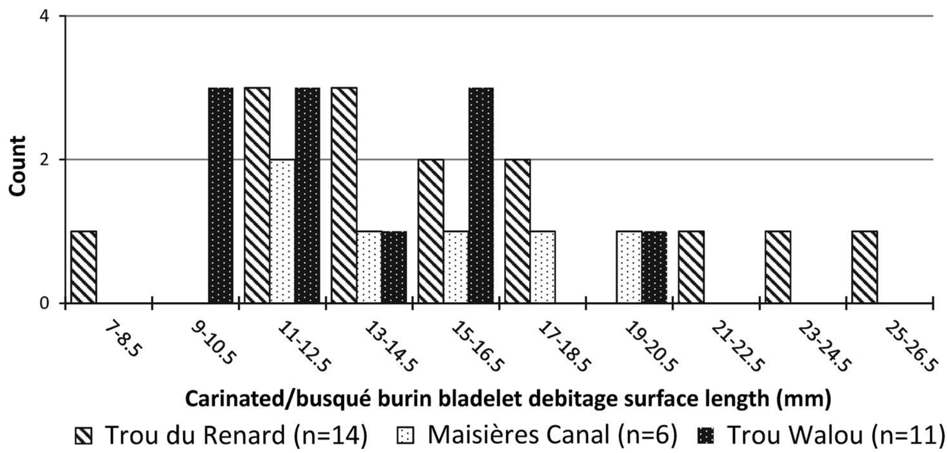

Fig. 10.
Length of the bladelet debitage surface of carinated/*busqué* burin bladelet cores from Trou du Renard, Maisières Canal, & Trou Walou. Two cores from Trou du Renard & one from Maisières Canal were excluded as their bladelet debitage surfaces had been altered prior to discard. Three cores from Trou Walou were excluded as it was impossible to determine their bladelet debitage surface lengths (data from Trou du Renard & Maisières Canal collected by the authors; data from Trou Walou from primary data supplemented by calculations from illustrations in Kozlowski & Sachse-Kozlowska (1993) & Draily (2011)). Note the similarity of bladelet debitage surface lengths despite the difference in width of the blanks (Fig. 9)

Walou. For carinated burins, blank width is the major determinant of the length of bladelets produced. One may therefore expect longer bladelet debitage surfaces at Maisières Canal than at Trou Walou and Trou du Renard. However, as Figure 10 shows, the length of bladelet debitage surfaces at all three sites is the same. The reason is the deep notching of the Maisières Canal *busqué* burins, truncating the blanks' widths and therefore the bladelet debitage surface lengths. This brought them into line with the bladelet debitage surfaces of carinated burins at Trou du Renard and Trou Walou, where narrower blanks meant that notching was unnecessary. The result is minimal difference in the size of the bladelets produced (Fig. 11).

The pursuit of highly standardised bladelets has previously been noted as a feature within Aurignacian assemblages elsewhere (eg, Chazan 2001; Hays &

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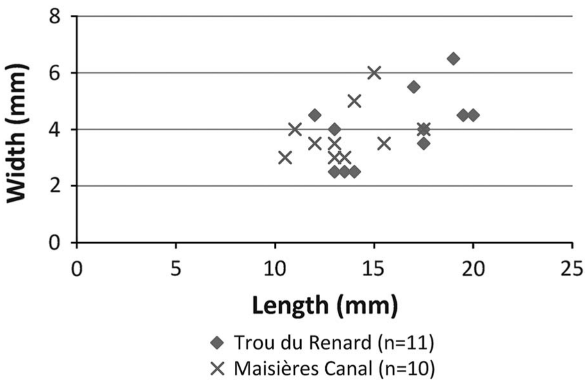

Fig. 11.
Width and length measurements (to nearest 0.5 mm) for complete bladelets coming from carinated/*busqué* burin cores from Trou du Renard & Maisières Canal (no comparable data is available for Trou Walou)

Lucas 2001; Bordes 2005; Normand *et al.* 2009). One would expect this standardisation to extend beyond single sites, should different locales have been occupied by the same individuals and groups creating and renewing equipment with the same tried, tested and trusted constituent parts.

Such a scenario would explain the archaeological signatures at Trou du Renard, Maisières Canal and Trou Walou. Familiar techniques were used to create blades and bladelets. Blades were transported away from areas where flint was readily available, to be used at those where a shortfall could be expected. Small bladelets of very specific size and morphology were regularly created in order that hunting apparatus could be maintained. This was carried out using a single technique, but with a level of flexibility sufficient to achieve strict morphological standardisation irrespective of the blanks available at the time.

CONCLUSIONS

The lithic assemblage from layer B of Trou du Renard includes Dufour bladelets of Roc-de-Combe subtype and their parent carinated/*busqué* burin bladelet cores, and is therefore well-described as Late Aurignacian. Given its similarity to the well-dated Late Aurignacian assemblage from Maisières Canal we argue that both date to *c.* 32–33,000 BP (*c.* 36–37,000 cal BP), an argument also made for the Late Aurignacian assemblage from Trou Walou layer CI-1. In marked contrast to the record for the periods prior to and following the Aurignacian, the typological and technological profile of these three assemblages closely resemble Late Aurignacian assemblages from further south in western Europe. This similarity probably reflects the presence of a north–south network of groups with shared subsistence strategies and cultural traditions, routinely undertaking similar tasks using the same technologies.

Artefacts and technological behaviours characteristic of other periods of the Upper Palaeolithic and other phases of the Aurignacian are absent, and the technology of blade and (in particular) small bladelet production is consistent. This indicates that the Trou du Renard layer B assemblage is unmixed, and thus supports the proposition that greater techno-typological diversity in other Belgian Aurignacian cave assemblages reflects, at least in part, different episodes of Aurignacian activity. At Spy Cave and Goyet this probably included occupation(s) that significantly pre-dated the Trou du Renard Aurignacian.

Trou du Renard's Aurignacian lithic assemblage documents a limited range of activities, of which the most notable is the production of bladelets 10–20 mm in length, including those subsequently modified into Dufour bladelets. Late Aurignacian knappers clearly regulated the size and shape of these pieces. Here we have proposed that the combination of raw material constraints and this desire for standardisation adequately explains differences in bladelet cores from Trou du Renard, Maisières Canal, and Trou Walou.

Although studies have not been entirely conclusive, Dufour bladelets are generally understood as barbs hafted laterally onto spears or javelins. Trou du Renard may therefore be interpreted as a short-term hunting camp, although this is potentially contradicted by Otte's (1976; 1979) study of the worked bone assemblage. A more detailed study of the Trou du Renard bone industry may help to shed light on this apparent discrepancy, as would further efforts to more conclusively establish the function of Late Aurignacian-type Dufour bladelets.

Endnotes

[1] Following Campbell (1980) and Pesesse and Flas (2012) we classify the earliest known Mid-Upper Palaeolithic material from Belgium as 'Maisierian', in order to stress its difference from the Early Gravettian.

[2] For curatorial reasons we have been unable to illustrate these pieces. Two of them were figured by Otte (1976, 131, nos 59 & 60) and were (rightly) described by him as '*enlèvements de burins carénés ou busqués*'.

[3] The term 'neo-crested blade' refers to a crested blade created during the debitage process, as opposed to at the beginning of the process in order to 'open' the core (Pelegrin 1986).

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RÉSUMÉ

Trou du Renard et l'Aurignacien belge, de Rob Dinnis & Damien Flas

Une multitude de sites de grottes font du sud de la Belgique la zone la plus importante si on veut comprendre le paléolithique supérieur ancien du nord-ouest de Europe. Toutefois, malgré leur abondance, l'interprétation de nombreux assemblages reste problématique. Nous présentons ici une nouvelle étude du matériel lithique de la couche B du Trou du Renard (Furfooz, Province de Namur) et examinons sa place dans l'Aurignacien belge. L'assemblage est charactéristique de l'Aurignacien rècent présents à travers l'Europe occidentale, soulignant le contraste entre l'Aurignacien et les périodes qui l'ont précédé et suivi, lors desquelles on constate de profondes différences entre le nord et le sud. L'assemblage est apparemment sans mélange, ce qui distingue Trou du Renard d'autres importants sites de grottes de l'Aurignacien belge. Une forte proportion de l'assemblage lithique du site montre la production de petites lamelles à partir de nucleus de type burin caréné/busqué, ce qui donne à penser que Trou du Renard a servi de campement de chasse de courte durée. La datation au C14 ne permet pas de déterminer l'âge de l'assemblage, cependant nous proposons ici qu'il se situe vers environ 32–33,000 BP (*c* 36–37,000 cal BP) sur la base de sa similarité avec l'assemblage Aurignacien clairement daté de Maisières Canal (Atelier de Taille de la zone de la Berge Nord-Est). Pour la même raison, nous argumentons qu'un troisième assemblage,Trou Walou couche CI-1, est aussi contemporain. Trou du Renard, Maisières Canal et Trou Walou représentent peut-être trois points dans le même paysage de l'Aurignacien rècent. Les différences entre leurs assemblages lithiques peuvent s'expliquer par l'acquisition et le transport de silex, et par un désir de produire de petites lamelles de forme hautement standarsisée quelles que soient les dimensions et la forme des supports disponibles.

ZUSSAMENFASSUNG

Trou du Renard und das Belgische Aurignacien, von Rob Dinnis & Damien Flas

Eine Vielzahl von Höhlenfundorten macht das südliche Belgien zur wichtigsten Region für das Verständnis des Jungpaläolithikums in Nordwesteuropa. Doch trotz ihrer großen Zahl bleibt die Interpretation von vielen Fundensembles problematisch. In diesem Beitrag stellen wir eine neue Untersuchung des lithischen Materials aus Schicht B aus Trou du Renard (Furfooz, Provinz Namur) vor und erörtern seine Stellung innerhalb des belgischen Aurignacien. Das Ensemble ist typisch für Fundensembles des späten Aurignaciens, wie sie überall in Westeuropa gefunden wurden, und unterstreicht den Gegensatz von Aurignacien und den vorhergehenden und nachfolgenden Perioden, während wir tiefgreifende Unterschiede zwischen Nord und Süd sehen. Das Ensemble scheint nicht vermischt zu sein, was Trou de Renard von anderen wichtigen Höhlenfundplätzen des belgischen Aurignacien unterscheidet. Ein großer Anteil des lithischen Materials des Fundplatzes verweist auf die Herstellung von kleinen Klingen aus Kielstichel-/Bogenstichelkernen, was nahelegt, dass Trou de Renard als kurzzeitiges Jagdlager diente. Radiokarbondaten können das Alter des Ensembles nicht enger eingrenzen, aber wir sprechen uns für eine Zeitstellung *ca.* 32–33.000 BP aus (*ca.* 36–37.000 cal BP) auf der Basis seiner Ähnlichkeit mit dem gut datierten Aurignacien-Ensemble von Maisières Canal (Atelier de Taille de la Berge Nord-Est). Aus dem gleichen Grund wird auch für ein drittes Ensemble – Trou Walou Schicht CI-1 – eine zeitgleiche Datierung angenommen. Trou du Renard, Maisières Canal und Trou Walou könnten demnach drei Punkte innerhalb derselben Spätaurignacien-Landschaft darstellen. Unterschiede in ihren lithischen Ensembles können mit dem Erwerb und Transport von Feuerstein erklärt werden sowie mit dem Ziel kleine Klingen hoch standardisierter Form zu produzieren, unabhängig von der Größe und Form der verfügbaren Rohstücke.

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RESUMEN

Trou du Renard y el Auriñaciense belga, por Rob Dinnis y Damien Flas

La riqueza de yacimientos en cueva hacen del sur del Bélgica una de las áreas más importantes para la comprensión del Paleolítico Superior inicial del noroeste de Europa. Sin embargo, a pesar de su abundancia, la interpretación de muchos conjuntos arqueológicos es problemática. Aquí se presenta un nuevo estudio del material lítico documentado en el nivel B de la Trou du Renard (Furfooz, Provincia Namur) y se considera su posición dentro del Auriñaciense belga. El conjunto arqueológico presenta los rasgos típicos de los Auriñaciense tarde a lo largo del oeste de Europa, subrayando el contraste entre el Auriñaciense y los períodos previos y posteriores, en los que se observan fuertes contrastes entre el norte y el sur. El conjunto está aparentemente intacto, lo que permite distinguir el conjunto de Trou du Renard de otros yacimientos en cueva clave para el Auriñaciense belga. Una gran proporción del conjunto lítico está orientado a la producción de laminillas a partir de núcleos-buriles carenados y busqués, lo que sugiere que la Trou du Renard sirvió como campamento de caza de corta duración. Las dataciones de radiocarbono no permiten precisar la edad del conjunto, aunque en base a la similitud con los conjuntos bien datados del Auriñaciense de Maisières Canal (Atelier de Taille de la Bege, área noroeste) se puede situar entre el 32 y 33.000 BP (*c*. 36–37.000 cal BP). Por la misma razón, un tercer conjunto – Trou Walou nivel CI-1 –se considera coetáneo. Trou du Renard, Maisières Canal yTrou Walou podrían representar tres puntos del mismo paisaje del Auriñaciense tarde. Las diferencias en sus conjuntos líticos se pueden explicar por la adquisición y transporte del sílex y por la intención de producir pequeñas hojitas altamente estandarizadas sin importar el tamaño y la forma de los soportes disponibles.