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LA GROTTE DU BOIS LAITERIE: THE SITE, STRATIGRAPHY, CHRONOLOGY AND EXCAVATION

L.G. Straus

Site Location

La Grotte du Bois Laiterie is one of a number of karstic caves developed in a small steeply tilted outcrop of Carboniferous limestone on the northern flank of the Sept Meuses hill in the Rivière village of Profondeville Township (Namur Province, Wallonia, Belgium). The Sept Meuses hill is part of a highly complex succession of convoluted geological synclines and anticlines in the Ardennes Piedmont, between the cities of Namur and Dinant. This region of (for Belgium) relatively high relief, with alternating Devonian metamorphics and Carboniferous limestones, is transected by the Meuse River, whose valley becomes increasingly entrenched and eventually canyon-like as one moves upstream from its great southward bend and confluence with the Sambre River at Namur. The Sept Meuses hill (from which, on a clear day, one is said to be able to see seven meanders of the Meuse) is, at 260 m a.s.l., one of the highest elevations in this region of north-central Wallonia, 25 km from the French border at Givet (Photo 1). (By comparison, the highest elevations in the Ardennes Plateau itself are generally no greater than 500-600 m a.s.l. and the level of the Meuse adjacent to Bois Laiterie is only 85 m a.s.l., which gives an idea of the steepness of the local relief around Bois Laiterie.) The Meuse is the principal avenue of communication between the eastern Low Countries and north-central France, a fact for which the region's inhabitants have had to pay dearly during the two world wars (and many times before, during the bloody history of this part of Europe - and for which reason Namur, Dinant and Givet are all fortress cities) (Fig.1).

The Sept Meuses hill lies within 15 km of the end of the south-north stretch of the Belgian Meuse, which flanks the western edge of the Ardennes and which at Namur is joined by the Sambre to flow eastward along the Sambre-Meuse trench, the northern limit of the Belgian uplands. The southern face of the Sept Meuses hill has been eroded into a 150 m vertical cliff by a major meander of the Meuse. Bois Laiterie is on the northern, more gradually sloping flank of the Sept Meuses hill, which is abruptly cut by the gorge of the Burnot stream (Fig.2; Photo 2). This west-east running stream descends from the 240-250 m-high Sambre-Meuse interfluve plateau and, over the course of its last 3 km, has dug a very narrow, steep-sided canyon as it cuts down to the Meuse. The Burnot is one of relatively few streams upstream of Namur City that affords relatively easy access to the plateau of western Namur Province and on toward Hainaut from the upper Meuse valley. The road which runs along the Burnot valley floor from Rivière to Charleroi is surprisingly busy despite its small size.

La Grotte du Bois Laiterie is at an elevation of c. 120 m a.s.l. and about 35 m. above the present (artificially high) level of the Meuse at its confluence with the Burnot, 500 m from the site. The lower cave mouth, which is the location of the Magdalenian site, faces due North

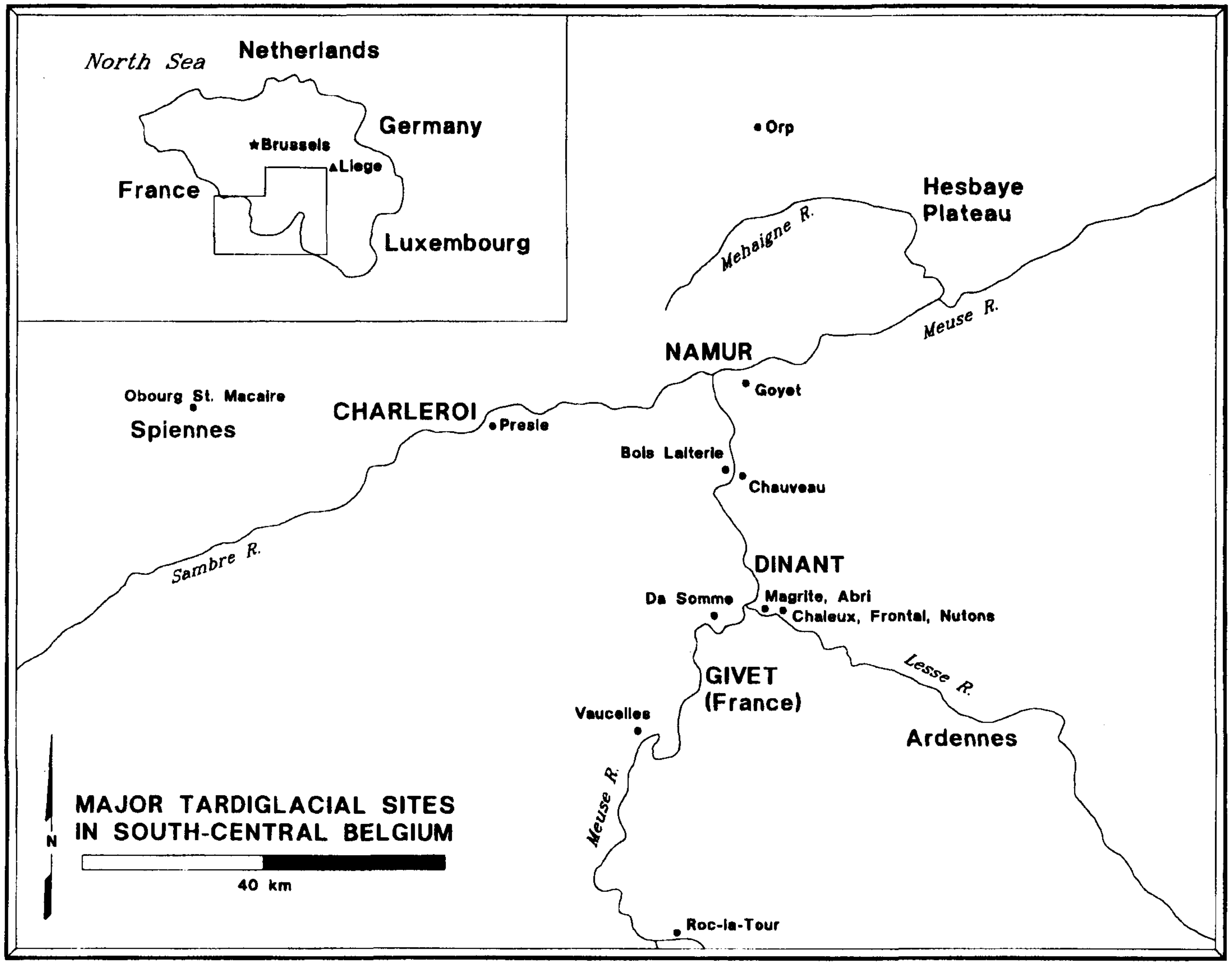

Fig. 1 - Major Tardiglacial Sites in South-Central Belgium

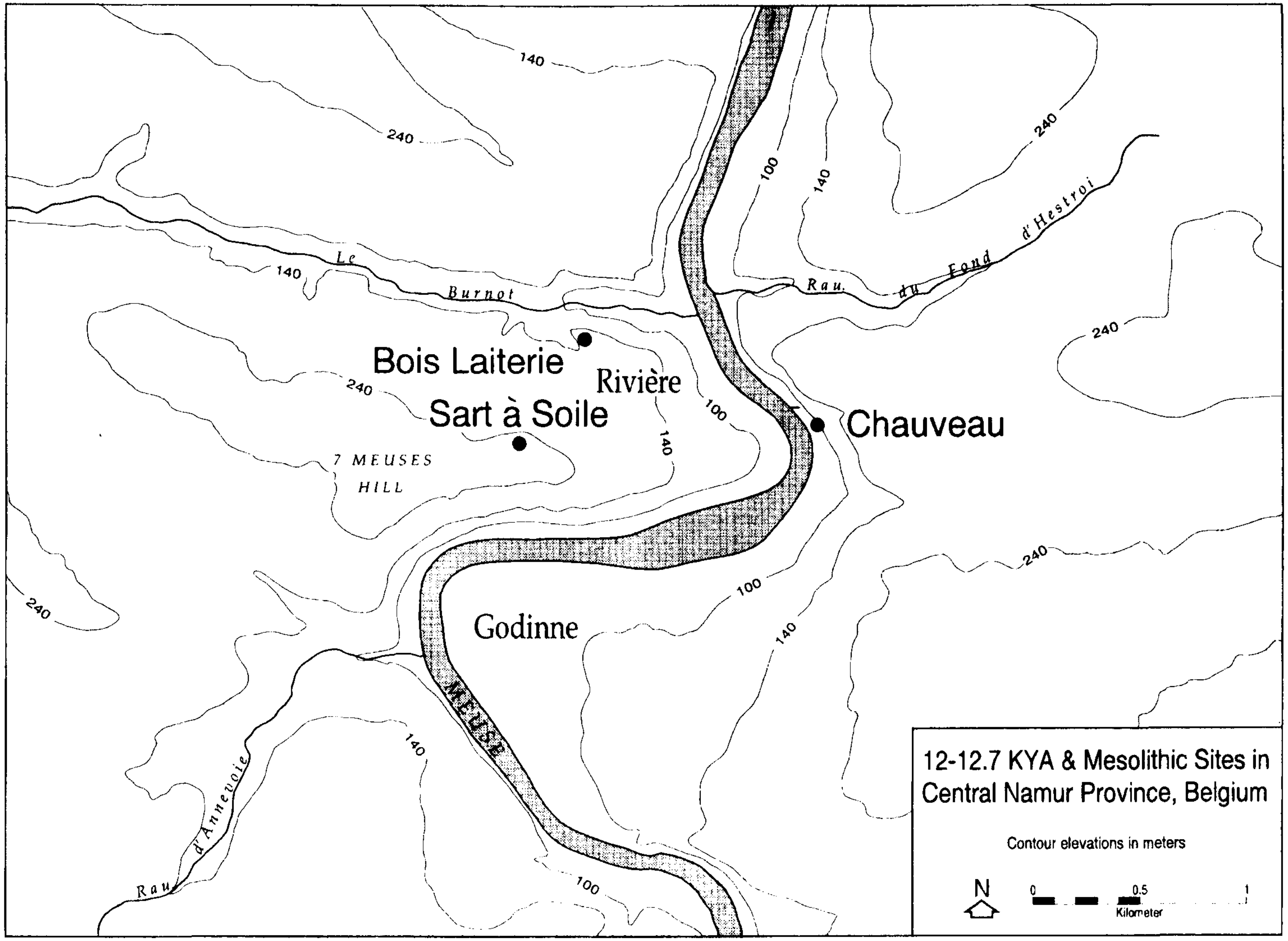

Fig.2 - Location of Bois Laiterie and Chauveau Caves

and dominates the Burnot gorge at its narrowest point, right above the confluence. Although not so readily apparent under today's densely wooded conditions, the cave would have had a dominant, commanding view of the Burnot gorge, the floor of which is a steep, but quick scramble from the site (and a rigorous, but short climb back up).

Exactly opposite the Sept Meuses hill, on the right (east) bank of the Meuse, 1,250 m ESE of Bois Laiterie, is the Grotte de Chauveau, which faces due west and is situated only a few meters above the river. This small cave recently yielded a small lithic assemblage radiocarbon dated to 12,000 ± 130 BP and attributed to the Magdalenian or Creswellian (Toussaint *et al.*,1993). A Chaleux-type double micro-perforator is present. Chauveau also has a microlithic trapeze-dominated Mesolithic component (with triangles and other microlithic weapon elements) dated to 7,350 ± 75 BP (uncalibrated). Via the Burnot valley and over the Meuse-Sambre interfluve, en route to the flint sources in eastern Hainaut, the cave sites of Presles are located in the Sambre valley, c. 22 km west of Bois Laiterie. One of the two radiocarbon dates from the cultural deposit in Trou de l'Ossuaire is 12,140 ± 160 BP. The associated cultural materials have been called «Creswellian» (Léotard and Otte,1988), but it is likely that there is a mixture of materials here (including typical late Magdalenian artifacts such as Lacan burins). There is also a radiocarbon date of 10,950 ± 200 BP whose association is unclear (Charles,1994). Another such site with problematical cultural attribution («Creswellian» or Magdalenian), Obourg-St.Macaire, is located near the Spiennes flint source, 42 km further west beyond Presles (Létocart,1970). It is undated, but has some truncation burins with a Magdalenian «aspect». Finally, Bois Laiterie Cave is very near the little-known, but very rich Mesolithic open-air site of Sarts-à-Soile, which is located near the summit of the Sept Meuses hill. Said to have produced large numbers of circle segment microliths, some trapezes and invasively retouched arrowheads, this site is attributed by Rozoy (1978 and pers.comm.) to the Late Mesolithic.

Site Characteristics

As noted above, the eastern face of the Bois Laiterie ridge which extends northward from the Sept Meuses hill is heavily faulted and caves form along the diaclases all of which seem to tilt down toward the North at about 30 degrees. Such is the case of Bois Laiterie cave *per se*. It opens out onto a small cliff-face and actually has two mouths (Photo 3). The upper mouth, some 4-5 m higher up on the slope near the top of the little cliff and about 7-10 m further west, is a jagged-edged crevice filled with a number of large blocs which, since they are still in place (not yet having rolled down the steep talus slope) and unweathered, may be indicators of a relatively recent opening of this upper mouth. At any rate, there are no sediments - only bare and extremely steeply sloping bedrock - in this upper cave, which is separated from the lower cave by a «bench» in the bedrock floor (no doubt following a joint in the limestone). Thus, what concerns us here is only the lower cave. It is highly unlikely that there could have been significant (if any) human occupation of the upper mouth for lack of any flat space.

The lower cave (hereafter simply referred to as «the cave» or «BL») is at the base of the little cliff. It has a mouth which at its inner, most restricted point is at most 4 m wide, opening up to 7 m wide at its outermost part along the cliffline. The top of the cave mouth is

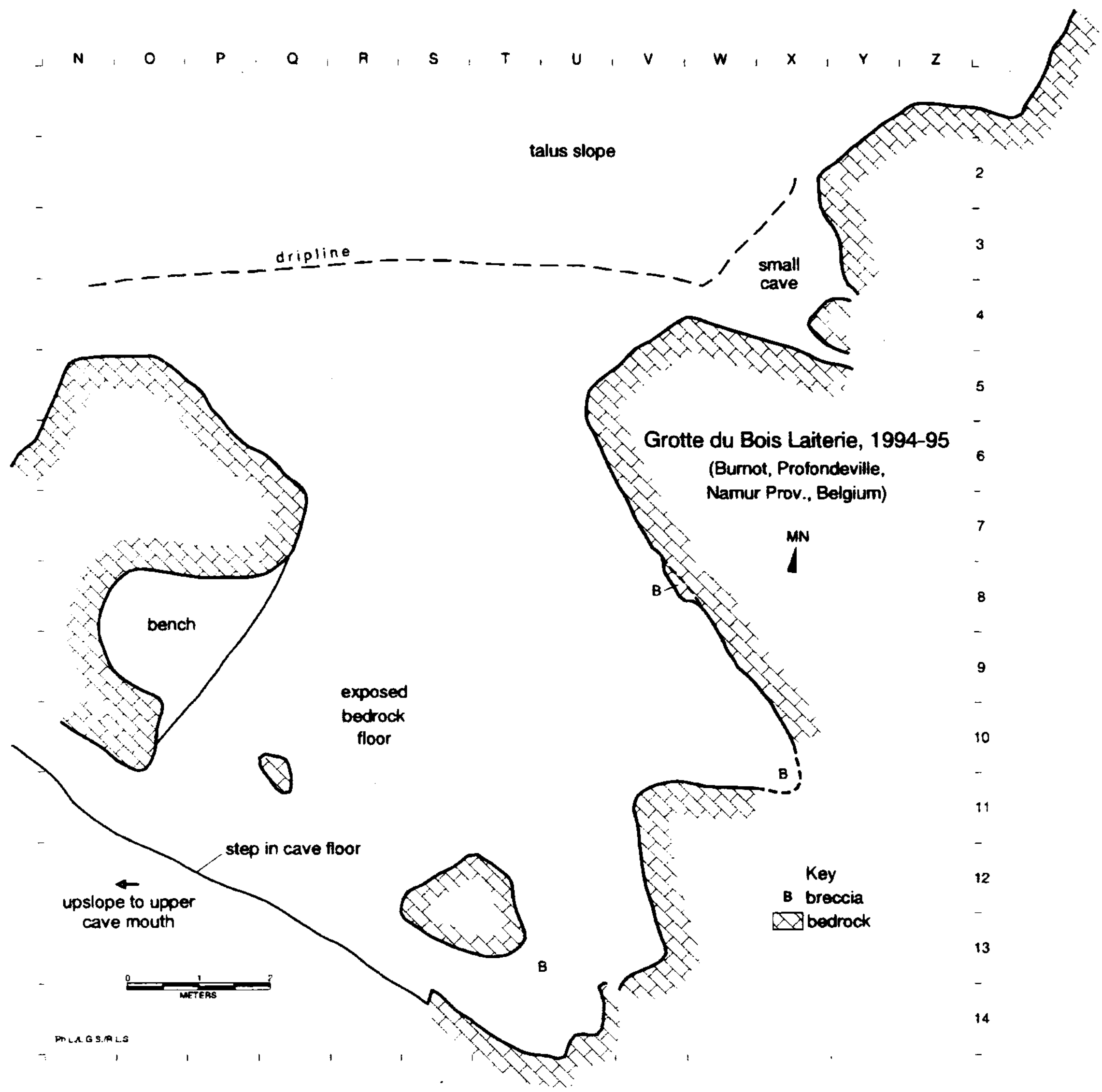

Fig.3 - Plan of Bois Laiterie, Lower Cave

smoothly, symmetrically curved; both it and the sides of the mouth are heavily weathered (Photo 4). Height of the cave mouth above the top of the Magdalenian horizon would have been c. 2,5 m. The lower cave area is maximally c.45 m^2, some of which is very high up the bedrock slope toward the upper cave (west). In addition there are some 13 m^2 of area in front of the cave mouth but under the present overhang and another c. 3 m^2 of useable space at the front of a small parallel cave entrance to the East of the lower mouth (Fig.3). So, altogether the sheltered site area (lower cave, small cave and area under the cliff overhang) totals about 60 m^2. However it is unlikely that c. 10 m^2 of the lower cave area furthest upslope toward the upper cave would or could have been used for habitation, due to the steepness of the bedrock floor, leaving a total area of about 50 m^2 (we found no artifacts stuck to or in cracks in the bedrock floor to the west of the «R» row of squares). On the other hand, it is likely that the overhang may have extended somewhat further northward at 12,600 years ago than today, and that there was a somewhat wider useable terrace during Bölling times than now. In any event, this is and always was a very small site.

In addition, it is a distinctly uncomfortable site. Besides the steep bedrock slope and the due north orientation (which at 50° 22' N latitude means that this is a cave with very little sunlight), BL is draughty. A continuous breeze descends from the upper mouth to the lower mouth. Even if the upper mouth did not exist in its present form during Bölling times, certainly its beginnings (a crack or small opening in the cliff-face) must have already existed and the draught with it. The cumulative effect of the northern exposure and the draught is to make BL a very cold, rather unpleasant cave - except during the hottest days of summer, when it is a cool spot in which to be excavating. It is hard to conceive of spending much if any time in this cave during the long Belgian winters - especially before Belgium had a North Sea coast with its moderating climatic effects.

Furthermore, the microtopography of the lower cave, with its steep bedrock floor, is such that a strip of only about 2-3 m wide, paralleling the eastern (downslope) wall, would really have been fairly flat by the end of the deposition of the Magdalenian-age sediments - and less at its inception (Figs.4-13). When Magdalenian people first used BL they would have found a narrow band of reddish clay or sand filling the bottom of an asymmetrical V-shaped «gully» in the bedrock formed by the eastern wall and the cave floor. They would have set up camp atop this «gully» fill and the lowest, adjacent area of bedrock floor, using psammite plaquettes to deal with the puddles and muddy spots along this band of wet basal sediments, such that, between the paved area and the bedrock, they had at least some more-or-less dry surface on which to live. But it was far from extensive and the only decently lit area would have been the front of the cave and overhang-covered terrace area.

The only advantageous aspect of this cave for Paleolithic hunter-gatherers - and it must have been a significant one - is its location dominating the confluence of the Burnot gorge with the Meuse valley. In short, BL is at a strategic location controlling a key passageway for game moving between the Meuse valley and the Meuse-Sambre interfluve plateau. In addition, under Bölling conditions, this north-facing slope was probably still treeless, though the south-facing slope opposite BL may have been covered with trees and shrubs. So, in order to have a view, a north-facing slope (despite the cold) would have been important. Humans did not go to Bois Laiterie Cave for comfort or commodity. They must have gone their for a purpose and this is what we must explore and elucidate.

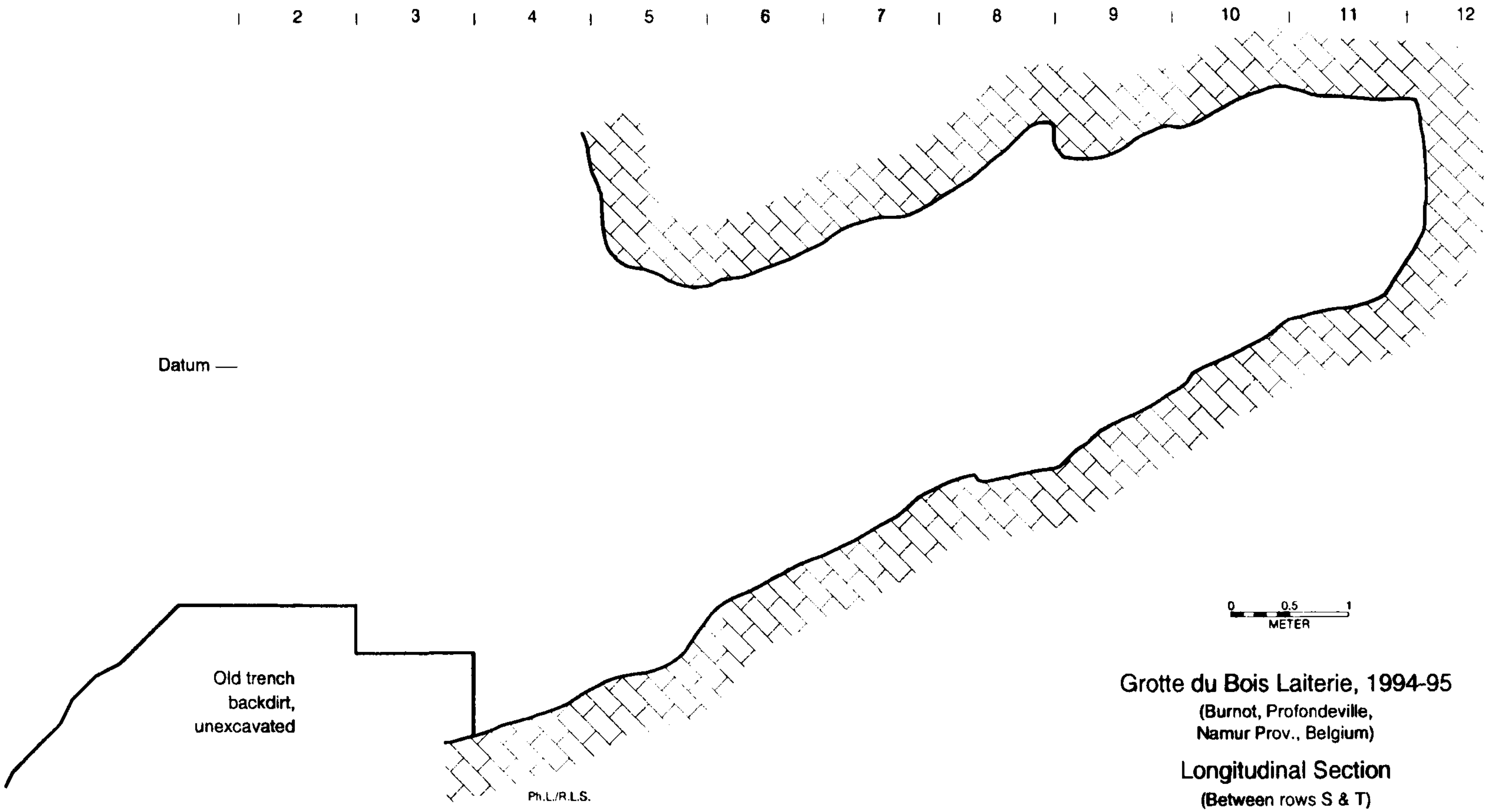

Fig.4 - Bois Laiterie Cave, Longitudinal (N-S) section, S / T rows.

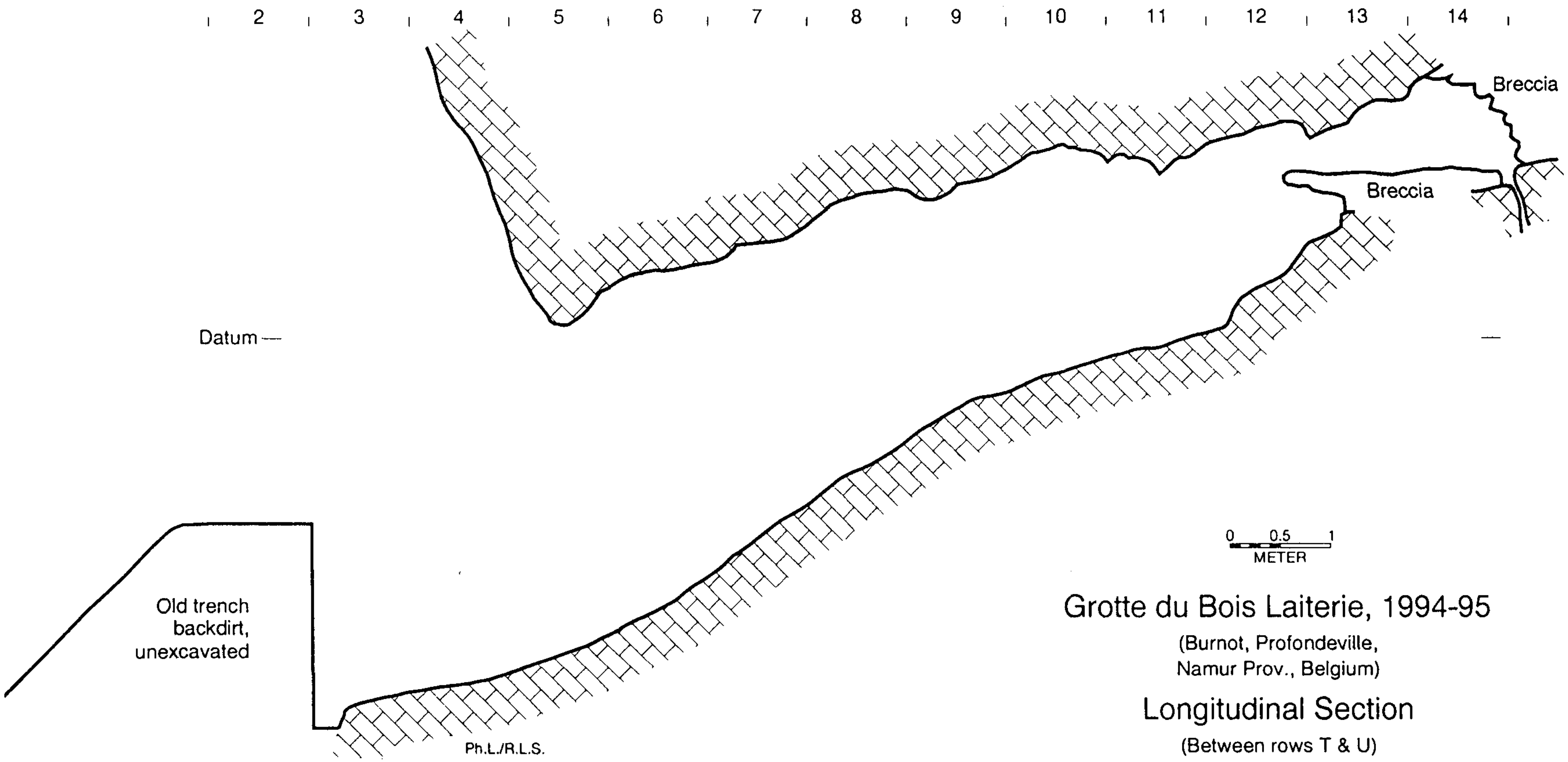

Fig. 5 - Bois Laiterie Cave, Longitudinal (N-S) section, T / U rows.

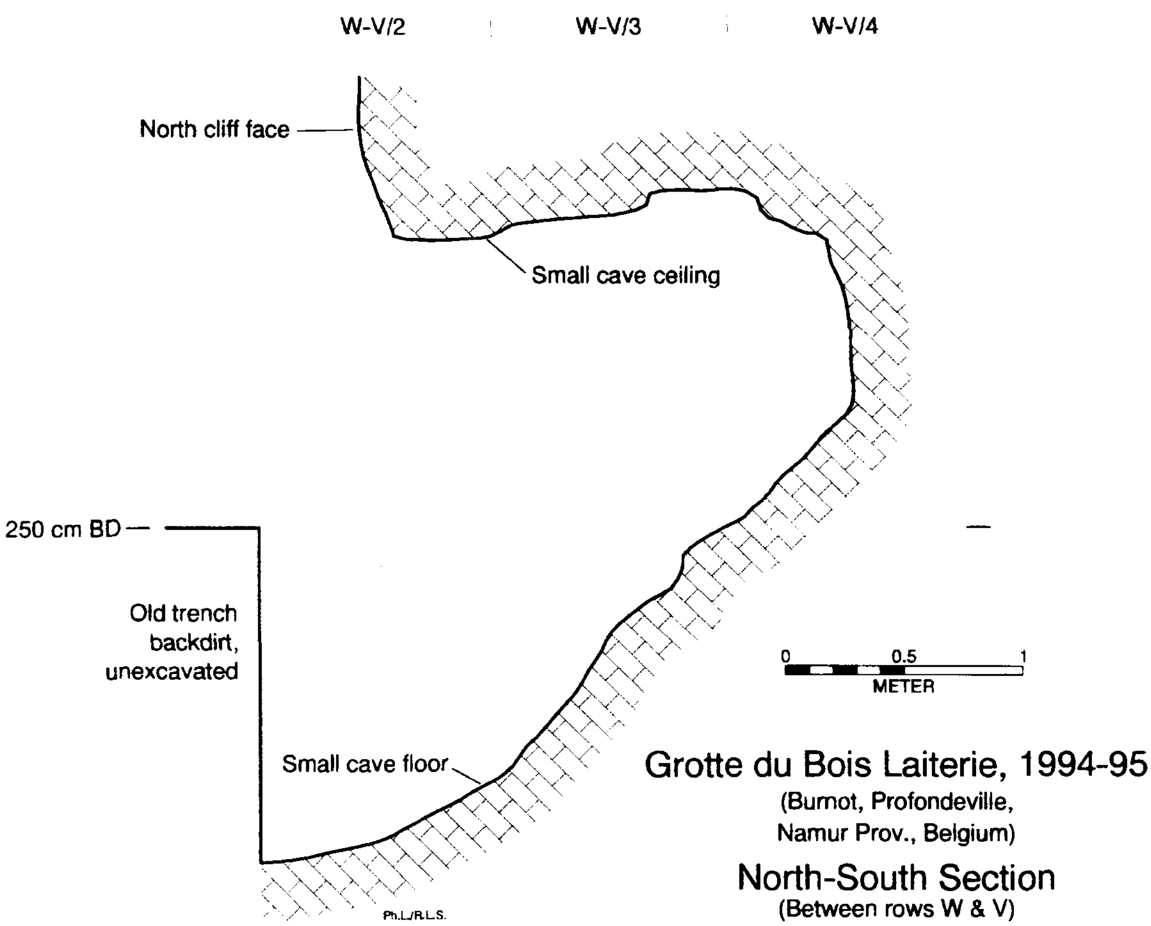

Fig.6 - Bois Laiterie Cave, N-S section inside small cave, W-V / 2-4

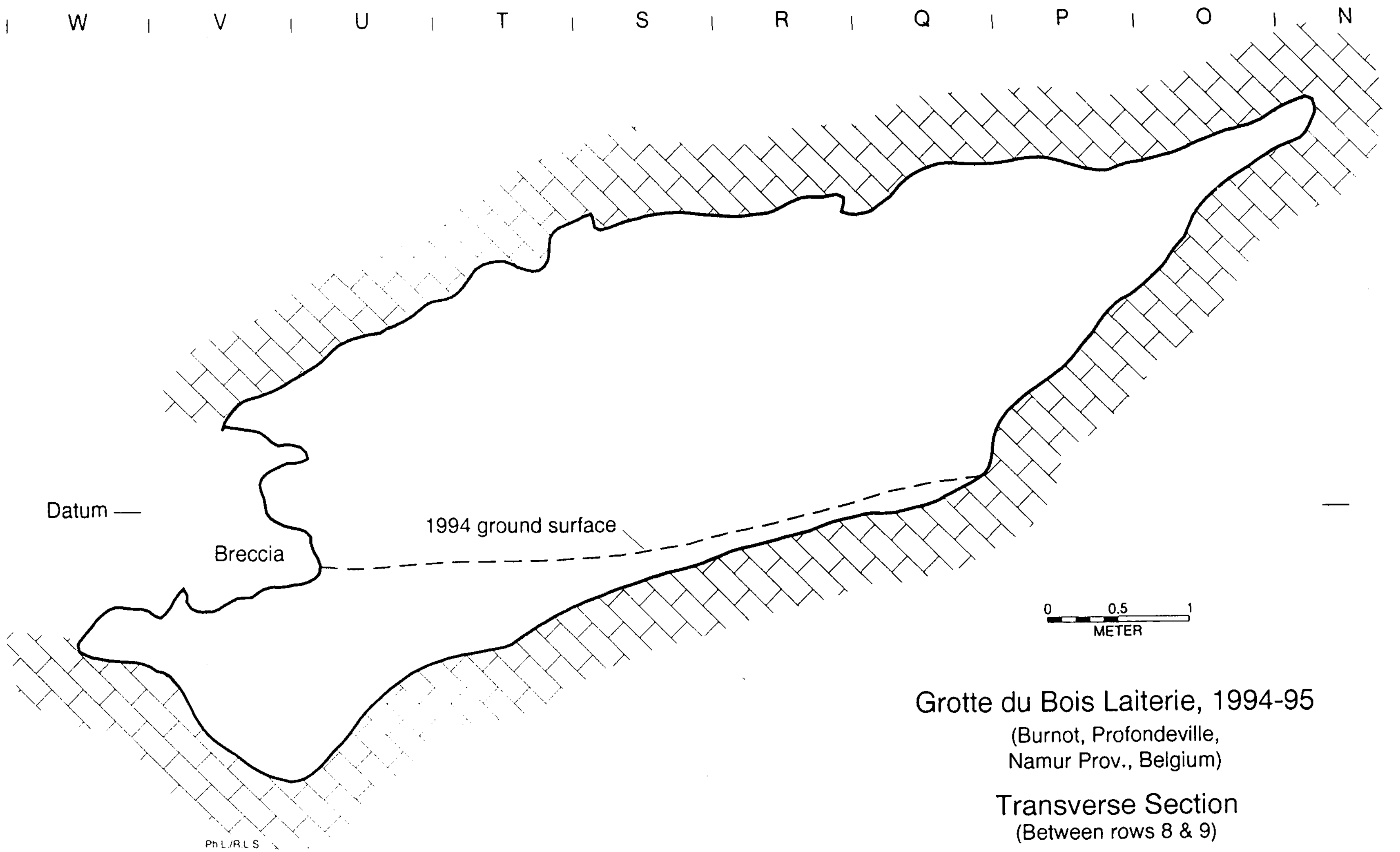

Fig. 7 - Bois Laiterie Cave, Transverse (E-W) section, 8 / 9 rows.

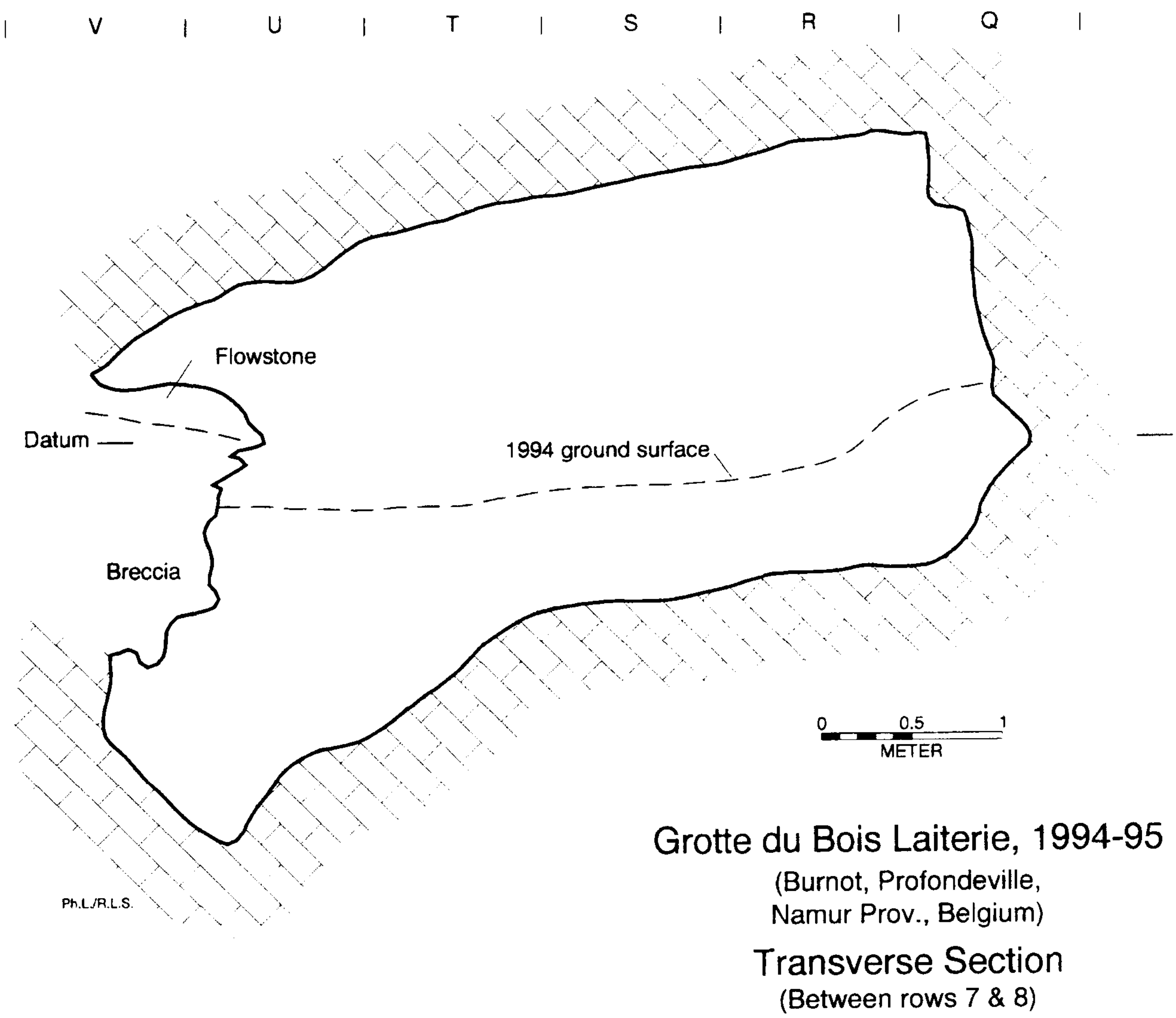

Fig. 8 - Bois Laiterie Cave, Transverse (E-W) section, 7 / 8 rows.

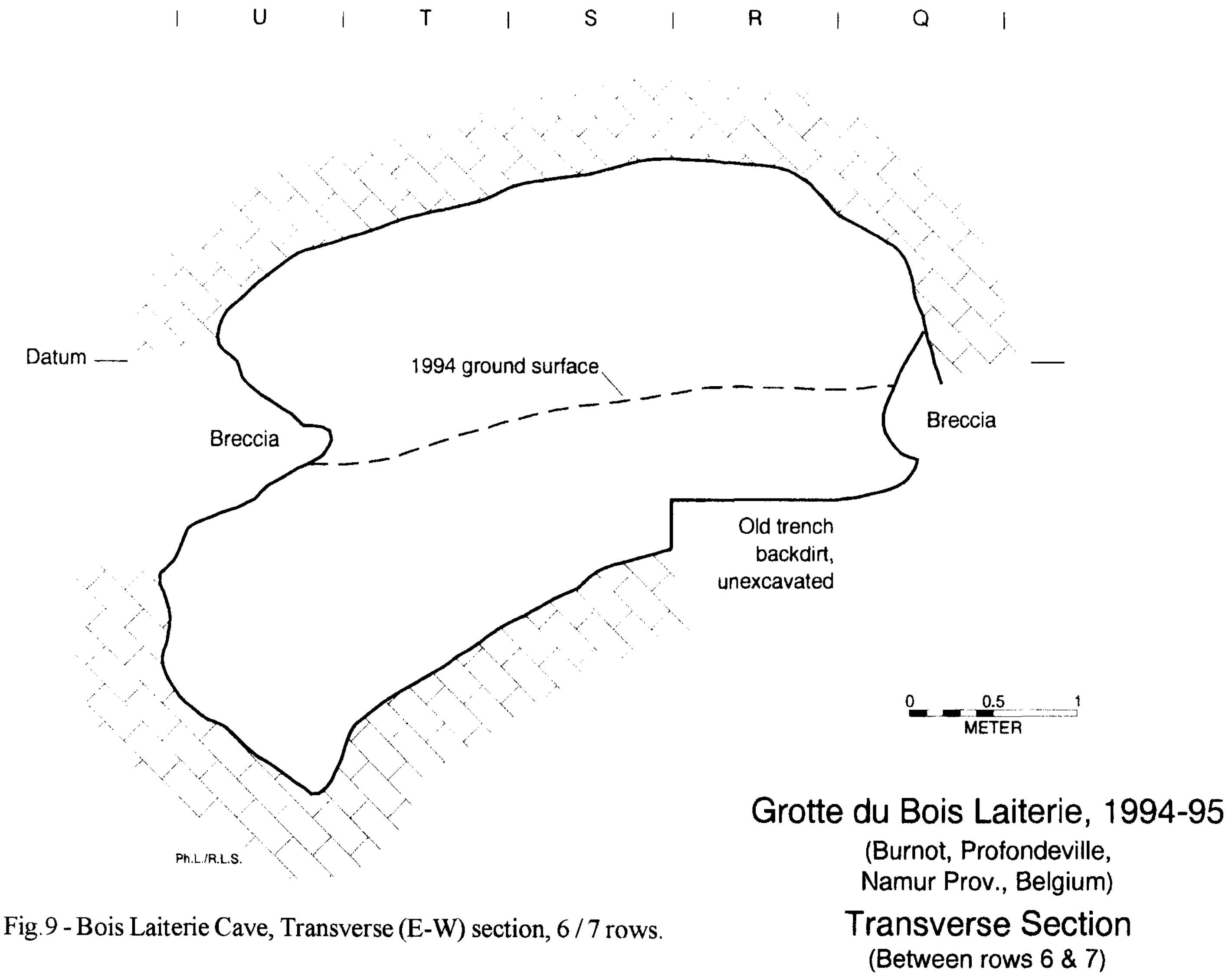

Fig.9 - Bois Laiterie Cave, Transverse (E-W) section, 6 / 7 rows.

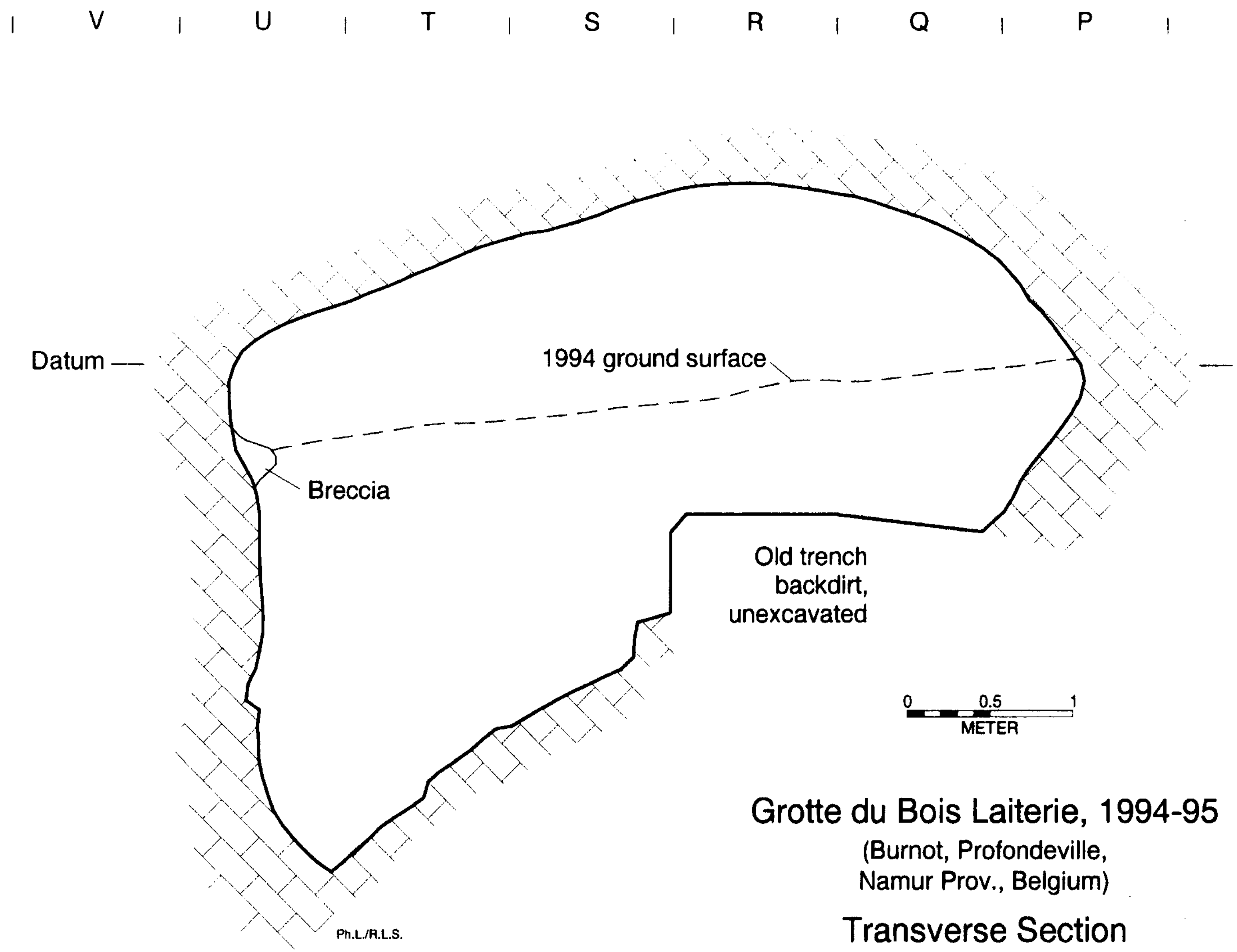

Fig.10 - Bois Laiterie Cave, Transverse (E-W) section, 5/6 rows.

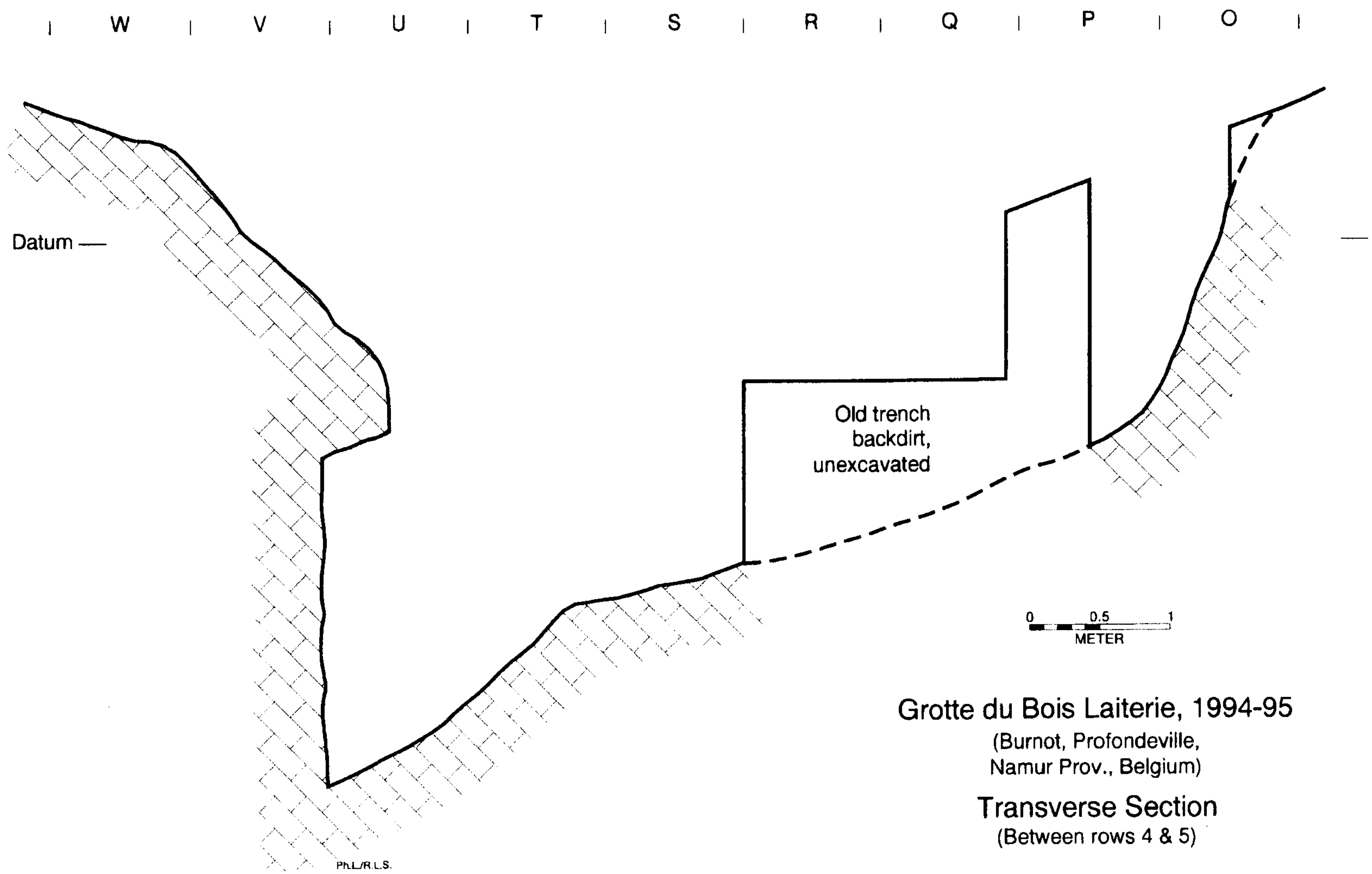

Fig. 11 - Bois Laiterie Cave, Transverse (E-W) section, 4/5 rows.

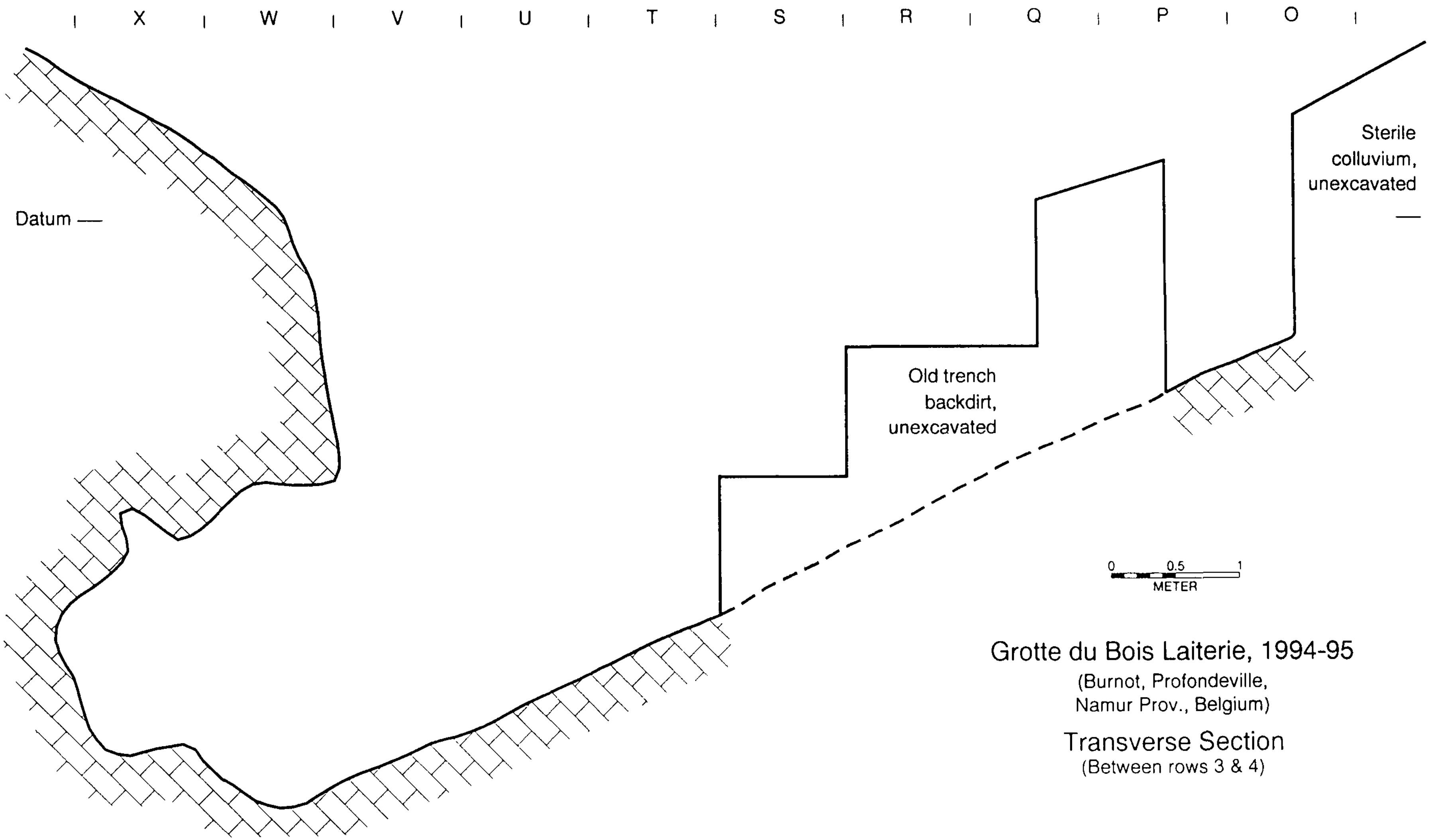

Fig. 12 - Bois Laiterie Cave, Transverse (E-W) section, 3/4 rows.

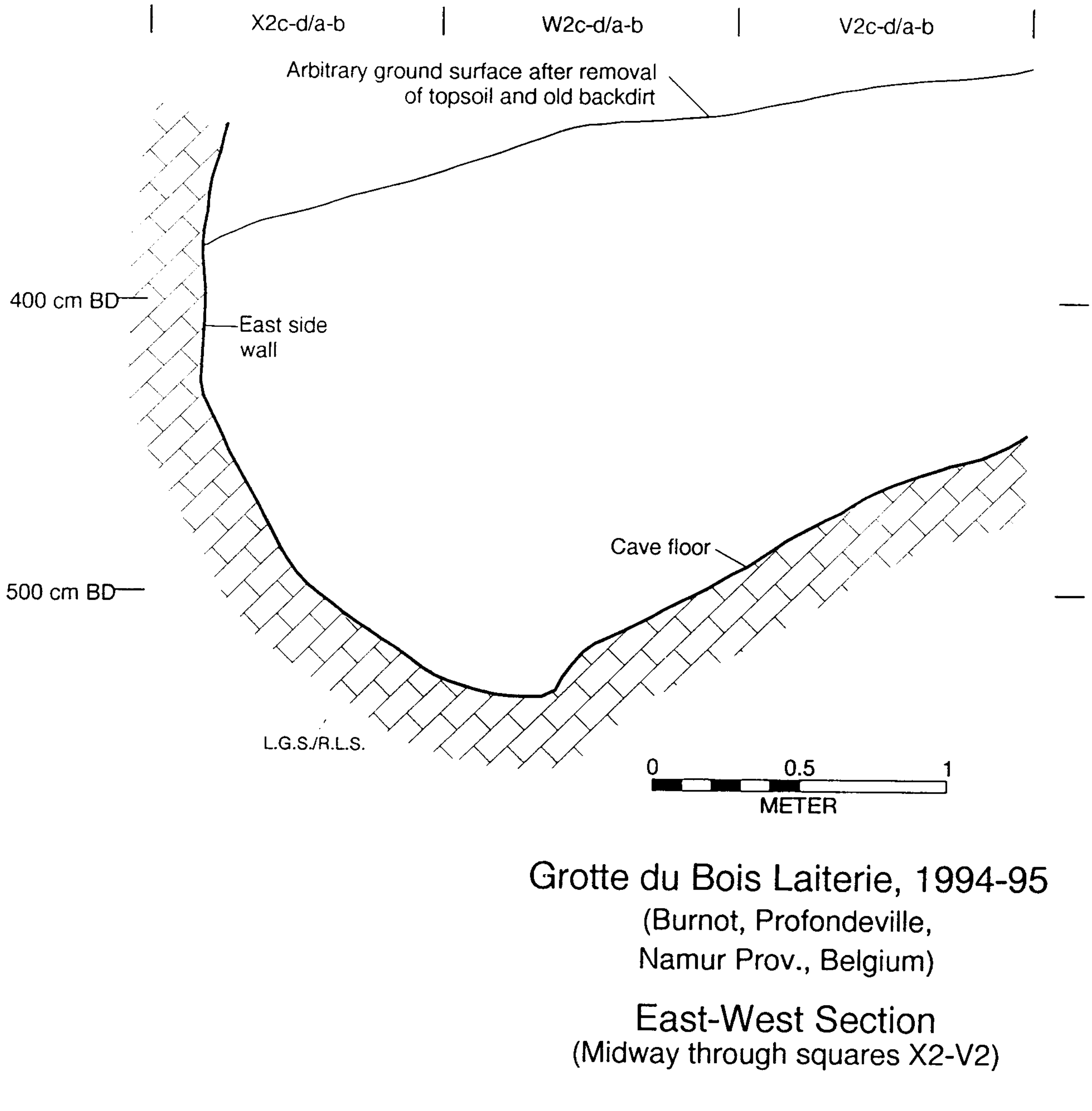

Fig. 13 - Bois Laiterie Cave, E-W section outside small cave, X-V / 2.

Stratigraphy: General Observations

As with any cave site, the stratigraphy of even the infilling of the small BL cave is relatively complex, due mainly to lateral variations and probably hiati. Fortunately, however, it is a short sequence and there is only one (remaining) principal cultural horizon that is so marked and continuous as to serve as a good «marker bed»in and of itself. The stratigraphy was first tentatively established by Ph.Lacroix in *sondages* at the rear of the lower cave, principally in the area that corresponds approximately to our squares U8-9 (his other shallower test pits were in the areas approximately corresponding to parts of V10 and U13). Since our first step was to establish a stratigraphy by extending northward from Lacroix's U8 pit parallel to the east wall of the cave, I will first characterize the sequence of levels from bottom to top in the area of U7-9, about mid-way toward the rear of the lower cave and roughly in the central axis of the «gully» formed by the bedrock of the cave wall and sloping floor. This is the most complete stratigraphy in the site; several of the levels defined at the cave mouth and on the terrace seem to be lateral variants (facies) of the basic units defined in U7-9. In general, the strata are far less clear in terms of texture and color in the terrace/small cave area of the site than toward the cave rear, where the alternation between levels is fairly distinct. Also in general, the exterior stratigraphy is simpler and the cultural horizon much thicker than the stratigraphy in the cave interior. The largest number of clearly distinct levels actually exist about mid-way back along the eastern side of the cave (U-V/8). Further toward the rear, the Magdalenian Stratum YSS lies directly in contact with bedrock. The strata which underlie YSS further toward the cave center may have been eliminated by erosion (?). Finally, in general, the sediments become less sandy toward the cave exterior - often with a higher clay content. The distinction between StrataYSS and BSC (see below) was often quite arbitrary, locally variable and subject to individual excavator interpretation. This is because it is a gradational distinction: from more «sandy silt» to more «clayey silt». Inside the cave, the sedimentary deposits fill the «gully» between the eastern cave wall and the steeply sloping bedrock floor. The non-cemented strata are fairly level on the west-east axis, but they all slope down relatively uniformly 10-20 degrees from the cave rear toward the cave mouth (south-north axis).

Stratigraphy in U9-U7 (U-V/7-9 Section: Figure 14)

Bedrock.

BGS: basal grey sand (not present in U9), 7-15 cm thick. Archeologically and paleontologically sterile.

RS: reddish (to bright red) clayey sand (mainly present in U8; possibly merges with BSC in U7, although this is unclear due to abundance of éboulis in that area), 10-20 cm thick. RS becomes a mere trace (1-2 cm thick) directly atop bedrock in U9 (U9-10 Section: Fig.15). Almost sterile archeologically (the few finds in RS may have migrated down from above in U7 or have been incorrectly labelled due to the difficulty of YSS-BSC-RS distinction in that square).

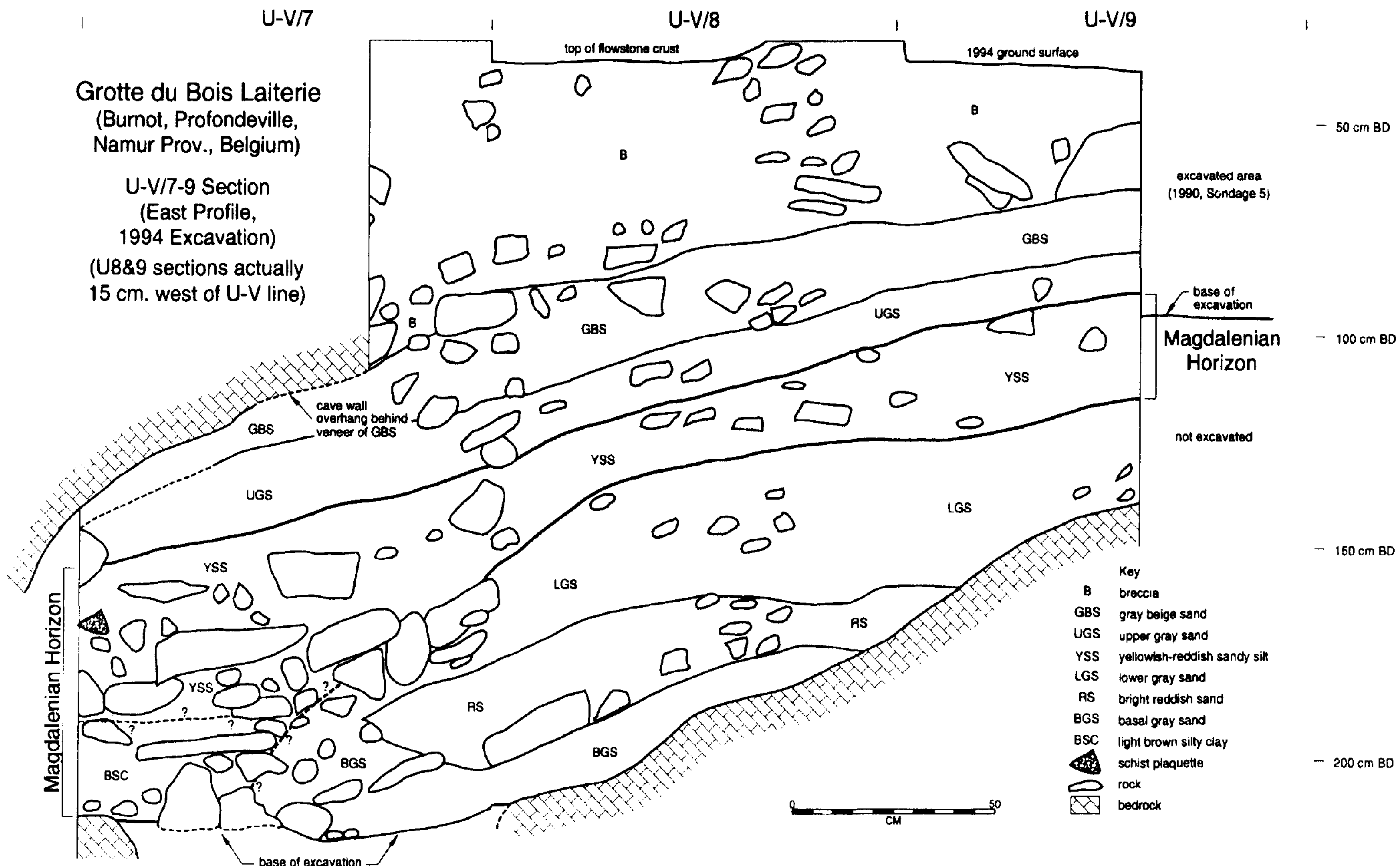

Fig. 14 - Bois Laiterie Cave, Stratigraphic section, U-V / 7-9

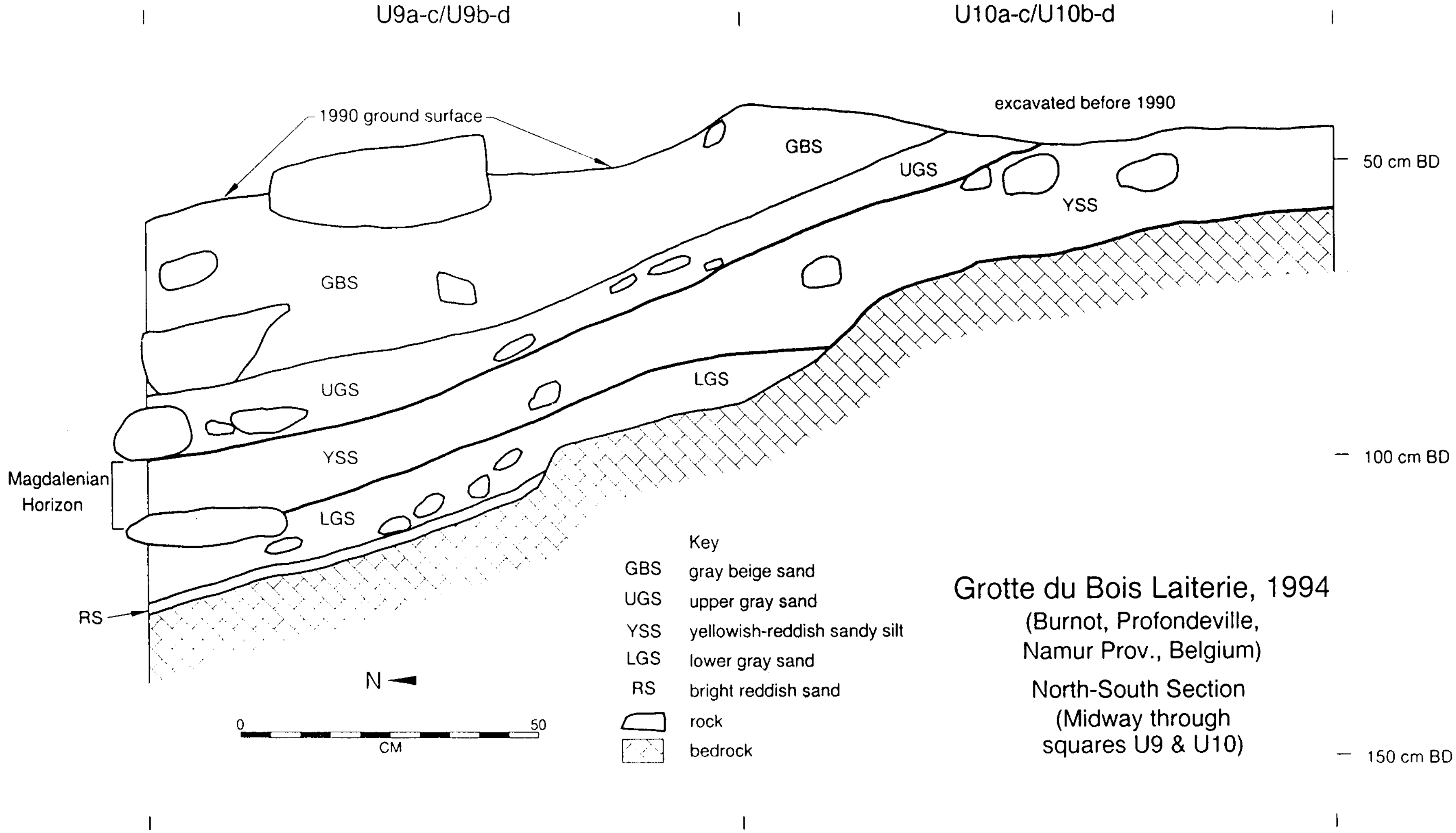

Fig. 15 - Bois Laiterie Cave, Stratigraphic section, U / 9-10

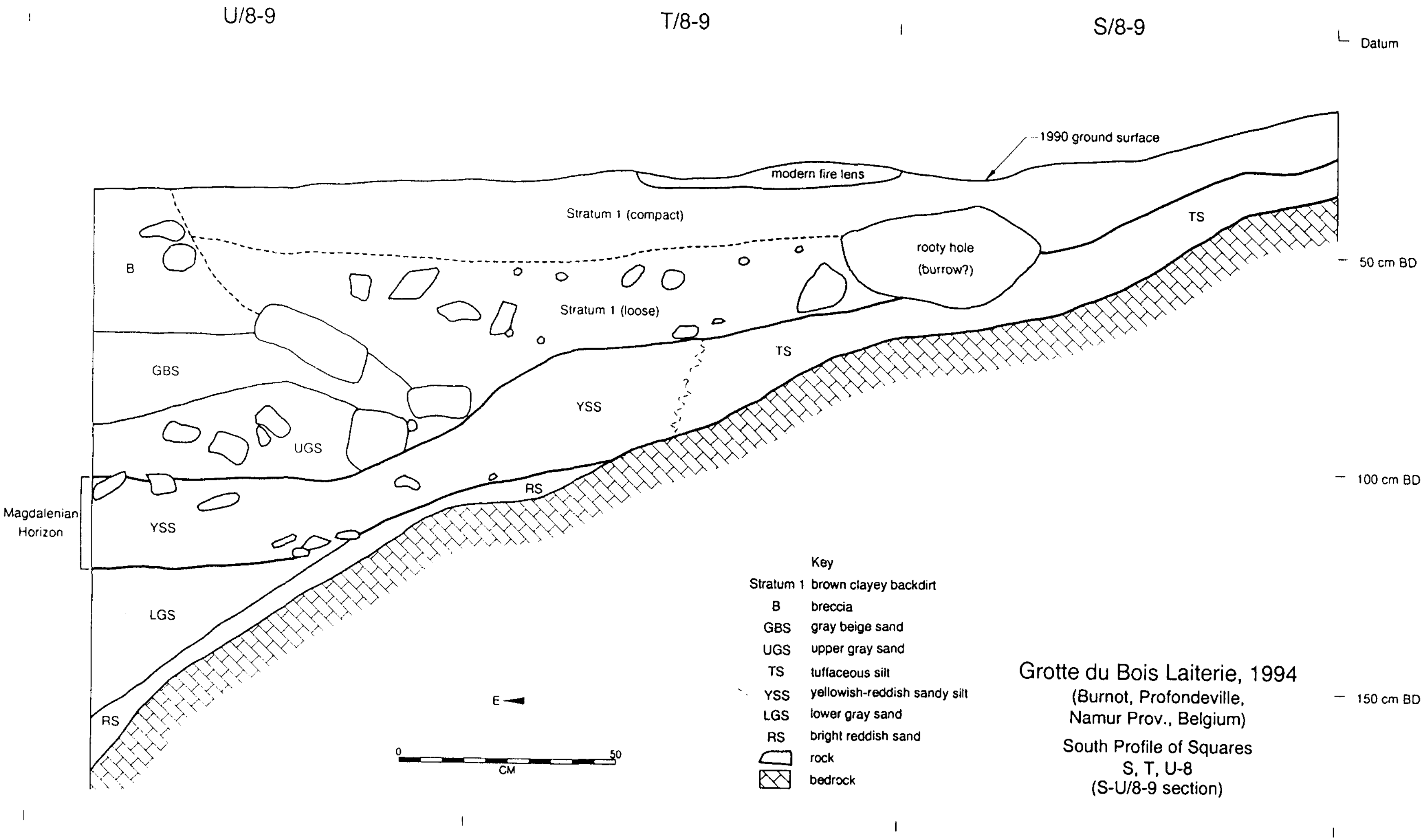

Fig. 16 - Bois Laiterie Cave, Stratigraphic section, S-U / 8-9, showing pothunter trench fill («Stratum 1»).

BSC: basal silty clay (see below). Southern end of unit extends into U7 and apparently merges with RS in a mass of éboulis. Contains artifacts.

LGS: lower grey sand (coarse sand); archeologically sterile; present in U8-9 but absent toward front of cave in areas where BSC is present. 20-40 cm thick.

YSS: yellowish-red or orange brown sandy silt (with a dark olive greenish hue in the cave interior); color and clay content are locally and vertically variable; very high anthropogenic content (psammite plaquettes, lithic artifacts, faunal remains). 15-40 cm thick. Directly in contact with bedrock cave floor in U10 and beyond toward cave rear. Further to the west, in the T8-10 area, where no overlying sediments (except recent pothunter backdirt) subsided at time of our arrival), there is a tuffaceous silt («TS») which contains a few Magdalenian type artifacts and psammite slabs and which is cemented to the surface of the bedrock cave floor. It is continuous with and probably is a lateral (calcium carbonate-rich) facies of YSS (S-U/8-9 Section, Fig.16). Together, YSS+BSC make up the Magdalenian horizon at Bois Laiterie. There no break in vertical distribution of artifacts, manuports or faunal remains between these two lithostratigraphic units, and, as noted above, BSC seems to be a localized phenomenon: a pocket of clayier sediment below YSS at the mouth of the cave only.

UGS: upper grey sand (present inside the cave, including U7-9, but merges with GBS and base of Breccia further east in V and W rows); base of unit often has large to medium-size angular roof-fall blocks which lie directly atop YSS. Almost sterile archeologically; with some artifacts which may have been thrown up from YSS as a result of the rockfall episode(s). 10-20 cm thick.

GBS: grey-beige silt; loose, light-color, fine silt (less compact than underlying levels); in direct contact with base of Breccia, this level may, in part, be the sort of sediment that was brecciated by calcium carbonate precipitation above. Almost sterile archeologically. Variable thickness, due to local differences in depth of brecciation; in direct contact with overhanging cave wall in U7, 15-25 cm thick.

Breccia: very hard, calcium carbonate indurated silts, éboulis, bones (including human bones), ceramic sherds. Adheres to eastern and rear walls of cave and merges with flowstone atop upslope bedrock cave floor toward the west. At least 75-100 cm thick in U8-9; merges with overhanging cave wall.

Stratigraphy in U6-T6 (U6-U7 Section, just inside cave mouth, Fig.17)

Bedrock.

RS (trace atop bedrock).

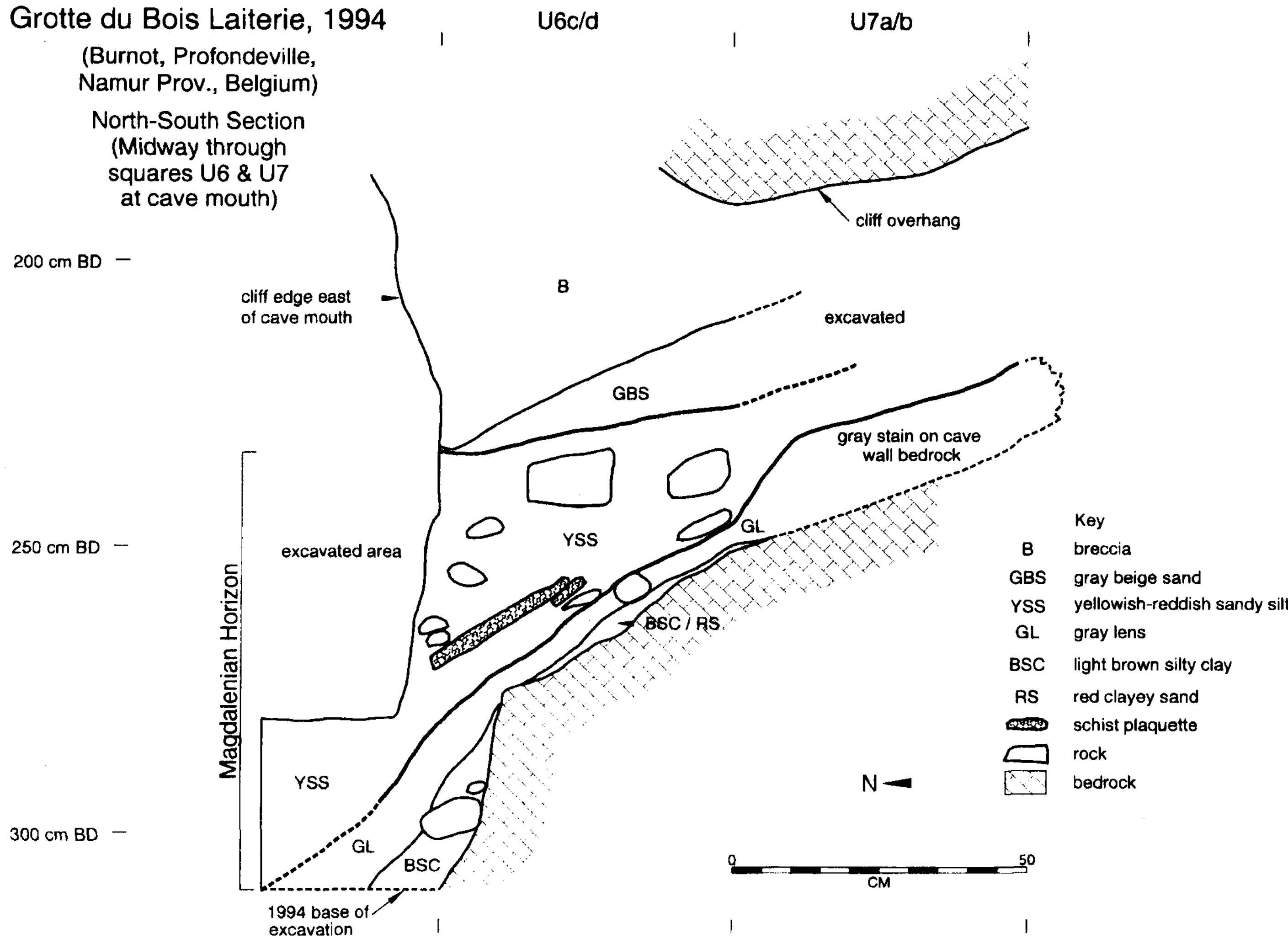

Fig. 17 - Bois Laiterie Cave, Stratigraphic section at eastern edge of the cave mouth, U / 5-7

GL or «Pseudo LGS»:
localized zone of distintegrating, decalcified éboulis forming a grey sandy lens. Contains some artifacts.

BSC: basal silty clay. Reddish brown; grades to moist, plastic clay, but with silt content and more sand toward cave interior. Intergrades in color and clay content with overlying YSS. 20-25 cm thick. Rich in cultural remains.

YSS (see above). Extremely rich in cultural remains.

Breccia (see above): small remnant adhering to cave wall in U6.

Stratigraphy in U5,T5-4

Bedrock.

Hint of RS atop bedrock in T4.

«Pseudo-LGS», otherwise known as «YSS-grey lens»(or GL):
lens of grey silty sand near/at base of YSS and BSC. Possibly a result of intensive burning, as among the cultural remains are relatively many burnt flints and bones (see Straus and Martinez, this volume). «Grey lens» contains psammite slabs, some of which cut across YSS/BSC and the grey lens. Artifacts are abundant, especially in T5 and U5. Generally 10-15 cm. thick. «Grey lens» is localized around eastern edge of cave mouth and at base of cliff between there and and the small cave.

YSS: not quite like the prototypical YSS in the cave center and rear, since it is less compact. But here it does contain lenses of fine clay similar in texture to BSC, which, however, does not seem to be present as a more widespread unit as in U6-7.

LBS : light brown silt. Loose with evidence of disturbance (animal burrows).

Stratigraphy in U-X/3:
Terrace outside Cave (U-X/3-2 and W3-4 Sections, Figs.18 and 19)

Bedrock.

BSC: somewhat clayier zone at base of YSS in U and V3, but absent in W and X3.

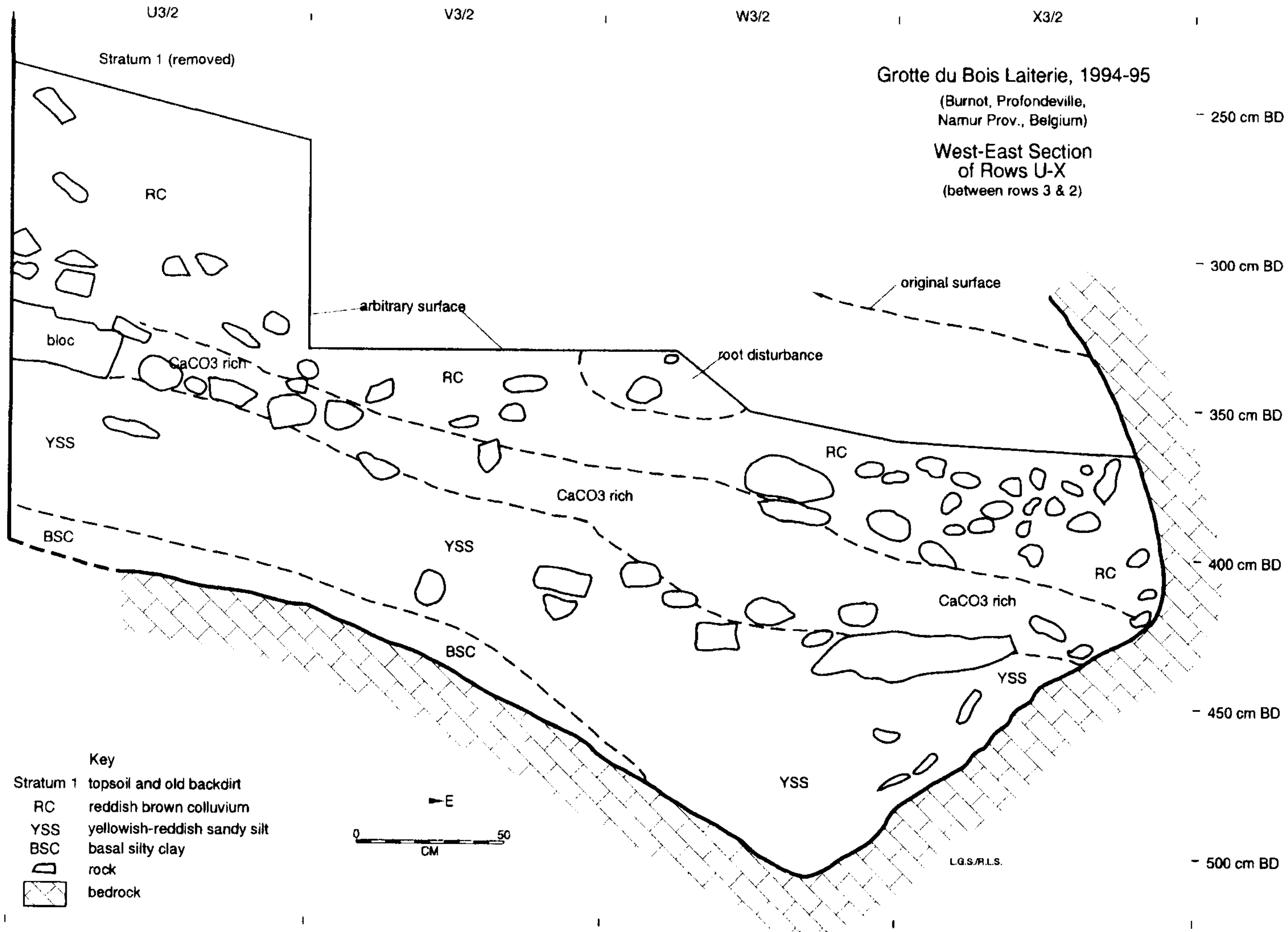

Fig. 18 - Bois Laiterie Cave, W-E Stratigraphic section on the terrace, U-X / 3-2

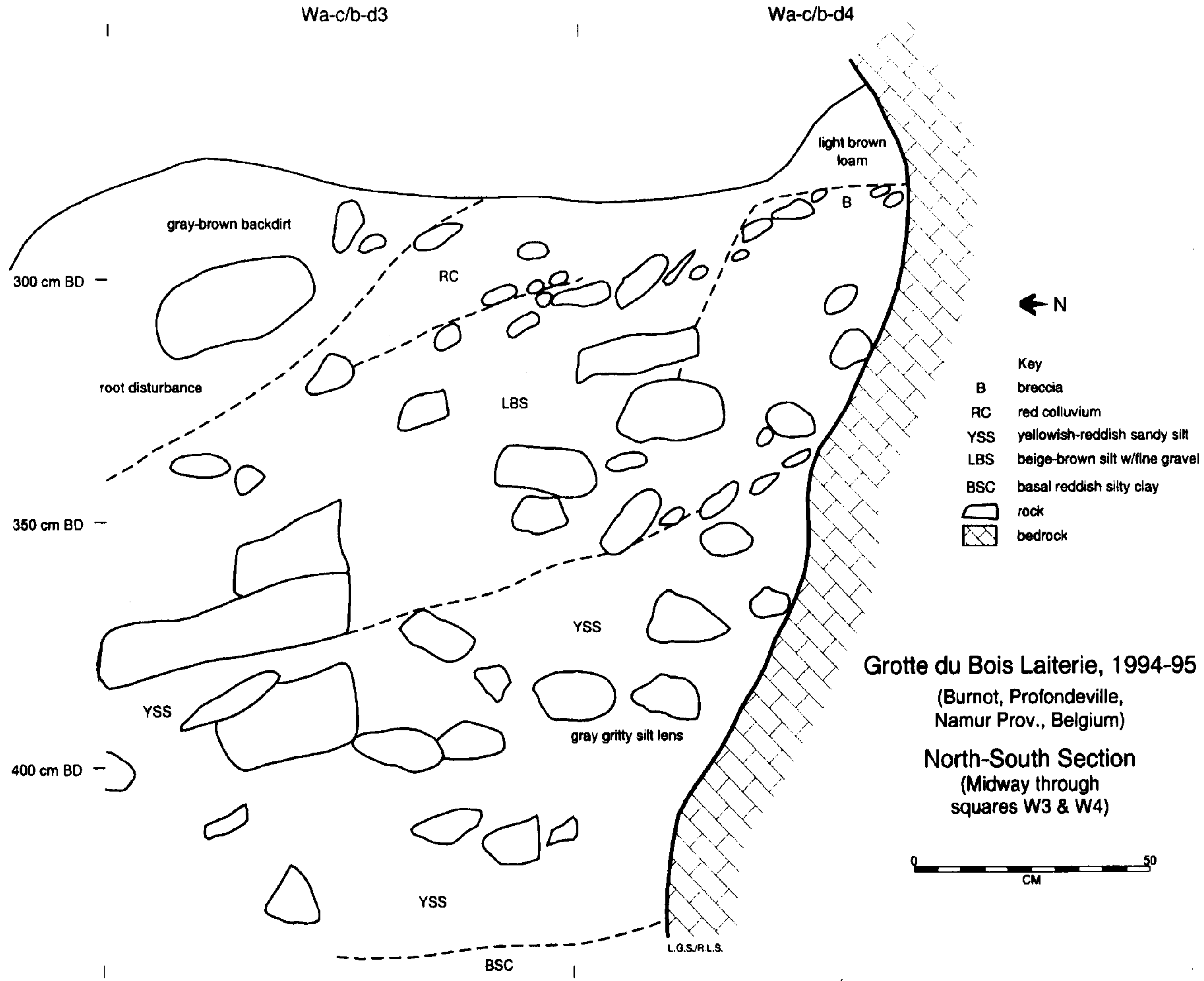

Fig. 19 - Bois Laiterie Cave, N-S Stratigraphic section on the terrace, W 3-4.

Contains artifacts down to bedrock. 5-15 cm.

YSS: Much redder, siltier (loamier) and thicker than in cave interior. Artifact and faunal distribution is continuous with that of YSS inside cave, but much more dispersed here both vertically and horizontally. 35-70 cm.

RC: reddish-brown colluvium; rich in éboulis, especially large angular blocks at base at contact with YSS, with which RC intergrades in color (YSS being somewhat more yellowish). Basal 15-35 cm of RC are heavily enriched in calcium carbonate precipitated from water percolated from above long after deposition of this loamy silt. The calcium carbonate-rich zone is possibly the same phenomenon as the Breccia and Tuffaceous Silt (TS) inside the cave and caused by the same climatic regimen. RC is disturbed by roots and is overlain by a surficial layer of humus and old backdirt («Stratum 1"). In some areas, RC intergrades with LBS (beige-brown silt, locally with fine «pea» gravel).

Further to the west on the narrow (2-3 m) terrace outside the cave mouth, there is considerable evidence of clandestine trenching exposed both by our main excavation extending out from the cave along its South-North axis (R-S/8-2 Section, Fig.20) and in our test trench (O-P/3-4) at the upslope edge of the terrace just west of the lower cave mouth. In this upslope area of the cave mouth (as inside the cave), the pothunters fortunately «ran out» of ceramic artifacts and human remains before hitting the Magdalenian component which mainly lay below the sterile Red Colluvium layer to the east. Having struck bedrock upslope, they gave up digging deeper in the downslope area before reaching the bottom of RC, hence never hitting YSS in the area to the east of the cave mouth and at the small cave. Thus, although there was massive disturbance (at least two cycles of trenching, backfilling, re-trenching and re-backfilling) in the P-S rows, hardly any Magdalenian had been present there and the Magdalenian horizon was spared in the T-X rows.

Chronostratigraphy and Chronology

Although more details are given below in micromorphological analysis (Courty, this volume), some preliminary chronostratigraphic hypotheses can be suggested here concerning the short stratigraphic sequence.

First of all, it seems likely that when Magdalenian people first used this cave, much of its floor was exposed, bare bedrock, since artifacts and psammite slab manuports were found in direct contact with the bedrock in parts of the R-T rows inside the cave (embedded in «Tuffaceous Silt») and right to the base of YSS/BSC in front and to the east of the cave mouth and in the front sector of the cave interior along the eastern wall. In these areas YSS/BSC either directly touched bedrock or was separated from it by a mere trace of Red Sand («RS»). Thus we can deduce that some erosive process had washed out any previously existing sedimentary infilling, the existence of which is testified to be the remnant deposits of «LGS»

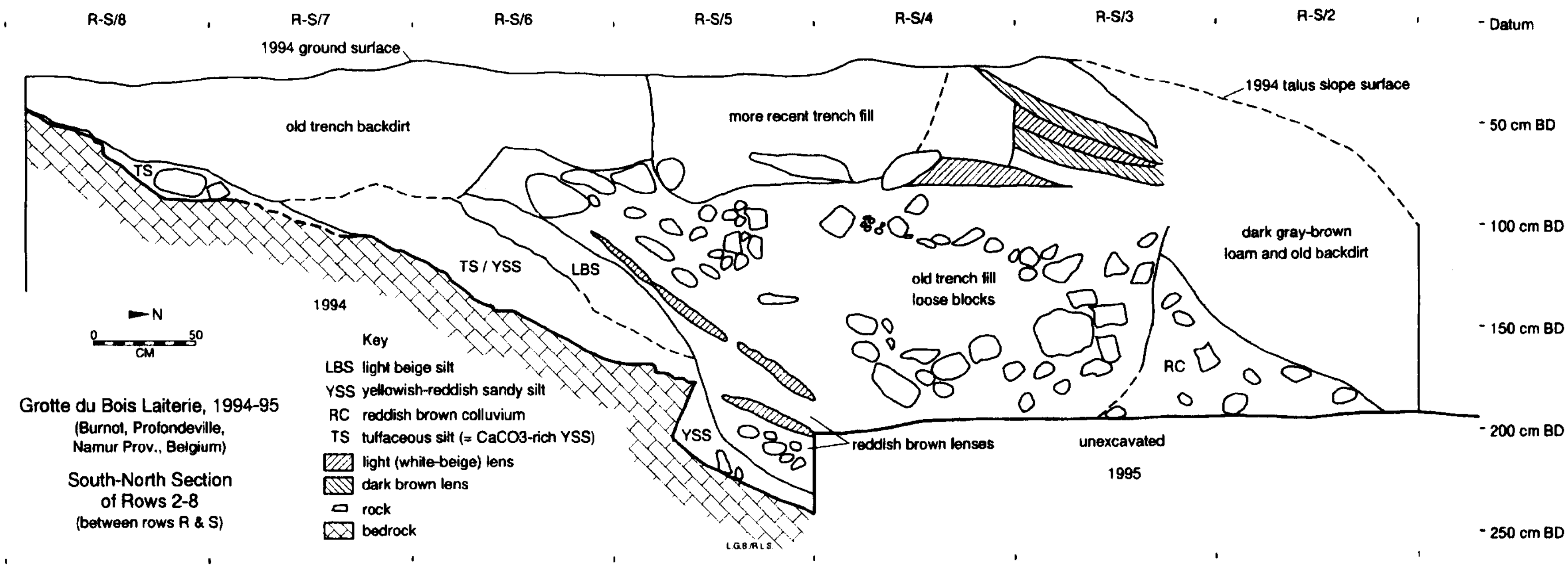

Fig.20 - Bois Laiterie Cave, S-N Stratigraphic section , R-S / 8-2, showing pothunter trench fill.

(lower grey sand), «RS» and «BGS» which underlie «YSS» in the deepest (best sediment trap) part of the «gully» in the bedrock between the eastern cave wall and the cave floor. Since we know that «YSS» (and presumbly also «BSC») probably dates to Bölling (see below), the coarse sand and blocks of LGS could have been deposited by freeze-thaw processes during some part of Dryas I. «RS» might be indicative of some oxidation (weathering) and could conceivably represent one of the more moderate climatic, humid pulses within Dryas I (*e.g.*, Pre-Bölling, Angles?), whereas the basal grey sand («BGS») could represent rigorous conditions of either early Dryas I or the Last Glacial Maximum.

The clayier content of «BSC» might be indicative of very humid conditions, perhaps at the tail end of the very wet episode that eroded the cave perhaps in early Bölling. The cave may have been quite wet, with muddy puddles along the eastern wall (the only area made flat by sedimentary infilling in the bedrock «gully») at the time of Magdalenian human arrival. One can perhaps suggest decantation of clay minerals in ponded water. Higher up in the stratigraphic sequence, somewhat drier conditions in Bölling led to the deposition of siltier (loess) sediments (YSS) - sandier inside the cave and siltier toward the front and in the exterior.

Inside the cave, the Upper Grey Sand («UGS») once again suggests freeze-thaw processes leading to deposition of coarse sand and the large angular roof-fall blocks that fell directly atop YSS. The Bölling amelioriation seems to have come to an abrupt, dramatic (albeit ultimately transitory) end with a major cold but fluctuating and relatively humid pulse, characterized by intense freeze-thaw activity. This could have been Dryas II (or Dryas III, in which case there would be a depositional hiatus in place of Dryas II and especially Alleröd, for which we have no certain indicators). «GBS» in the cave interior and «LBS» on the terrace *might* be lateral equivalents, but they are not physically continuous - being interrupted either by cave wall or floor bedrock or by the pothunter diggings. These loose, light brown/beige silt/silty clay deposits lack modern artifacts or other intrusives (despite disturbance of «LBS»). One or the other or both could either have been formed during the early Holocene (Preboreal?) or, more likely, at least for LBS during Alleröd. The only evidence possibly suggestive of the latter hypothesis (*i.e.*, LBS = Alleröd), aside from stratigraphic position, is the fact that «LBS» is characterized by mixtures of *both* cold, dry, open-habitat taxa and more temperate, humid, wooded taxa of micromammals and malacofauna, according to López Bayón *et al.* and Cordy and Lacroix (both in this volume). These data would seem to square poorly with Preboreal conditions in Belgium (densely wooded and very humid). LBS lacks either Mesolithic or Magdalenian artifacts, save for a very few probably brought up by minor disturbance agents (*e.g.*, burrowing animals).

The base of the Breccia yielded human bones, including a foot one of whose bones has been dated to 9,200 BP (uncalibrated): Preboreal/Early Mesolithic (see Krueger and Vandenbruaene and Gautier, this volume). In close association with these remains, however, there are ceramic sherds, suggesting reuse of the cave as a (Neolithic?) ossuary (of unknown age). The sediments (silts and limestone blocks) that were later cemented to form the Breccia were thus laid down during Preboreal, Boreal and at least early Atlantic. The calcium carbonate precititation must have taken place during the mid-late Atlantic period - or even more recently.

Radiocarbon Dates

The first radiocarbon date obtained from Bois Laiterie was a direct AMS (accelerator mass spectometry) determination on one of the antler sagaies discovered in the level that would later be named «YSS» in the cave rear (probably in V10) in 1991 by Lacroix. The date was procured by R.Charles as part of her dissertation research (1994); it was done on collagen by the Oxford University Research Laboratory for Archaeology and the History of Art. Two other accelerator dates were done on individual animal bones from our 1994 excavation. These samples were processed and the collagen samples were extracted by Geochron Laboratory in Cambridge, Massachusetts, but were also actually dated by the Oxford Accelerator. Both bones came from square U6 at the front of the cave: one from the top of «YSS» and the other from the bottom of «YSS». The three determinations are statistically identical at 12,650 BP.

Collagen from a human foot bone retrieved from the base of the Breccia in square V9 during the 1995 excavation was also extracted by Geochron and accelerator-dated by Oxford. It provided unexpected evidence for the existence of an early Mesolithic ossuary use of the cave - just as in several other caves in west-central Wallonia, all dated between c. 9,600-9,000 BP (see below). The BL radiocarbon dates (uncalibrated) are listed in Tab.1.

TABLE 1: BOIS LAITERIE RADIOCARBON DATES

Stratum	Square	Material	Lab.No	Date and 1 Standard Deviation
YSS	V-10	Antler sagaie	OxA-4198	12,660 ± 140 BP
YSS top	U6	Bone	GX-20433	12,625 ± 117 BP
YSS base	U6	Bone	GX-20434	12,665 ± 96 BP
Breccia base	V9	Human bone	GX-21380	9,235 ± 85 BP

The YSS/Magdalenian dates fall squarely in the middle of the traditional (uncalibrated) age range for the Bölling phase or pollen zone. As demonstrated by Charles (1994), all the credible dates for Magdalenian in Belgium fall within this period, denying the reliability of dates in excess of 13,000 BP. However, Street et al. (1994), using experimental calibration curves, suggest that the recolonization of NW Europe (notably the German Rhineland) may actually have begun as early as late Dryas I. This may be suggested by the recently obtained dates from the Magdelenian level at Trou Walou in the hill country of Liège Province (Gilot,1993), which may have fewer problems than the «old» dates from the lower, artifact-poor (or devoid) levels at Trou des Blaireaux in the upper Meuse basin. Radiocarbon-dated Bölling-age Magdalenian sites (c.12,900-12,200 years ago, uncalibrated) in Belgium now include the following: Sy Verlaine, Chaleux, Frontal, Nutons, Bois Laiterie, Blaireaux (Couche II), Coléoptère and Trou Da Somme. These sites are dated by a total of 18 acceptable determinations (mostly AMS). In addition, there are two C-14 dates of c.13,000 BP from the Magdalenian level at Trou Walou, which, given their single standard deviations of 140 and 190 years could either suggest an early traditional Bölling age or a late Dryas I occupation. But Charles (1994) questions their reliability due to the use of bulk bone samples for conventional (not accelerator) radiocarbon dating. Finally, the TL dates from one or both loci at Orp could be interpreted as dating to Bölling (as also suggested by geological / pedological evidence)

(Vermeersch,1991), since the standard deviations are very large and since C-14 dates are systematically «too young» in this time range.

With regard to the human foot dated to 9,200 BP, but apparently unassociated with any Mesolithic artifacts (none were found in our fine-screening of the pothunter backdirt or in our removal of the bones from and inspection of the Breccia base), there are a number of comparable data from the upper Meuse and Sambre valleys above Namur. In recent years no fewer than five other caves in this small region have yielded individual or multiple human burials, with few or no associated artifacts, but attributable to the early Mesolithic on the basis of 12 coherent radiocarbon dates (mostly AMS) ranging from 9,600 to 9,000 BP (Cauwe,1995; Toussaint *et al.*,1996). Bois Laiterie is thus part of a distinctive regional tradition involving use of certain caves for burial but not for residence during the Preboreal. On the other hand, other sites, such as the Abri du Pape, a shallow rockshelter upstream of Dinant whose lowest Mesolithic level dates to c. 9,000 BP, were used as campsites in roughly this same time period (see Straus *et al.*,n.d.).

The Excavation

The objectives of the two seasons of fieldwork in Bois Laiterie Cave were to extract the maximum possible amounts of information relative to Magdalenian environments and adaptations, and to completely excavate the limited remnant intact deposits to salvage this unprotected site's data before its almost inevitable final destruction by looters. This involved the removal of large quantities of old backdirt from within the cave and especially from the terrace, followed by careful, controlled excavation and screening of the remnant intact deposits. Actual excavation was done in an area totalling about 23 m², but in addition we cleared old backdirt down to bedrock and recovered artifacts and psammite slabs resting atop or cemented to the bedrock floor in an additional upslope area of about 7 m². Thus our sample covers a total of 30 m² and essentially no intact deposits remained after the close of the 1995 excavation (except small areas along the eastern and rear walls that are virtually inaccessible due to the overhanging breccia ledge). In addition, we excavated a 1x1.5 m test trench in the upslope area of the terrace (O-P/ 3-4), which reached the very steeply sloping bedrock and cut through the western end of at least two generations of clandestine trenches and a small area of intact sediments (on the upslope site) with no trace of Magdalenian deposits. Thus it is possible that we may have excavated (or, atop exposed bedrock floor, at least sampled) a total of as much as about 3/5 of the habitable area of the Magdalenian site in the lower cave + terrace (Fig.21).

In 1994 we cleaned the upper part of the south-north stratigraphy created along the U-V line by the pothunter diggings (which stopped along that axis because the capping breccia deposit had become too hard and too thick) and by Lacroix's *sondage* in U8 (Fig.14). Then we excavated the infilling of the «gully» in the bedrock along that axis, principally in squares U9-10, U7-5 and T7-4, while also recuperating Magdalenian materials from the exposed bedrock mainly in the «S» row. All this work was inside the cave.

In 1995 we finished excavating remnant deposits at the rear of the cave mainly in V7-9, V11-13, W9-10, X10, S14 (or portions thereof), often having to «tunnel» under the breccia in

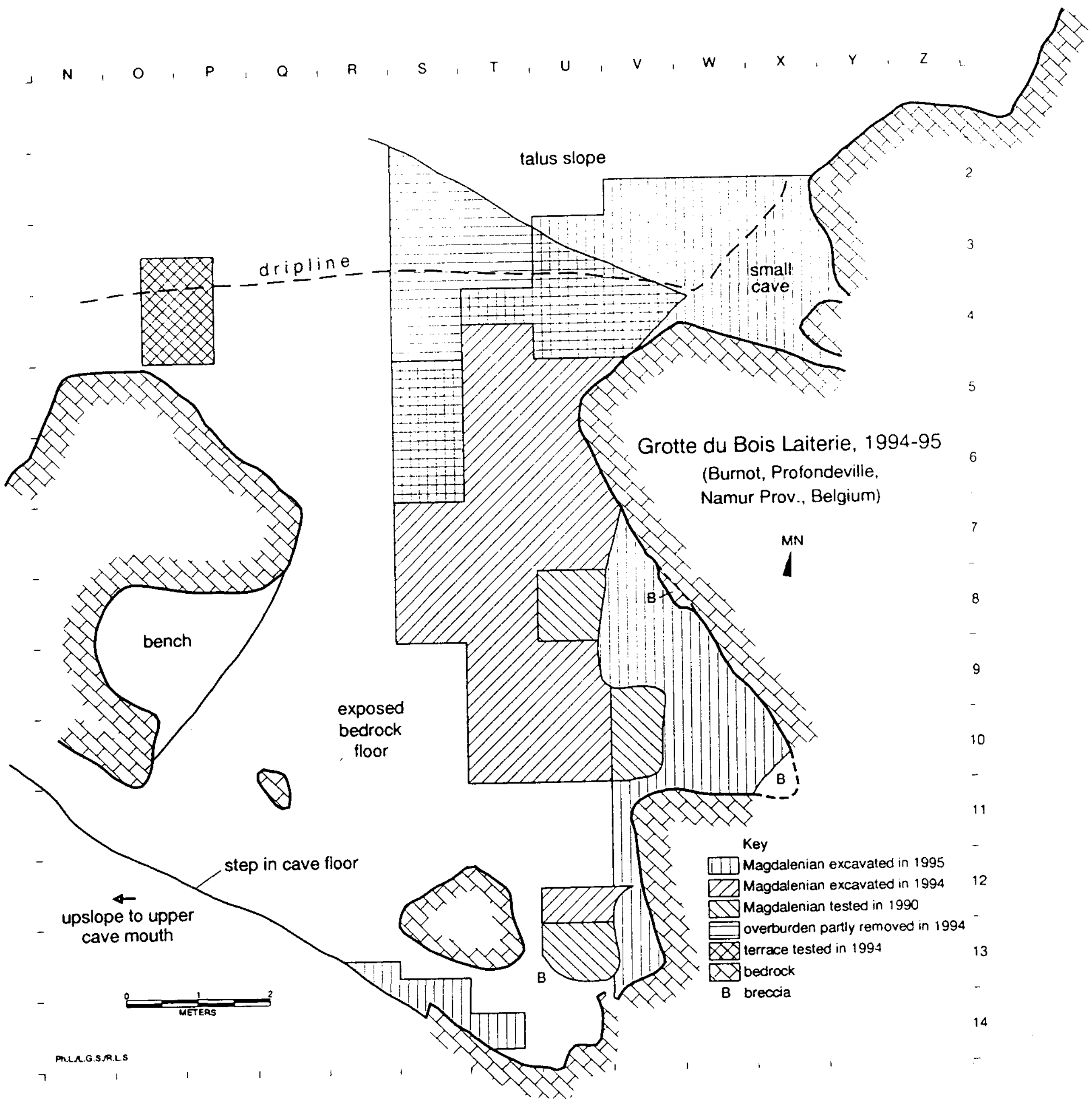

Fig. 21 - Bois Laiterie Cave. Excavation areas.

order to be able to remove the Magdalenian deposit back to the cave walls where ever possible. We also excavated most of the area between U-X and between 2-4 in front of the eastern part of the cave mouth on the terrace and in the entrance of the small cave. *All* these areas were dug down to bedrock and the terrace area was excavated out to the edge of the bedrock ledge in front of the cave, at which point an earlier cliff-line, now buried in colluvial talus sediments, seems to plunge vertically down toward the Burnot stream.

The procedure of digging outward from and thereby vertically and horizontally extending existing stratigraphic sections, allowed us to maintain good stratigraphic control. However, as noted above, there was considerable lateral variation in texture and color of the strata and there was considerable complexity of levels and lenses in the east-central part of the cave, and a high degree of deposit homogeneity in the terrace area, which made our job difficult at times. Most fortunately in this essentially single-component site (leaving aside for all practical purposes the existence of apparently partially mixed early Mesolithic and Neolithic components in the Breccia), the distribution of Magdalenian artifacts, manuports and faunal remains was continuous and relatively (though variably) dense from the 13 row at the cave rear all the way to the 2 row on the terrace. Thus we were able to follow, document and recuperate this (palimpsest) «living surface» from one end of the site to the other without much uncertainly, despite the variations in its sedimentary matrix.

Excavation and Analysis Methods

The site was mapped in detail and, once the excavation was finished and bedrock exposed throughout, both longitudinal and transversal sections were drawn (mainly by Ph.Lacroix).

The entire lower cave was gridded into 1 m² units, using weighted strings hanging from screws driven into the ceiling. The terrace area grid units were marked by elastic strings attached to iron rods driven into the ground and screws driven into the cliff-face. The North-South axis was designated by numbers (numbers 2-14 were used) and the West-East axis by letters (letters O-X were used). For actual excavation and screening purposes, each meter square was subdivided into four quadrants labelled «A» (NW quarter square), «B» (NE), «C» (SW) and «D» (SE). A datum plane was established and permanently marked by screws driven into cave wall and upslope areas of the bedrock floor at an elevation higher than most of the extant deposits. Most «z» coordinates (depth measurements) are thus negative, but there are some finds from the very rear of the cave (11-14 rows) that were above the datum plane, thus giving positive depth measurements. At the beginning and end of the excavation of each «spit» (excavation level = «décapage») we would measure and record the 9 depths corresponding to the corners of all the quarter squares making up the meter square. Each spit in each square is thus a uniquely defined unit.

Except when backdirt had to be removed (by pick and shovel - although then coarse, dry-screened on site) or blocks broken (by wedge and sledge hammer), excavation was done by small pointing trowel, dental pick, wooden spatula and brush.

All tools, all artifacts of 1 cm or greater in length, and all faunal remains and plaquettes of more than about 4-5 cm in length were normally piece-plotted in three dimensions (cm from the southern and western edges of the square and cm below [or above]the datum plane). Depth measurements were taken with line levels on strings that were frequently double-checked. To study possible natural disturbance processes (*e.g.*, solifluxion, running water), we recorded the orientation of all elongated objects found *in situ* by compass and the inclination by clinometer. We also weighed all piece-plotted finds. Piece-plotted finds and bags of screen finds from subsquares and spits are given numbers that run in one single sequence from 1 to infinity for each meter square. A sample label would read: «BL-U6-107». Finds found in the screen or otherwise not individually piece-plotted, but otherwise «deserving» individualization (*i.e.*, retouched tools, identifiable bones or teeth) are given decimal numbers based on the field sample numbers assigned to their respective spit bags: *e.g.*, «BL-U6-108.3». Other analytically non-individualized screen finds (mainly microdebitage and bone splinters) are identified only by square, subsquare, stratum, spit and collective field sample number.

Excavation was carried out following the natural «lay-of-the-land», *i.e.*, following the presumed local angle(s) of the strata. In practice we would dig «spits» (excavation levels within natural strata) of generally no more than 5-8 cm in thickness (sometimes less in areas with extreme densities of finds; sometimes more in sterile layers such as the strata above YSS). All sediments were screened by units combining spits and quarter squares, so that even objects found in the screen (mostly microdebitage, bladelet fragments, small bone splinters, rodent remains) have a fairly precise provenience consisting of square, quarter-square, stratum, spit and depth range. Of course, piece-plotted objects have an additional degree of provenience precision: their three-dimensional coordinates. In 1994 all intact sediments were dry-screened on site through 2.5-3 mm mesh and samples of the residues were taken to Namur by Lacroix for finer wet screening for recovery of malacofaunal and micromammalian remains. In 1995 arrangements were made (*i.e.*, 280 m of hose run from the Sept Meuses campground on the ridgetop above the site) to water-screen on site, again through 2.5-3 mm mesh - after dry-screening through 5 mm mesh. Columns of samples for malaco- and microfauna were taken for later fine-screening, sorting and study by Lacroix in Namur (with further identification to be done by or in association with I.López Bayón and Professors Gautier, Peuchot and Cordy).

Micromorphological samples were taken by L.Lang from the stratigraphic sections before their final removal near the end of the 1995 season. Radiocarbon bone samples and dental cementum samples were selected after paleontological identification by Prof.A.Gautier. Flint artifacts (mainly retouched tools, but also some larger debris) that appeared relatively unpatinated, were selected for lithic microwear analysis (or residue analysis) in the field, minimally handled and put immediately into individual sealed plastic bags, unwashed and unlabelled. All other finds were washed in water, dried and labelled in the field laboratory (in Dinant in 1994 and in Namur in 1995). Faunal remains were separated for study by Gautier and his present and former students at the Universiteit Gent. Plaquettes were weighed, measured and inspected for engravings, cutmarks, ochre stains and for possible refits (several of which were found). Those bearing possible artificial modifications were set aside for study by M.Lejeune.

All flaked lithics were classified according to a uniform debris (core + debitage / blank) typology developed by Straus and students (Table 2). This classification, plus the weighing of all lithics (either individually in the case of piece-plotted items or other individualized objects, especially tools found in the screen), provide the basis for technological analysis. Piece-plotted

TABLE 2. BLANK OR DEBRIS (CORES+DEBITAGE) TYPES

ID	NAME	ATTRIBUTES
1	Non-cortical Trimming Flake	≤1cm with Hertzian morphology, no cortex
2	Non-cortical Shatter (small angular debris)	≤ 1cm without Hertzian morphology, without cortex
3	Plain Flake	> 1cm, no cortex
4	Primary Decortication Flake	cortex covers dorsal surface
5	Secondary Decortication Flake	some dorsal cortex
6	Plain, whole or proximal Blade	> 2cm twice as long as wide-whole or proximal fragment (with definite butt), no cortex
7	Primary, whole or proximal Decortication Blade	Length=2x Width & Length>2cm, cortex covers dorsal surface
8	Secondary, whole or proximal Decortication Blade	Length= 2x Width & Length>2cm, some dorsal cortex
9	Plain, whole or proximal Bladelet	≤ 2cm long, narrow, & thin - whole or proximal fragment, no cortex
10	Burin Spall	thick blade(let) with tri- or quadrangular section
11	Unidirectional Crested Blade	crest formed by flake scars perpendicular to blade axis in one direction
12	Bidirectional Crested Blade	same, but in two directions
13	Flake Core	core with only flake removals
14	Prismatic Blade Core	cylindrical core with only blade removals
15	Pyramidal Blade Core	pyramidal core with onlyblade removals
16	Prismatic Bladelet Core	cylindrical core with only bladelet removals
17	Pyramidal Bladelet Core	pyramidal core with only bladelet removals
18	Mixed Core	both flake and blade / bladelet removals
19	Non-cortical Chunk	> 1cm, without flake (large angular debris) morphology (i.e., no bulbs), includes core remnants and fragments of exhausted cores, no cortex
20	Platform Renewal Flake	has lip of platform, with nibbling from core preparation
21	Pièce Esquillée (splintered)	bipolar flake or core remnant
22	Cortical Trimming Flake	like No. 1, with some cortex on dorsal surface
23	Cortical Shatter	like No. 2, with some cortex
24	Broken Plain Blade	mesial or distal blade fragment, no cortex
25	Broken, Plain Bladelet	mesial or distal fragment like No. 9, but without cortex
26	Cortical Chunk	like No. 19, but with some cortex
27	Mesial/Distal Cortical Blade	like No. 24, but with some cortex
28	Medial/Distal Cortical Bladelet	like No. 25, with some cortex
29	Whole/Proximal Cortical Bladelet	like No. 9, but with some cortex
30	Fire-Cracked Rock	angular fractures, reddened and/or blackened
31	Pebble or Cobble	smooth, water worn stone
32	Hammerstone	
33	Plaquette	

items were individually measured and weighed. All lithics were also classified according to our *ad hoc* typology (Table 3) of lithic raw material types encountered archeologically in our work in Wallonia, a list developed in association with Prof.Otte, J-M.Léotard and E.Teheux. In addition, formal, retouched tools were all classified according to the original Upper Paleolithic type list of D.de Sonneville-Bordes and J.Perrot (1954-56) and retouched edge angles were measured. Multiple tool types on individual blanks, that are not covered by the established «Composite Tool» types (N° 17-22), are counted as separate tools (but they are not counted as multiple blanks in technological or raw material analysis). There are a dozen cases of such multiple-count tools (mostly doubles). All data (provenience and analytical) were entered into an SPSS computer database on a PC at the University of New Mexico for statistical analysis. Refitting of lithics and slabs was carried on both during initial artifact processing and later on, mainly by A.Martinez and R.Miller, but also by several other students (I.López Bayón, J.Orphal, R.Schwendler, J.Summers).

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TABLE 3. SOUTH BELGIUM LITHIC RAW MATERIAL LIST

Prepared by: J-M.Leotard, A.Martinez, R.Miller, L.G.Straus and E.Teheux.
(Used for le Trou Magrite, Huccorgne, Bois Laiterie and Abri du Pape, 1991-95)

ID	Description
9	Very fine grain, highly homogeneous, flint, white to gray with tiny black flecks, smooth uniform surface, opaque, crystalline inclusions, conchoidal fracture, pattern shiny. Source Tertiary deposits near Doisch Agimont (South Belgium) or Charleville (North France).
10.	Fine-grain flint: fine grain; shiny, smooth surface; opaque to slightly translucent; light brown or blue-gray original color; patinates white; chalk cortex; some white, ovoid inclusions ; conchoidal fracture pattern. Source: Cretaceous of Hesbaye and/or Spiennes. Intergrades with 11 and 12.
11	Fine-grain flint: fine grain; shiny, smooth surface; opaque to slightly translucent; brown-yellow color; patinates white; chalk cortex; occasional inclusions; conchoidal fracture pattern. Source Cretaceous of North Belgium. Intergrades with 10 and 12.
12	Medium-grain flint: medium grain; matte, slightly rough surface; opaque; occasional inclusions; gray color, patinates white; water-worn cortex; conchoidal fracture pattern. Source: Cretaceous, occurs in river beds. Intergrades with 10 and 11.
13	Fine-grain flint: fine grain; shiny, smooth surface; opaque; dark brown color with occasional yellow bands; does not patinate; water worn cortex; inclusions rare; conchoidal fracture pattern. Source: Tertiary of North Belgium.
14	"Pseudo" flint: fine grain; shiny, orthogonal surface; translucent to slightly opaque; light brown to dark gray, mottled; does not patinate; water worn cortex; inclusions rare conchoidal fracture pattern. Age and source unknown.
15	Black flint: like 12, except very matte; with some rare inclusions. Source: in local limestone.
16	Black flint: very fine grain; opaque; homogeneous; no inclusions; conchoidal fracture; orangeish chalk cortex, smooth and shiny. Source: possibly Obourg or, at Huccorgne, a local (Hesbaye) Cenomanian flint (like "Brandon" flint).
17	Light gray flint: fine grain; good quality; opaque; matte; grayish-white inclusions; chalk cortex, not water-worn; generally homogeneous; conchoidal fracture; (Cretaceous?). Source unknown.
18	Patinated "Hesbaye" yellow, medium-grain.
19	Other flint.
20	Chert - general, non-cortical: fine to medium grain; matte or shiny, smooth surface; opaque to slightly translucent; wide color range; does not patinate; cortex absent; inclusions rare; mainly orthogonal fracture pattern. Cretaceous. Source unknown.
20	Chert with unworn cortex: Same as above, but with unworn cortex. Occurs in Cretaceous geological beds.
20	Chert with water-worn cortex: Same as above, but with water-worn cortex. Cretaceous. Found in river beds.
30	Phtanite: medium-grain; matter or shiny surface; opaque; jet black to grayish black; does not patinate; gray cortex with occasional metal adhesions; no inclusions; conchoidal fracture pattern. Cretaceous. Occurs in geological bed at Ottignies, Central Belgium.
40	Medium-grain limestone; medium grain; soft, matte surface; opaque; gray-black;

	patinates gray; cortex impossible to distinguish; inclusions rare; conchoidal fracture pattern; violent reaction with acid.
41	Fine-grain limestone: fine grain; hard, matte surface; opaque; black with white-yellow flecks; light tray patina; cortex impossible to distinguish; inclusions rare; conchoidal fracture pattern; mild reaction with acid. Silicified limestone. Cretaceous. Intergrades with 15.
42	Crystallized limestone: fine to medium grain; hard, matter surface; opaque; gray-white mottled; does not patinate; cortex impossible to distinguish; occasional inclusions; mainly conchoidal fracture pattern; mild reaction with acid ("limy chert"). Cretaceous.
50	Medium-grain quartzite (includes quartzitic sandstone): medium grain; matte to shiny surface; opaque; wide color range; does not patinate; cortex water worn; no inclusions; conchoidal fracture pattern. Occurs as cobbles in river beds.
51	Fine-grain quartzite/siltstone: fine grain; matte surface; opaque; tan-brown color with occasional bands; does not patinate; cortex water worn; manganese inclusions; conchoidal fracture pattern. Possible source: Paris Basin; occurs as river cobbles.
52	Quartz crystal: fine to medium grain; shiny surface; translucent to opaque ("Milk quartz") milky-white to yellow; does not patinate; cortex unworn; no inclusions; orthoconchoidal to planar fracture pattern. Occurs in geological beds (incl. in the local limestone).
53	Sandstone.
54	Brussels sandstone.
55	Psammite: light brown with manganese oxide stains; medium-course grain (looks like quartzite); opaque; occurs in Meuse valley at Rivière and Lesse river valley at Gendron railroad. station in form of tabular plaquettes. Sandstone with quartz grains and mica inclusions.
56	Calcite.
57	Light olive green-gray micaceous schist; psammite-like (w/o manganese oxide specks) Badly eroded surfaces. Exfoliates in sheets along bedding planes with raised lumps; lamellar structure.
58	Red-brown (iron color) micaceous schist; dense, uniform, tabular, uneroded surface. Like 57, but denser, heavier and less eroded. (58 and 57 may be variants of 55).
90	Ochre/hematite.
99	Other stones.

Photo 1 - View from Sept Meuses Hill looking up (southward) the Meuse valley.

Photo 2 - Confluence of the Burnot Stream gorge with the Meuse at Rivière. The site is behind the hill at left. View is oriented c. NNW.

Photo 3 - Upper and lower mouths of Bois Laiterie Cave. Site is in lower mouth at left.

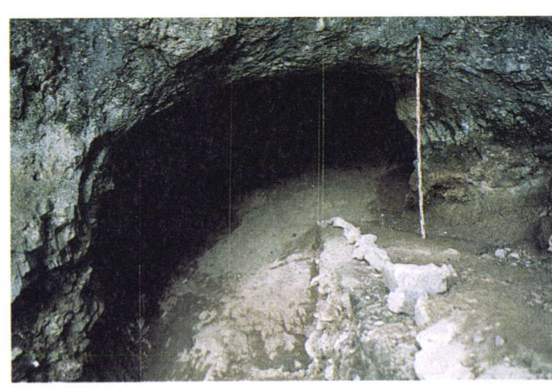

Photo 3 - Upper and lower mouths of Bois Laiterie Cave. Site is in lower mouth at left.