M. Otte et L.G. Straus (éds.). *La grotte du Bois Laiterie*. Liège, E.R.A.U.L. 80, 1997.

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SITE FORMATION / DISTURBANCE PROCESSES, SPATIAL DISTRIBUTIONS, SITE STRUCTURE AND ACTIVITY AREAS

L. G. Straus and A. Martinez

Introduction

Each archeological site lies somewhere along a continuum of intactness from a pristine, Pompeii-like state to a condition of complete redeposition. We are wont to call these extremes «primary» and «secondary» context. In reality, most recognized «sites» can be characterized as being «decimals». Both organic (human and animal) and geological processes have affected almost all sites, especially those which date back to the Pleistocene, in such a manner that the distributions of cultural residues are not found in exactly the *location* or position where they were abandoned by the humans who had originally created or manipulated them. The complexity of the archeological record has been the subject of numerous theoretical and applied works, especially over the past two decades (see Schiffer, 1987; Nash and Petraglia, 1987; Goldberg, Nash and Petraglia, 1993, all with references). The upshot of this research is that archeologists have learned how not to despair of recovering behavioral data (admittedly at varying levels of specificity - ranging from coarse to fine grain in resolution), as methods (some in existence since the turn of the century, such as G.W. Smith's early experiments in lithic refitting at Caddington, England) are available to assess the condition of and interpret the distributions of finds from a variety of types of sites, including caves and rockshelters (*e.g.*, Straus, 1990).

The main thing to keep in mind is that one should never automatically interpret all patterns within a site (especially a very old one in a cave) as if they could *only* be due to the actions of the original human inhabitants. A program of site formation / disturbance analyses is necessary before making any qualified behavioral interpretation.

Two recent examples of such a procedure concerning Paleolithic rockshelter/talus slope sites are the cases of l'Abri Dufaure (Magdalenian and Azilian) (Straus, 1995) and Combe-Capelle Bas (Mousterian) (Dibble and Lenoir, 1995) both in SW France.

It is the purpose of this chapter (and of the micromorphology chapter: see Courty, this volume) to explore the state of the Magdalenian deposits in Bois Laiterie Cave and then to analyze the distributions of artifacts, manuports, faunal remains, burned objects and refitted lithics. Taking natural processes into account, we argue that it is nonetheless possible to extract information on the human organization of space within this small site, and thereby to help interpret its functions and role or place within the cultural and economic landscape of the Belgian Magdalenian.

The Bois Laiterie «Problem»

As described earlier, Bois Laiterie has a very steeply sloping bedrock, with the principal grade descending West-East at an angle of c.20-30° down from the upper mouth to the lower chamber where the site was located. The secondary gradient of the bedrock floor of the lower cave slopes at an angle of c. 20-25° down from the cave rear to the mouth and exterior ledge, before plunging vertically down the lower cliff-face, which is covered by the talus slope of the Burnot gorge. Gradients in the «gully» in the bedrock paralleling the eastern wall of the lower cave can be even steeper, making for a veritable «chute». Intuitively it would seem hard to imagine how archeological materials and sediments could have remained more-or-less in place in such a setting, especially given the presence of the upper cave mouth from which water could flow downward - and fast! The sloping bedrock would also be an ideal surface for the occurrence of solifluction, especially when sediments on a precarious angle of repose were to become lubricated with water.

Fears of substantial disturbance within the archeological deposit were promoted by the discovery of psammite slabs that lay at steep angles and even vertically, with five refit sets that cross-cut strata (see Miller and López Bayón, this volume). Other elongated objects were also often found lying akilter or on end. Yet at the same time, we continuously found fragile faunal remains and lithics in excellent condition throughout the whole site. Bones are neither rolled nor battered. The faunal assemblage is not dominated by only the most solid elements (teeth, foot bones, etc.) as would be the case in an assemblage that had suffered heavy mechanical disturbance. The antler sagaies are very well preserved. Most flints (including the smallest, most delicate chips and bladelets) are «fresh», although generally patinated. Edges are usually razor sharp with little or no edge damage that could be attributed to movement within the deposit. There are only a very few pieces that are in fact heavily battered or blunted («pièces émousées») - and these look like artifacts that had been picked up elsewhere and brought to BL for re-use. There are virtually no pieces with «ragged» edges due to abrasion.

So we were faced by an apparent contradiction: a site where one would predict massive disturbance and erosion and where there were many steeply angled manuports and artifacts, but one which also had excellent preservation that would seem to belie the possibility that the deposit had undergone significant movement or churning. The first question, then, is «How intact is the Magdalenian deposit in Bois Laiterie Cave?», or, to the contrary, «How disturbed is the deposit?»

Once this question is at least tentatively answered, one might be able to ask and address the second question: «What indications might there be for the site structure, for the organization of activities or of residue disposal in space, and what might we be able to learn from any patterned distributions of objects not attributable to natural (*i.e.*, non-human) processes?»

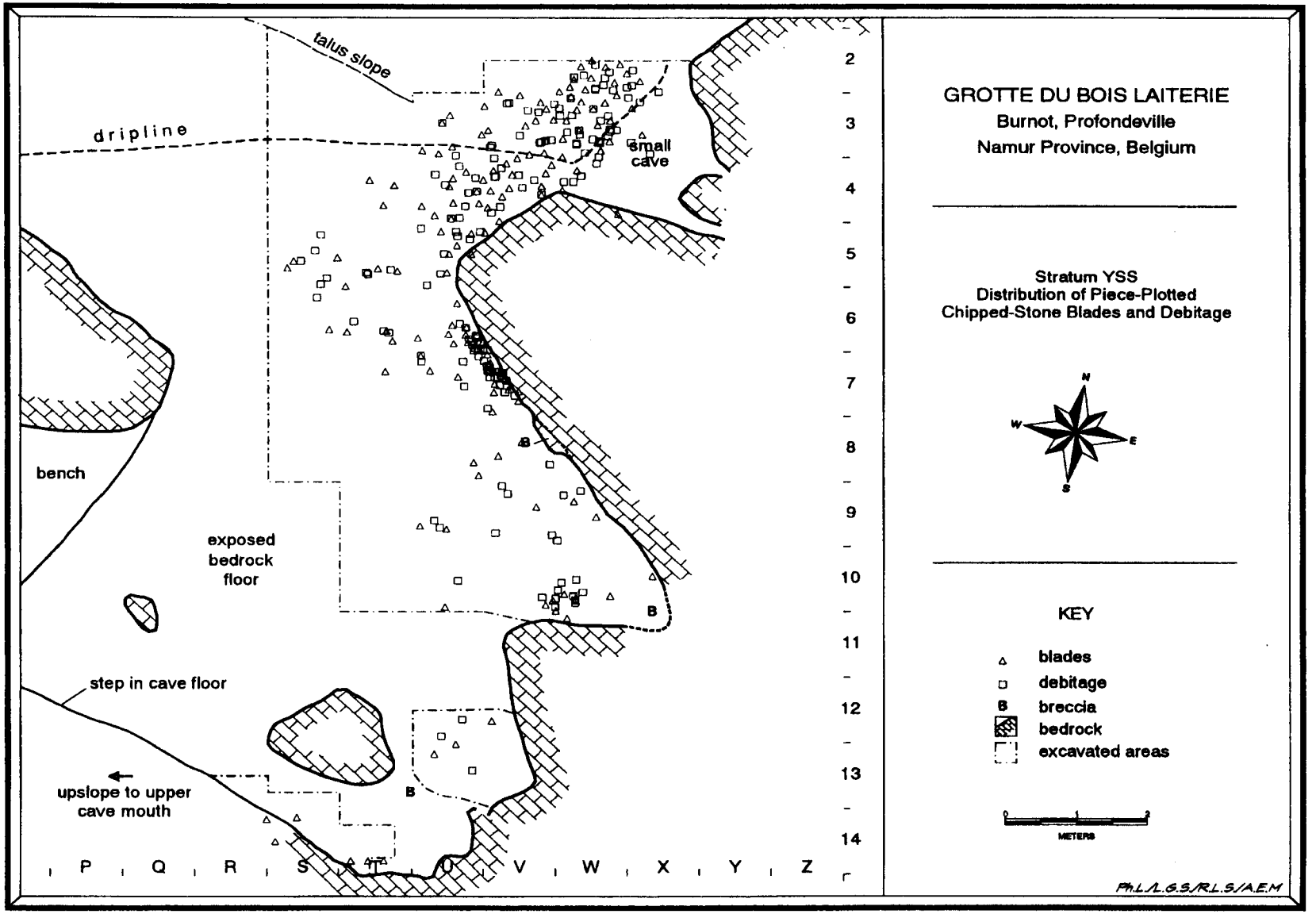

Fig.1 - YSS, Distribution of piece-plotted blades and other large debitage.

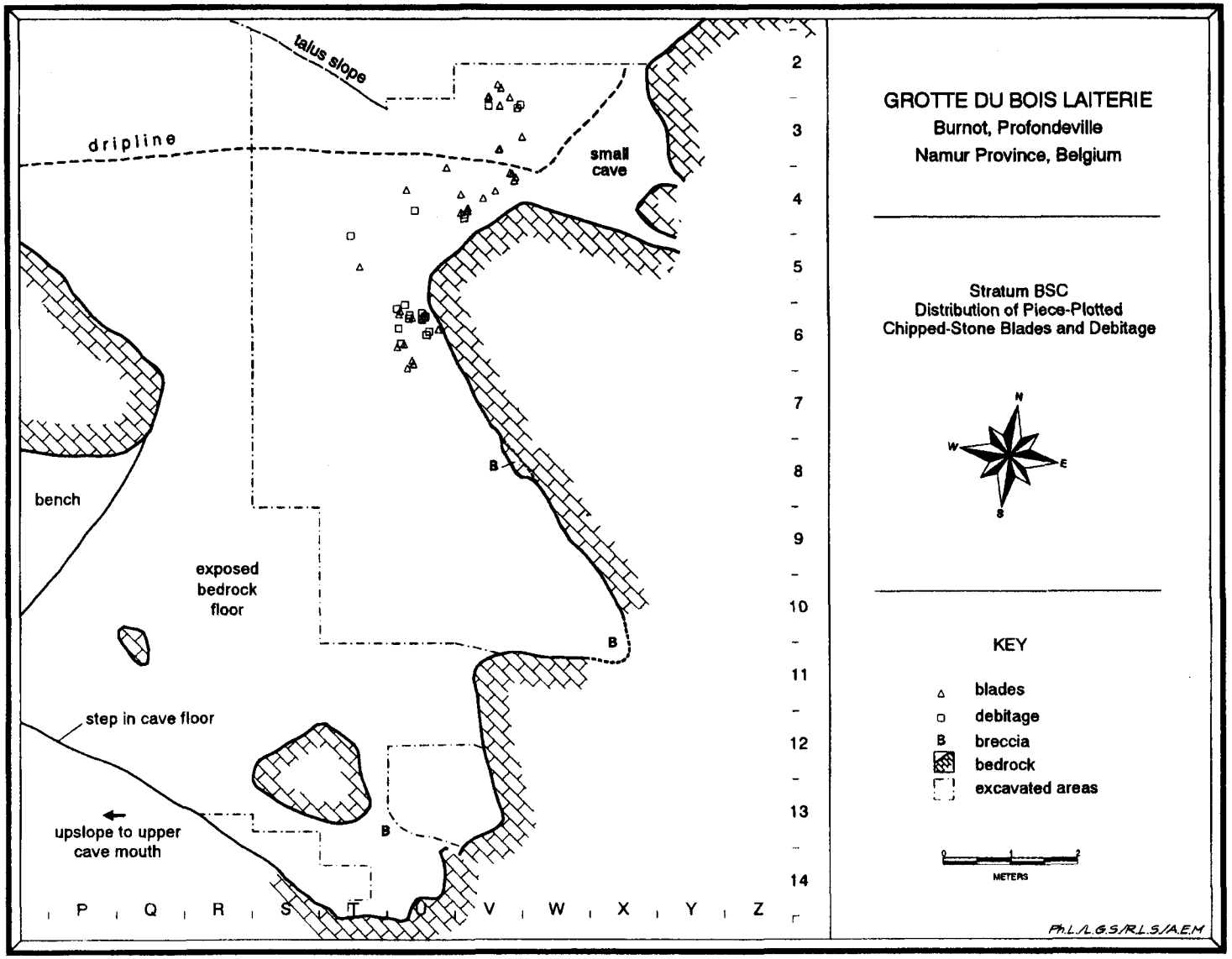

Fig.2- BSC, Distribution of piece-plotted blades and other large debitage.

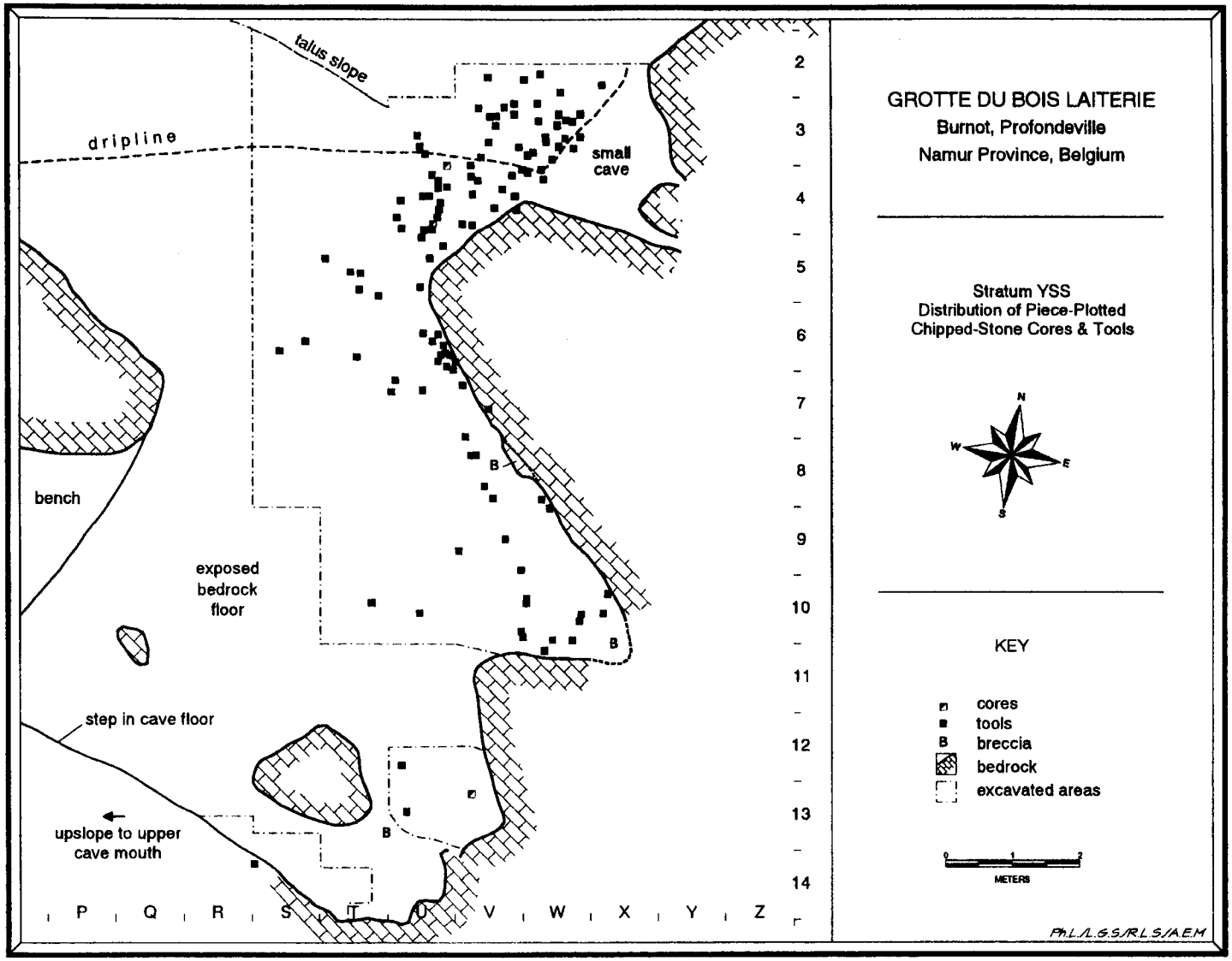

Fig.3- YSS, Distribution of piece-plotted cores and tools.

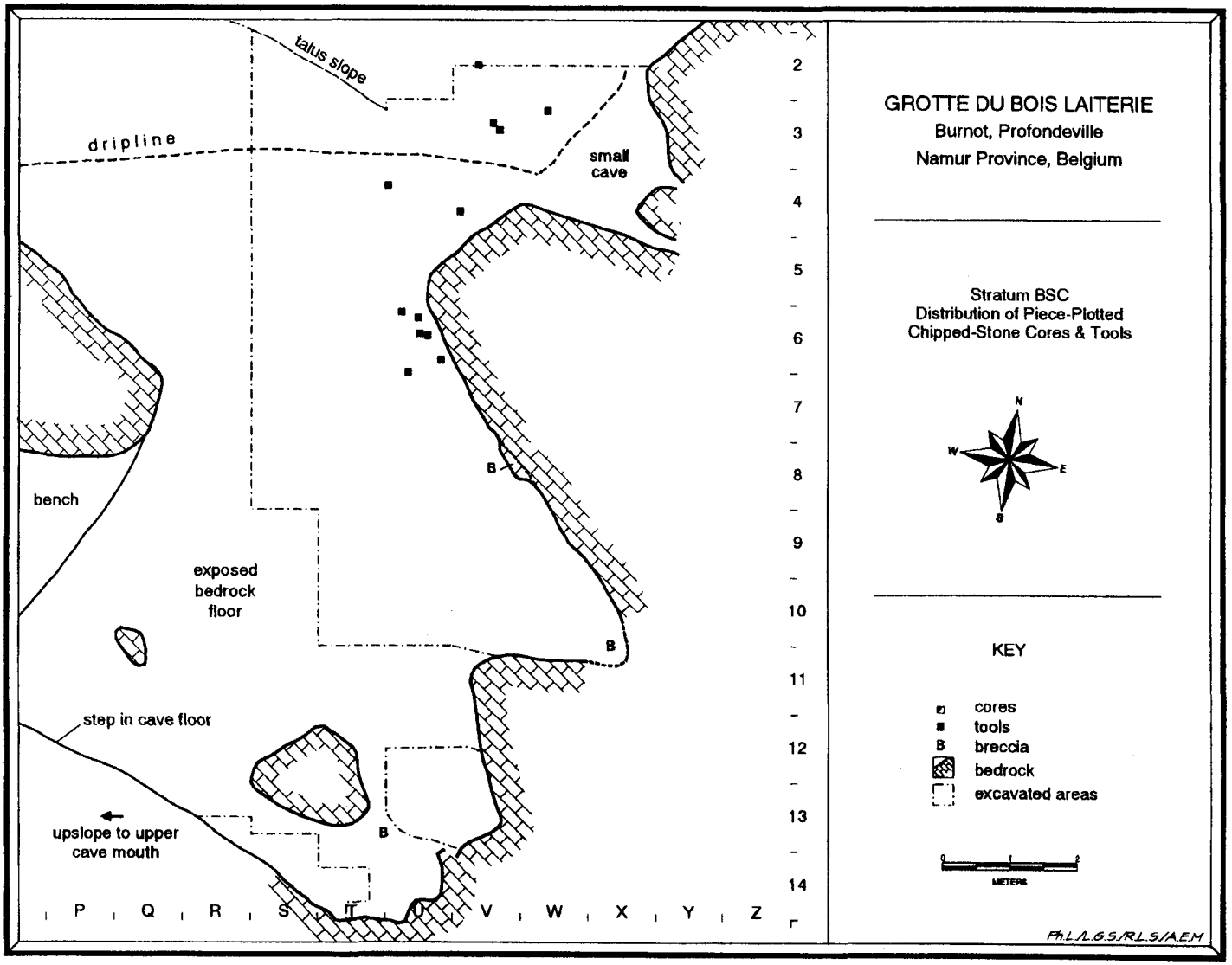

Fig.4- BSC, Distribution of piece-plotted cores and tools.

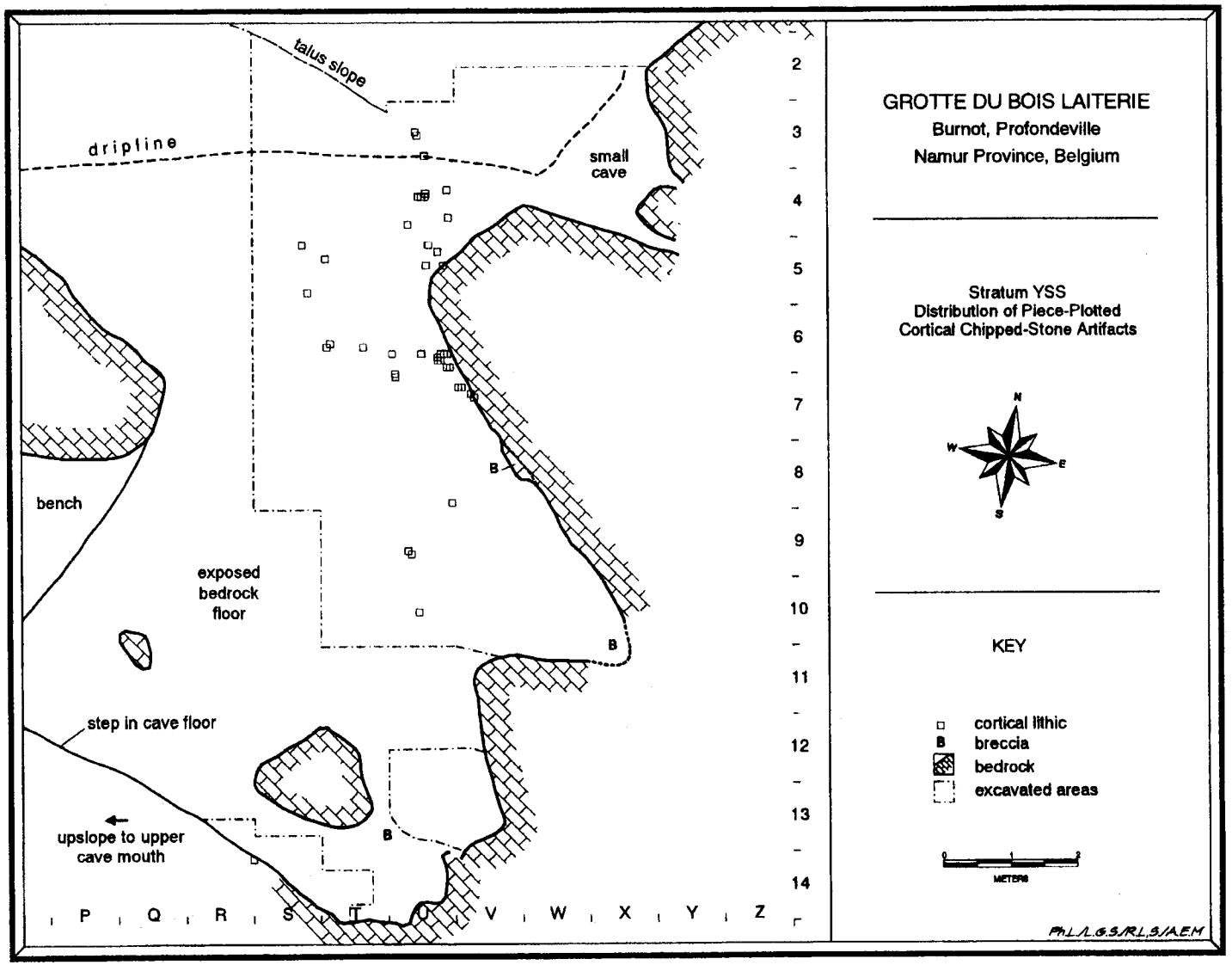

Fig.5- YSS, Distribution of piece-plotted cortical artifacts.

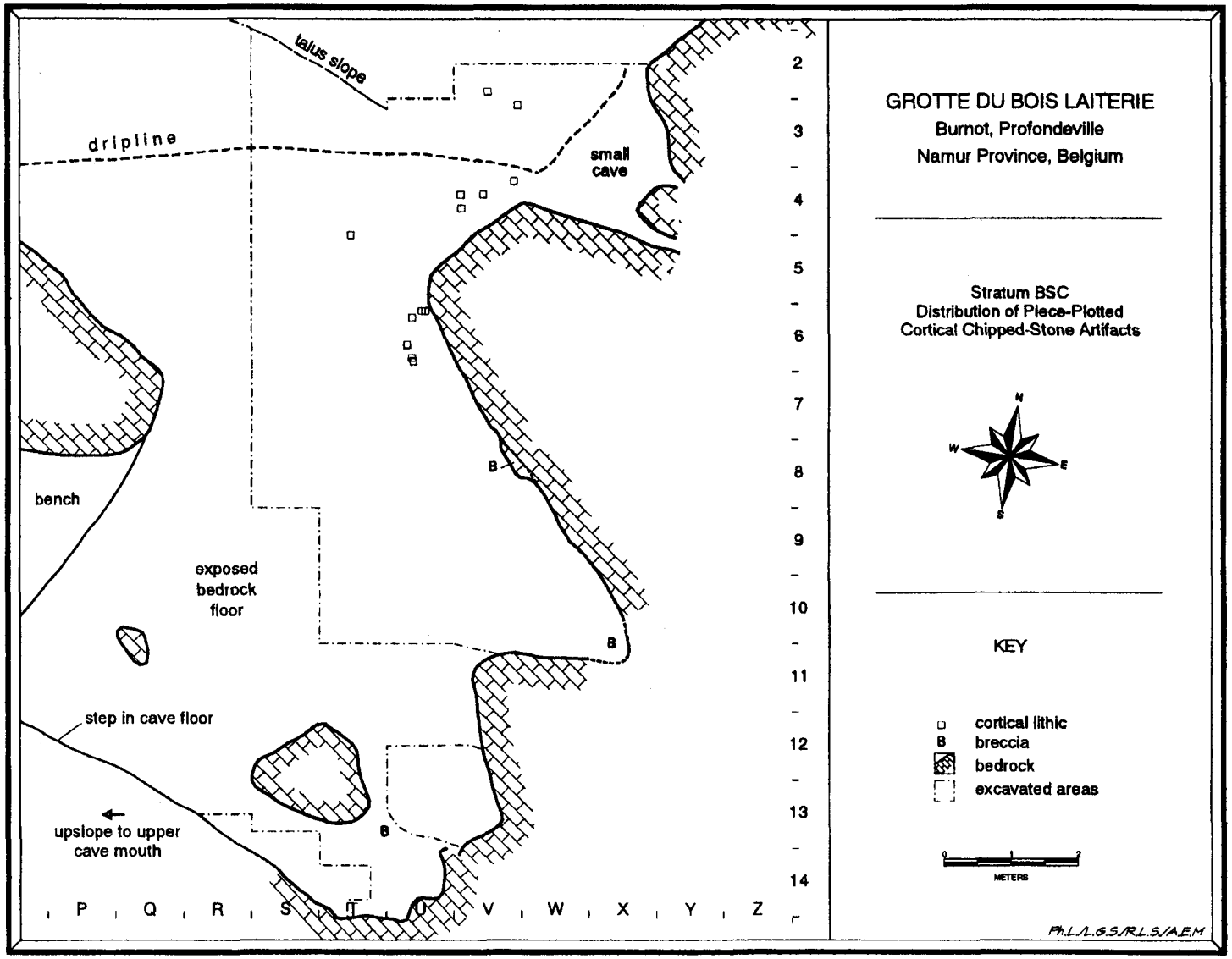

Fig.6- BSC, Distribution of piece-plotted cortical artifacts.

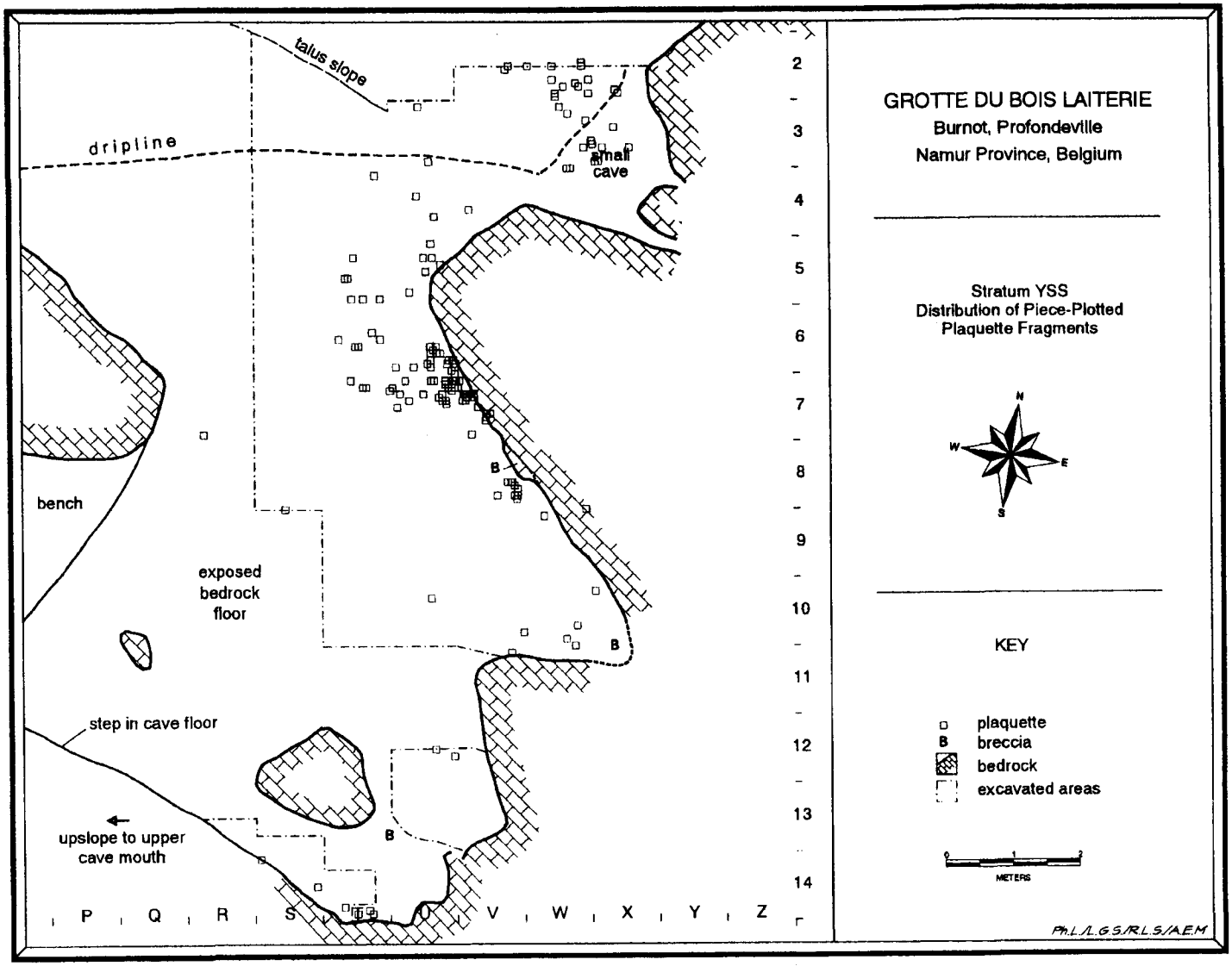

Fig.7- YSS, Distribution of piece-plotted plaquettes.

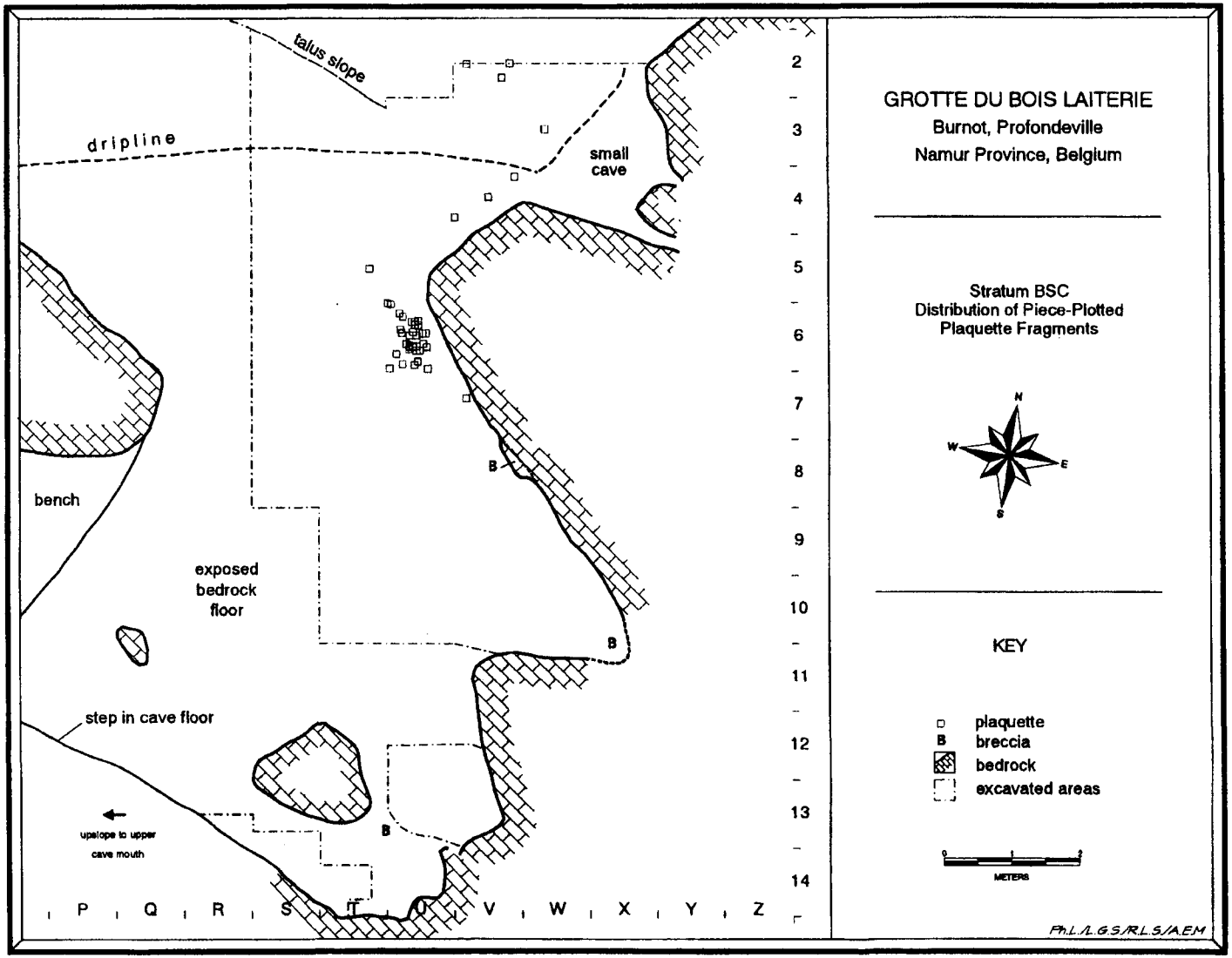

Fig. 8- BSC, Distribution of piece-plotted plaquettes.

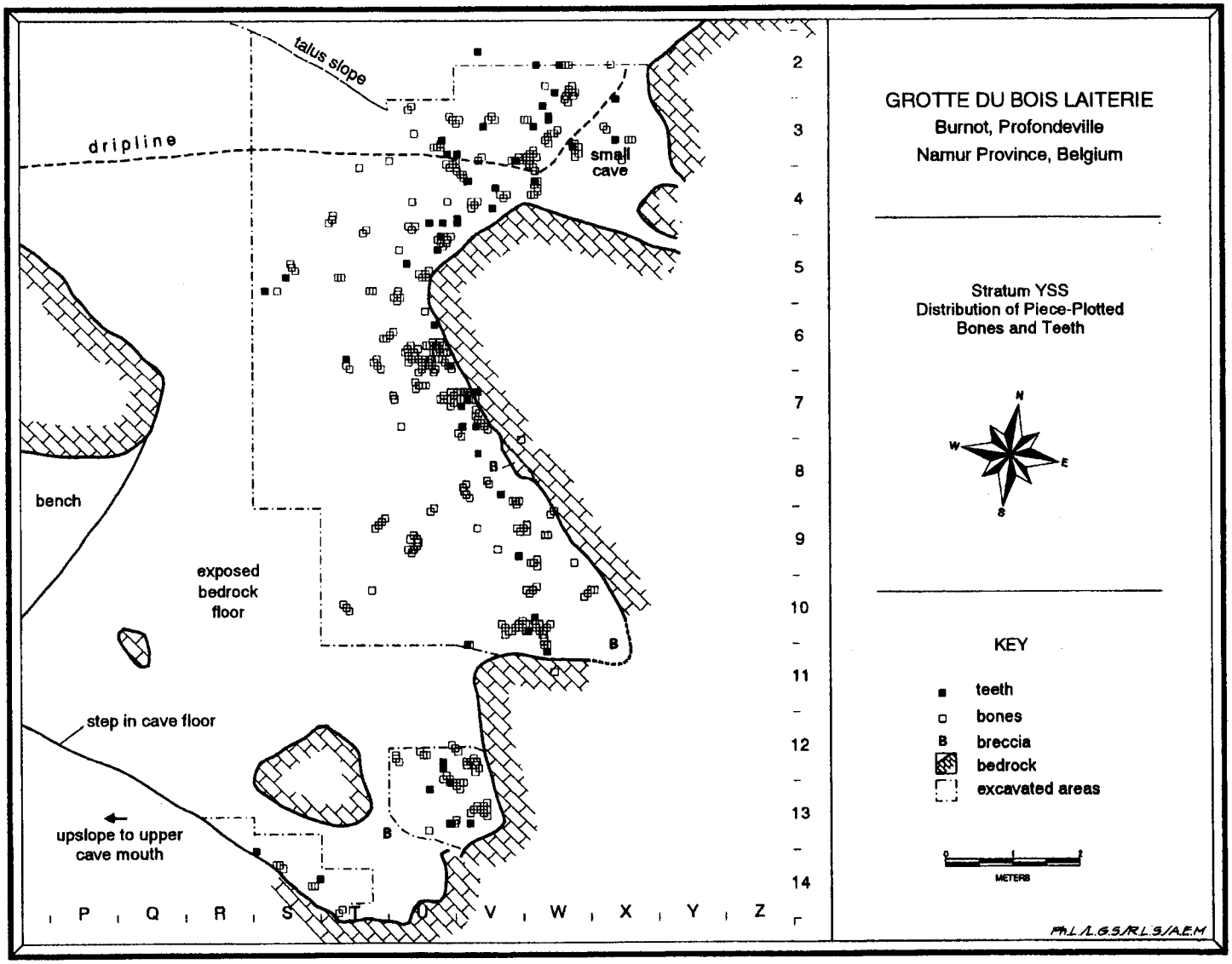

Fig.9- Bois Laiterie, YSS, distribution of piece-plotted faunal remains.

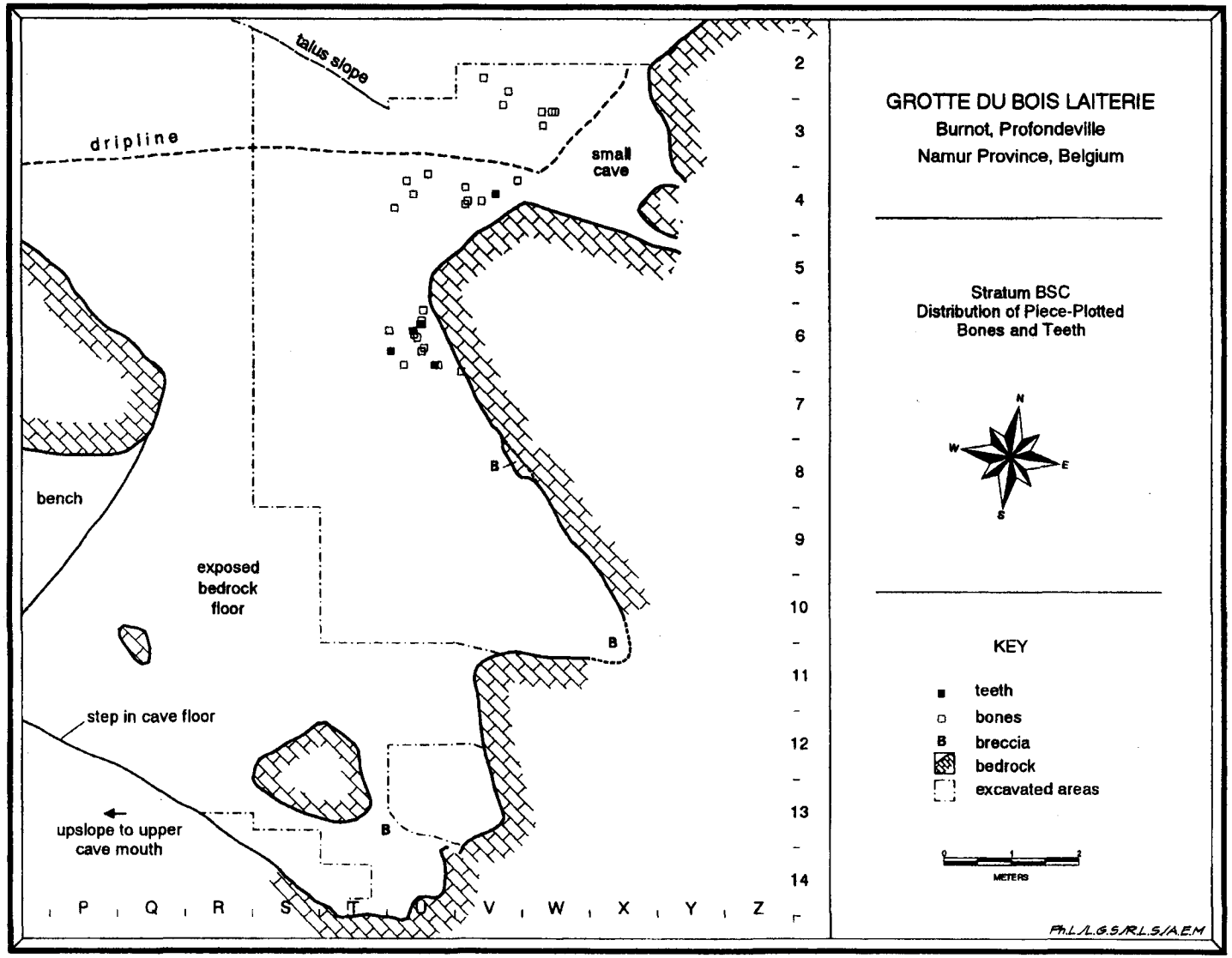

Fig.10- BSC, Distribution of piece-plotted faunal remains.

The Unity of the Magdalenian Horizon: YSS+BSC

In sedimentological terms there is a distinction (albeit vertically gradational and horizontally variable) between the two stratigraphic units which yielded abundant Magdalenian artifacts and associated faunal remains: YSS (yellowish-red sandy silt) and BSC (reddish-brown basal silty clay) - as well as between these and the grey gritty lens near/at the base of YSS at the cave mouth and *vis à vis* RS (red sand). Because the sedimentological difference between YSS and BSC is subtle, variable and gradational, and because artifacts, manuports and faunal remains (essentially not found in the overlying or underlying levels) of the same general kinds are distributed continuously between the two lithostratigraphic units (identified and hence «created», after all, by us), one can pose the question as to whether their distinction has any meaning or validity in an *archeological* sense. Do YSS and BSC in any respect represent distinct occupations of the site at different times, insofar as we can discern and measure them? Can we really make such a distinction?

First of all, about 21% of the Magdalenian debris and about 13% of the Magdalenian tools were found in BSC. Similar, significant portions of the psammite plaquettes (slabs) and faunal remains also came from BSC. Indeed, some individual large, tilted or vertical slabs cross-cut the two strata and some slab fragments refit across them (Miller and López Bayón, this volume), lending weight to skepticism over the existence of any break between these units, whose formation might, to the contrary, be seen as continuous. Figs.1-10 show the respective distributions for YSS and BSC of (Figs.1-2) piece-plotted blades + large debitage, (Figs.3-4) piece-plotted cores and retouched tools, (Figs.5-6) piece-plotted cortical artifacts, (7-8) piece-plotted plaquettes, and (Figs.9-10) piece-plotted faunal remains. The only notable differences between these paired distributions are that BSC has far fewer of all object classes than YSS and that BSC finds are limited to the front of the cave and the adjacent terrace area. BSC simply did not exist as a discernable unit to the south of the «6» row. Otherwise the YSS and BSC distributions coincide quite substantially, generally showing major concentrations of most types of finds in area of square U6 and, more diffusely, in the area of squares U-V/3-4. There is particularly a great mass of plaquettes in and immediately around U6 in *both* stratigraphic units and the distribution is absolutely continuous vertically as well as horizontally.

Figs.11 and 12 show the lumped horizontal distributions of piece-plotted lithic artifacts and faunal remains for both strata together and they also show the vertical distributions of these artifacts and bones + teeth by two «cuts» (rows S-U combined and rows V-X combined). (Gaps or low-density areas exist in the vertical distributions in part due to the existence of areas that had already been dug out [Lacroix's *sondages*] or that are occupied by bedrock of the eastern cave wall or the western bedrock floor slope.) The vertical distributions show no discernible lenses within YSS (although very locally, such distinctions were occasionally suspected, notably in square V8). They do show a few «high» outliers, but these are objects that were found atop or in crevices in the bedrock floor in the upslope «S» row. Most significantly, there is no indication of a break between items labelled as coming from YSS and those labelled as coming from BSC. The distributions are completely continuous both horizontally and vertically.

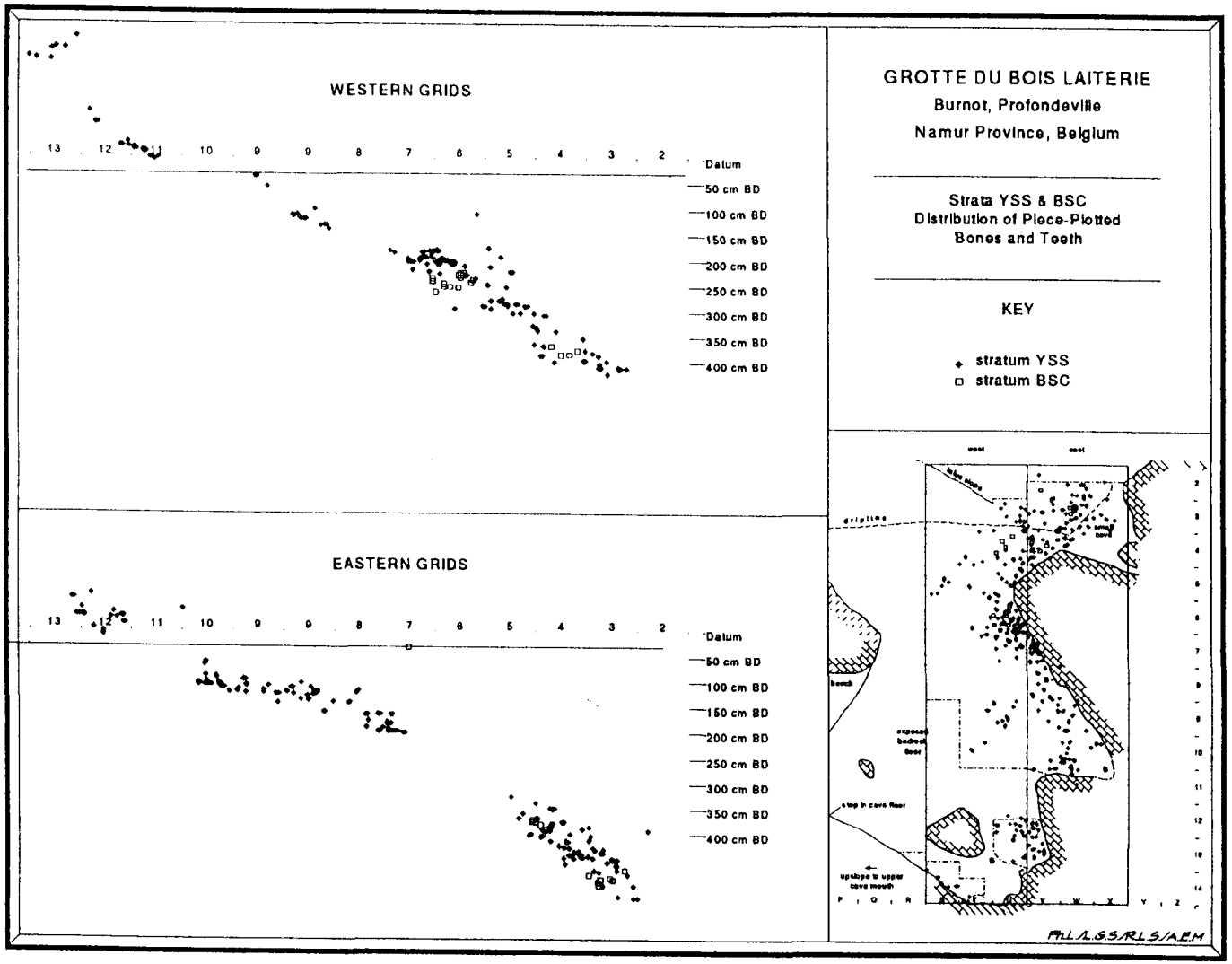

Fig.11- Vertical distribution of faunal remains in BSC + YSS.

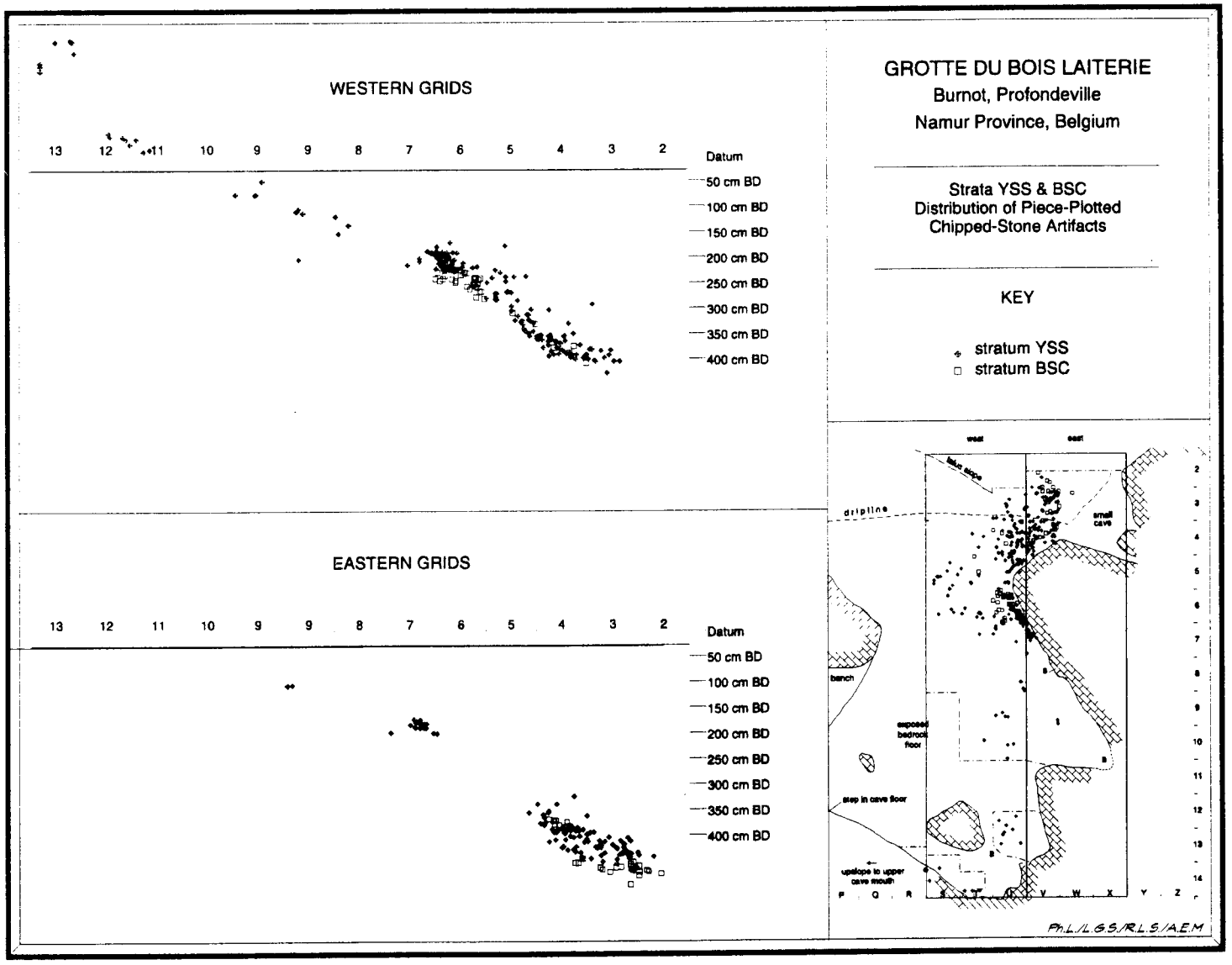

Fig.12 - Vertical distribution of lithic artifacts in BSC + YSS.

There are detailed differences in terms of the composition of the debris assemblages from YSS and BSC. In YSS, 9.5% are unretouched bladelets and only 5% in BSC; yet 43% of the tools from BSC are backed bladelets while there are only 19% in YSS. In YSS, 16% of the debris are blades, but only 8% in BSC. In YSS, 56% of the debris is composed of microdebitage (trimming flakes and shatter, both <1 cm), yet in BSC the relative frequency of these smallest lithics is 76%. In contrast, all three cores that were found *in situ* are from YSS. Overall, there is a statistically significant difference between the debris assemblages of YSS and BSC, but it is hard to interpret. It is possible that larger objects were prevented from migrating downward into BSC from YSS by their greater area, leading to a degree of size-sorting between the two units (or, in reality, *within* the stratigraphic horizon that contains Magdalenian artifacts).

Finally, lithic refits (dealt with in more detail below) also show the intimate archeological relationship (or identity) between YSS and BSC (Fig.13). Of the 32 sets of refits, fully 10 (nearly one-third) have elements from both strata that conjoin. This clearly suggests that the *archeological* subdivision of YSS and BSC is illegitimate, either because the assemblages come from one human occupation of the cave or, more likely, from several, closely-spaced epsiodes of use of the cave that became amalgamated by prehistoric human trampling and/or digging, by animal burrowing, by minor solifluction and/or cryoturbation, by rockfall and by the weight of overburden on the fairly plastic sediments of YSS and especially BSC (for comparisons, see, for example, P.Villa, 1977 and 1982; Villa and Courtin, 1983). Since no legitimate subdivision is possible, in all our typological and technological (and faunal) analyses, we lump data from YSS and BSC as «the Magdalenian horizon», even though it is likely to represent a palimpsest of more than one (but not many) occupation of the cave. In addition, there is a case of a lithic conjoin between YSS and the Grey Lens at its base, and several intra-YSS conjoins are separated by substantial vertical distances within the same square (the longest such cases being separations of 40, 45 and 46cm). Fully 23% of plaquette refits also cross-cut YSS-BSC. All this shows that the Magdalenian horizon cannot be analytically subdivided and therefore must be treated as one unit.

Orientations and Inclinations

In order to see whether there may have been natural processes that systematically rearranged the cultural materials in the Magdalenian deposit of Bois Laiterie, compass orientations and inclinations were measured and analyzed for elongated artifacts (mainly blades and plaquettes) and long bones. Were running water involved in deposition or disturbance of the Magdalenian, there should be alignments paralleling the direction of the flow. If soil creep or flow (solifluction) were operative, there should be alignments perpendicular to the axis of the slope and inclinations should be parallel to the angle of the slope. On the other hand, in the microenvironment of a cave, all kinds of confounding factors (cave walls, niches, anfractuosities, ledges, columns, etc.) can make the interpretation of results difficult or unclear.

The overall distribution of elongated object orientations for YSS is presented in a rose diagram (Fig.14). In these diagrams, compass orientation is based on the direction of the

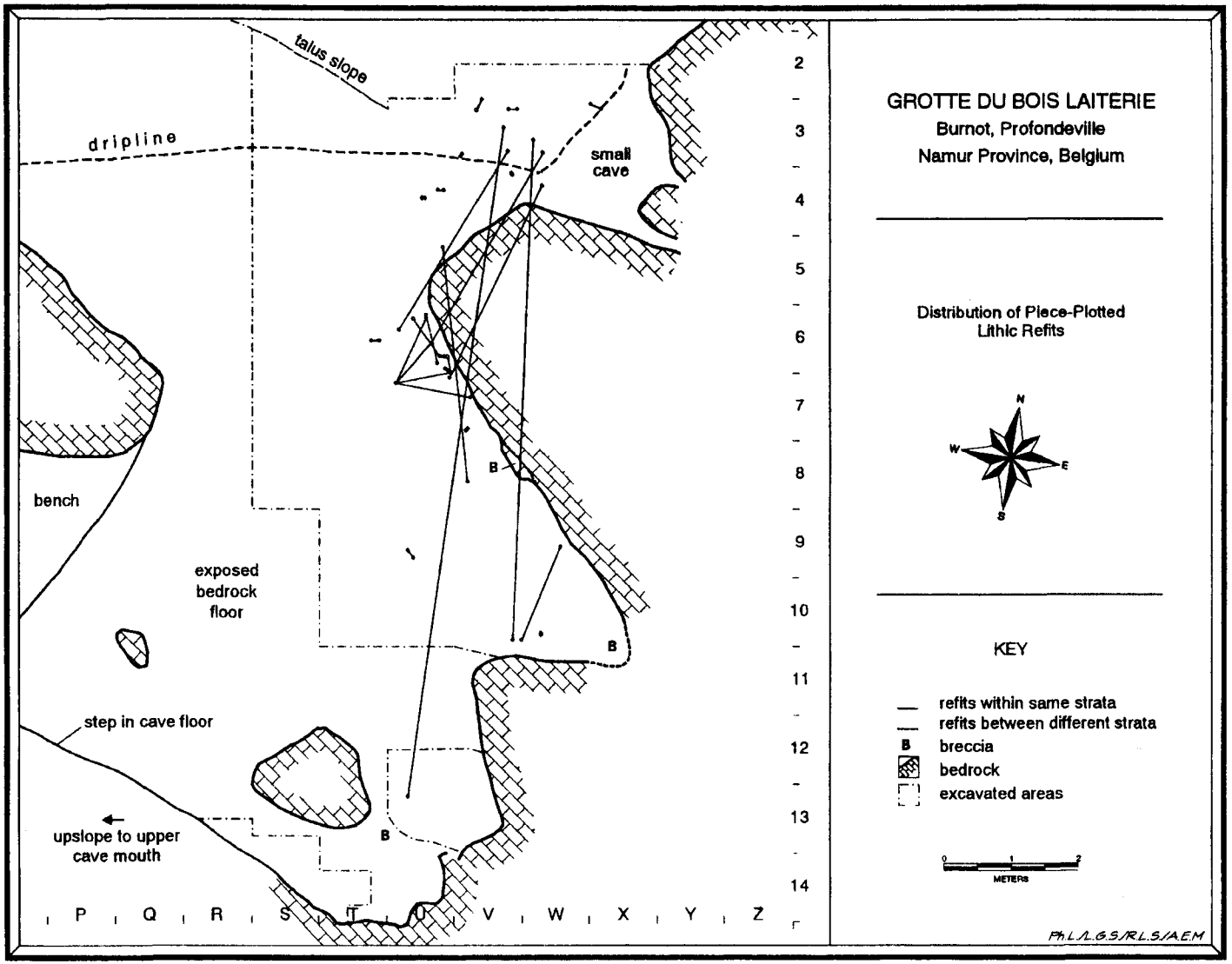

Fig.13- Plan of piece-plotted lithic refits, including inter-strata sets (YSS+BSC).

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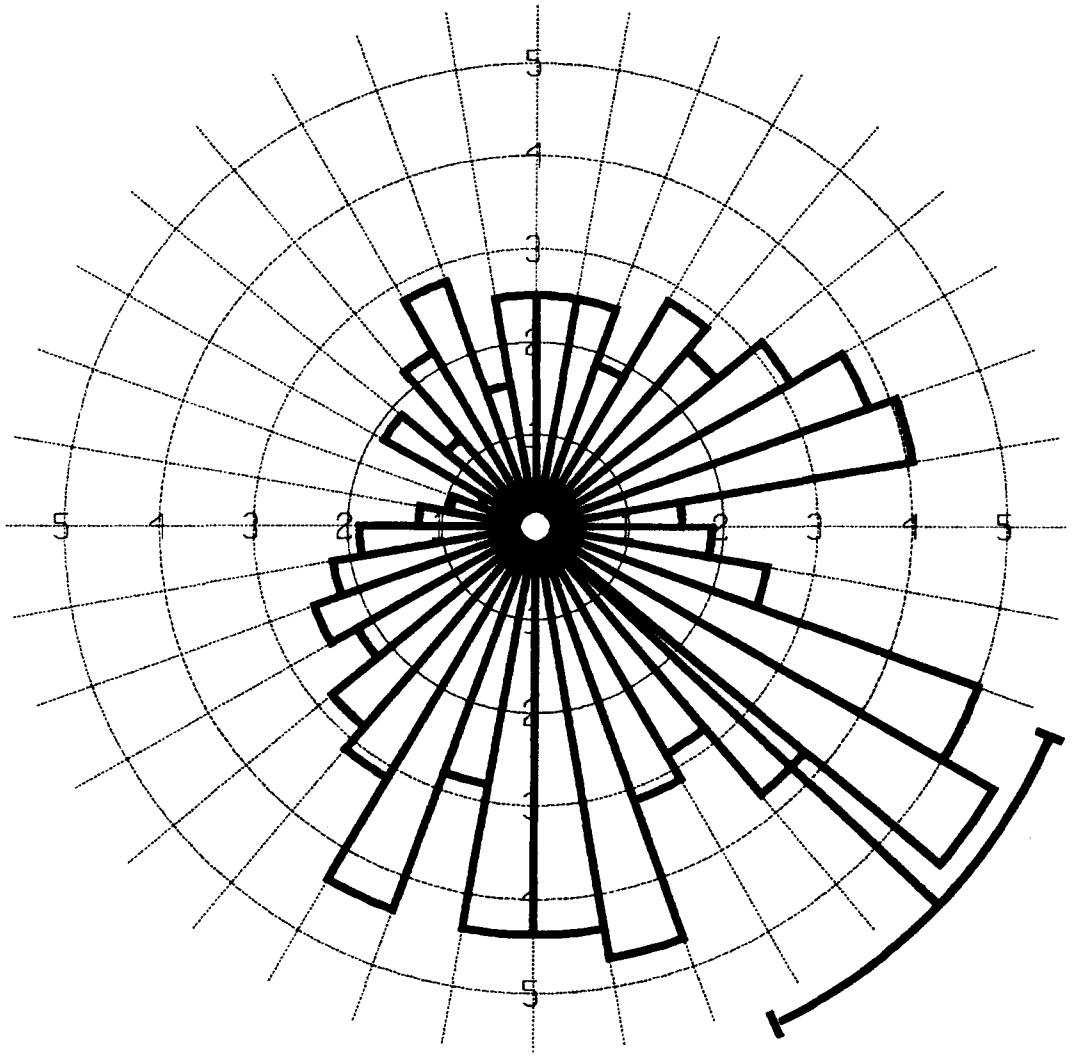
STRATUM YSS
Rose Diagram of General Orientation Information



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Standard Deviation ... 1.18 Percent
Vector Mean ......... 133.23 Degrees
Confidence Interval .. 20.98 Degrees
R-mag ............... 0.21
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Fig.14- YSS general - slab, artifact and bone orientations.

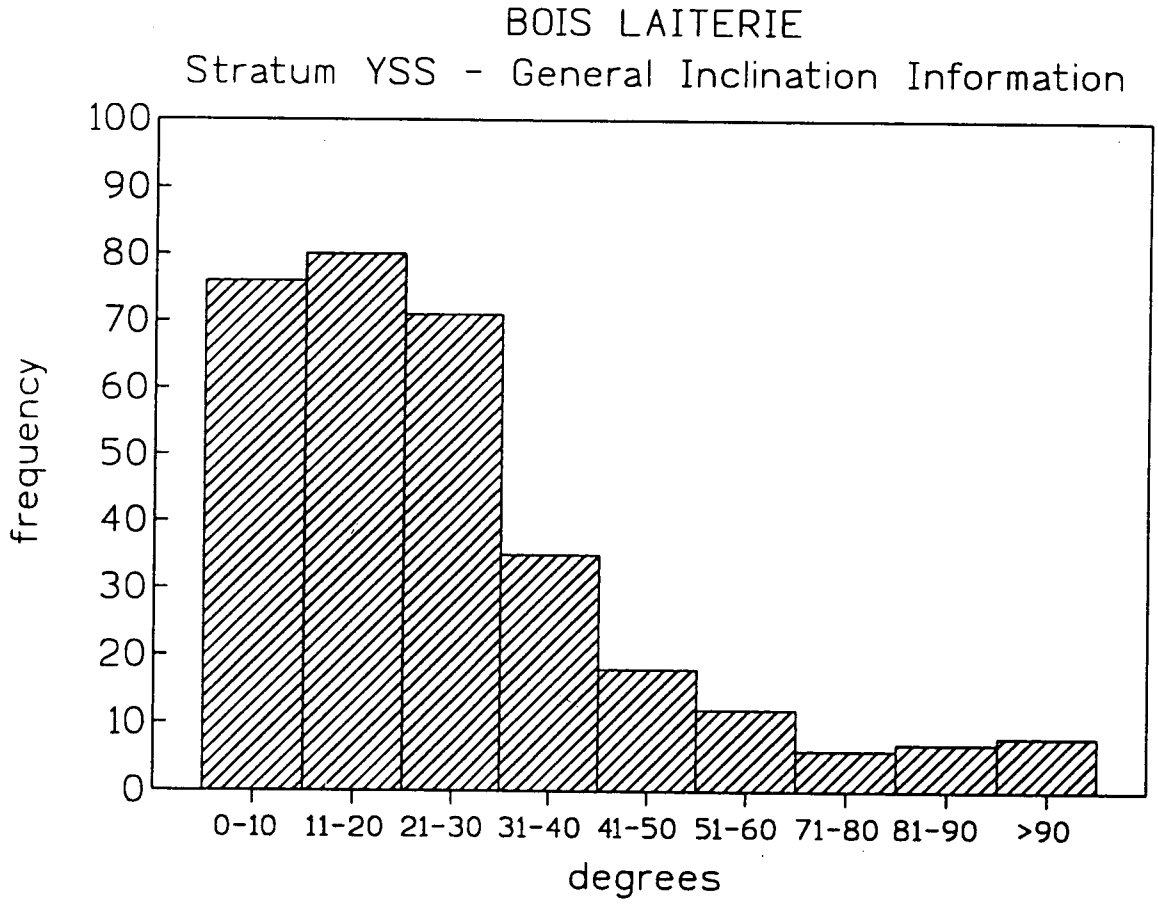

Fig.15- YSS general - slab, artifact and bone orientations.

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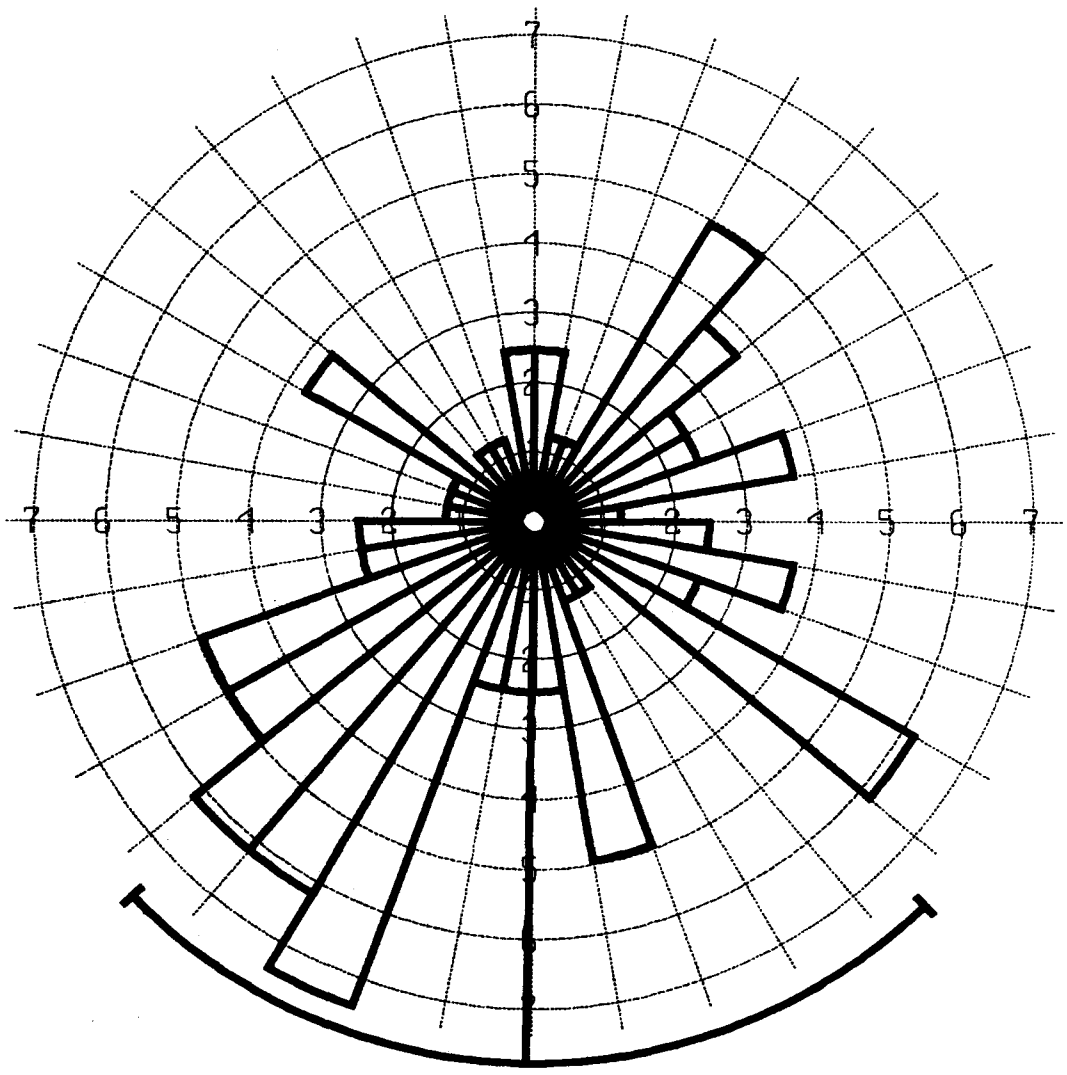
STRATUM YSS
Rose Diagram of Orientation Information for Cave Talus

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Maximum Percentage ... 7.4 Percent
Mean Percentage ..... 3 Percent
Standard Deviation ... 1.78 Percent
Vector Mean ......... 180.59 Degrees
Confidence Interval .. 45.64 Degrees
R-mag ............... 0.19
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Fig.16- YSS terrace - slab, artifact and bone inclinations.

higher end of each object (the upper end, as detemined by clinometer). Each concentric circle equals 1% of the total number of meansured items. Magnetic North (essentially the cave mouth) is at the top of the rose diagram. The heavy curved bar at the circumference describes 2 standard deviations around the mean orientation. The overall preferred orientation for all of YSS lies in the ESE direction, but with a second mode at essentially due South. The histogram of inclinations (Fig.15) of elongated objects from all of YSS (n = c.340 items) shows that over two-thirds lay between 0° and 30° (between flat and following the dominant slope angle of the cave bedrock floor).

The rose diagram (Fig.16) of orientations for the terrace area of the site (here labelled «talus» and corresponding to the 4-2 rows) displays a very wide dispersion of values, with none being truly predominant. This would seem to preclude any systematic rearrangement by running water, despite the exposed location at the edge of the precipitous talus in front of the lower and small cave mouths. Similarly, the inclination values (Fig.17) include relatively many items that are flat or sloping no more than 30°. This would suggest that, despite the exposed location, once buried (presumably very quickly) the artifacts and bones on the terrace atop the narrow ledge of bedrock were immune from movement. Artifacts and bones were, in fact, found down to contact with bedrock in YSS/ BSC all the way to the edge of the ledge midway north across the «2» row, at which point the bedrock plunges straight down and obviously the archeological material stops. The stability of the buried Magdalenian «surface» on this ledge is remarkable, particularly since it is also at the foot of a very steep exterior slope descending along the exposed upper cliff-face from the upper cave mouth to the West, as well as at the end of the internal South-North bedrock slope descending from the cave rear.

Distributions of values for orientation and inclination for the cave front area (7-5 rows) are very different from those of the terrace. Fig.18 shows a very strongly preferred orientation of due south, with a secondary mode at due north (*i.e.*, objects lined up along the axis of the cave, its eastern wall (where most of the finds are from) and the bedrock «gully». The objects are mainly following the lay-of-the-land, with their high ends toward the cave rear, although there are some (those of the North mode) whose tilt is diametrically opposite to that of the bedrock slope along the N-S axis. There is another secondary mode of orientations toward the ESE. Fig.19 shows that there are fewer flat-lying objects relative to ones lying between 11-30°, and there is quite a respectable number of steeply tilted items (10 lying between 51-90° or more). It is quite likely that in this zone of the site (especially the extremely rich square U6) there was a «wall effect»: items aligning themselves along the wall and therefore naturally taking on a N-S orientation. Trampling in this intensively used (sheltered by still relatively well-lit part of the cave, combined with moist sediments, may have been the cause of the extreme angle of many of the cultural items. It is precisely in this sector that the base of the Magdalenian horizon consists of the most plastic, most purely clayey area of BSC, first defined, in fact, in U6. It is also here, probably not coincidentally, that we found by far the densest concentration of plaquettes. Probably people were obliged to make a bit of paving investment here in order that the best part of the cave not be excessively muddy, slippery and unpleasant underfoot. But the very moisture in the U6 area contributed to extensive *in situ* movement due to trampling and overburden weight. This means that things got rearranged within the clayey matrix without actually travelling significant distances laterally.

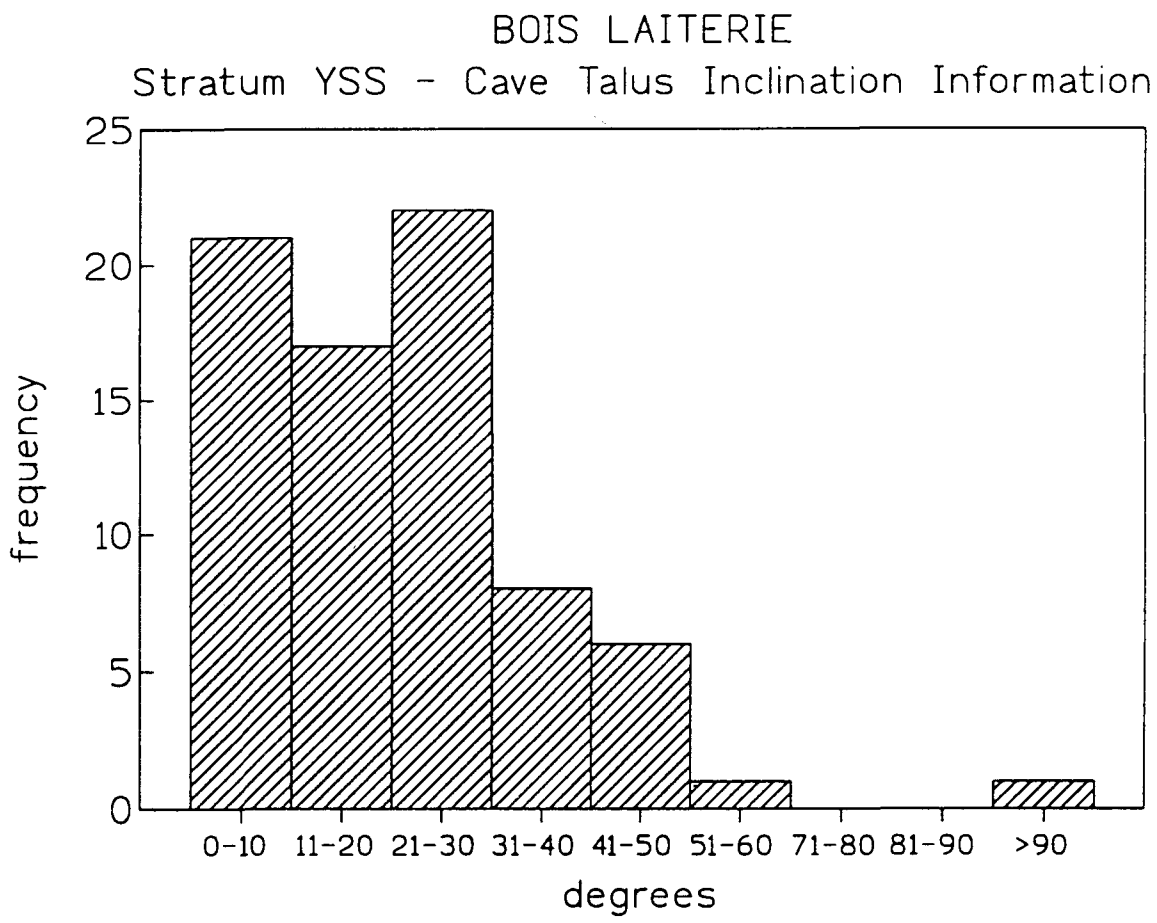

Fig.17- YSS terrace - slab, artifact and bone inclinations.

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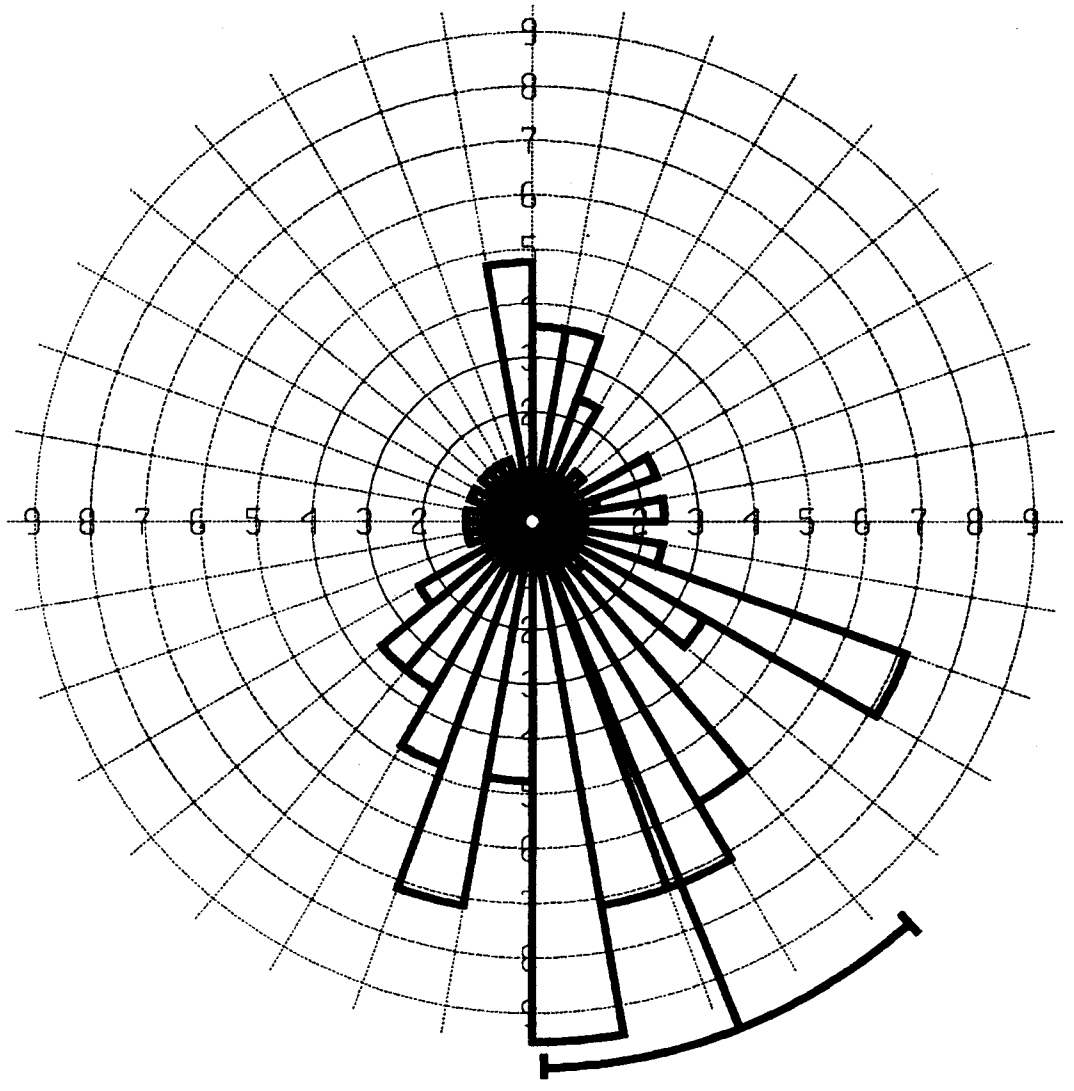
STRATUM YSS
Rose Diagram of Orientation Information for Cave Front



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Mean Percentage ..... 3.4 Percent
Standard Deviation ... 2.39 Percent
Vector Mean ......... 158.06 Degrees
Confidence Interval .. 20.69 Degrees
R-mag ............... 0.4
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Fig.18- YSS cave front - slab, artifact and bone orientation.

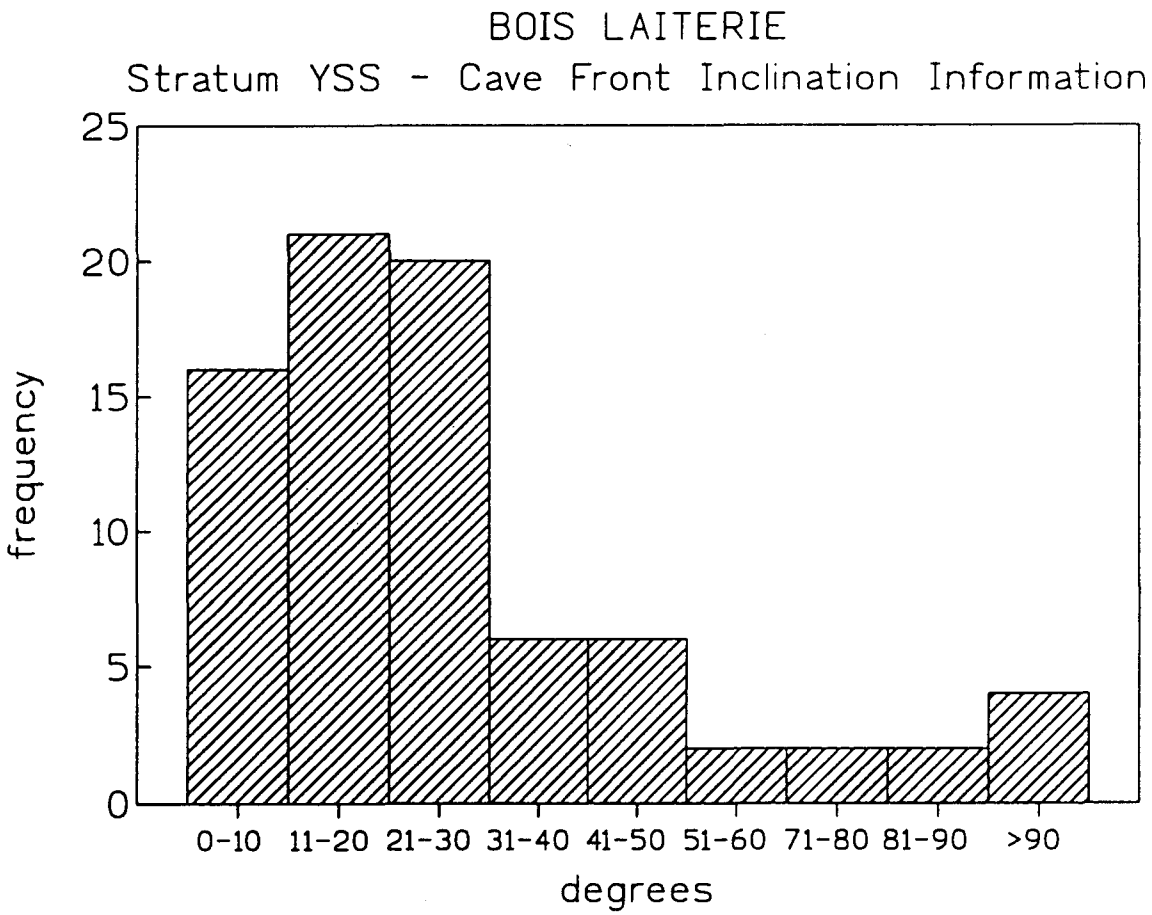

Fig.19- YSS cave front - slab, artifact and one orientations.

Orientation values are not so clearly dominated by one axis in the center of the cave (rows 8-10) (Fig.20); objects seem to be scattered across a wide variety of orientations, although there are modes at ENE, SE, and, secondarily at due south and at WNW. There are more items lying flat or close to it (0-2°) than at the cave front, and fewer lying at very steep or even vertical angles (Fig.21).

Sample size of elongated objects is more limited in the cave rear (rows 11-14), since much less was excavated there. Again, however, there is a very wide scatter of orientations (Fig.22), which would seem to preclude a significant role for running water. The histogram of inclination values is unlike any of the others, however (Fig.23), with two modes: a major one centered on values around 20° (but with very few items lying really flat) and a secondary mode of items lying vertically (or just under, or just over 90°). At the cave rear, YSS was in direct contact with the steeply sloping bedrock floor. Here, unlike in the cave center and front, humans found no strip of more or less level basal sands filling a bedrock «gully» when they first occupied the site. It is probable that they mainly used the dark cave rear as a «toss zone», since there is little artifactual, combustion or micromorphological evidence for actual intensive habitation of this zone (see below and Courty, this volume).

The sample being limited both quantitatively and spatially (cave front and part of the terrace only), we just give global figures (Figs.24 and 25) for orientations and inclinations in BSC. The former are quite scattered, but (as with YSS in the cave front) there is a preferred orientation at SSE, with objects tilted parallel to the long axis of the cave's bedrock floor. The diagram may be confounded somewhat by the inclusion of items from the terrace, where a more «random» scatter of orientations may be expected. Inclinations include many flat or nearly flat items, as in YSS on the terrace, but with a number of items more steeply tillted, especially between 30-70°. Overall, however, the histogram resembles that of YSS for the cave center. There is nothing in these rose diagrams or histograms that cannot be explained by local «wall effect», «lay-of-the-land effect», trampling without extensive lateral movement, or random scatter that may indicate areas of relatively intact deposits of cultural residues. The distribution maps tend to support this view and the good state of preservation of the bones and lithics militates against any catastrophic or even forceful movement by running water, solifluction, cryoturbation, etc., although it is undeniable that some local movement has occured, probably mostly after the items had been buried at least to some extent in the sedimentary matrix.

Distributions and «Latent Structures».

Inspection of the distribution maps of piece-plotted artifacts, plaquettes and faunal remains (Figs.1-10) show a fairly small, linear and very dense concentration of items along the easten cave wall toward the front of the cave, especially in and around U6. There is a broader, somewhat less dense concentration of especially artifacts and fauna on the terrace in front of the lower cave mouth and under the overhang of the small cave. The distribution of plaquettes is much less continuous between these two areas than are the distributions of artifacts and fauna; there is also a secondary cluster of piece-plotted plaquettes in the small cave area.

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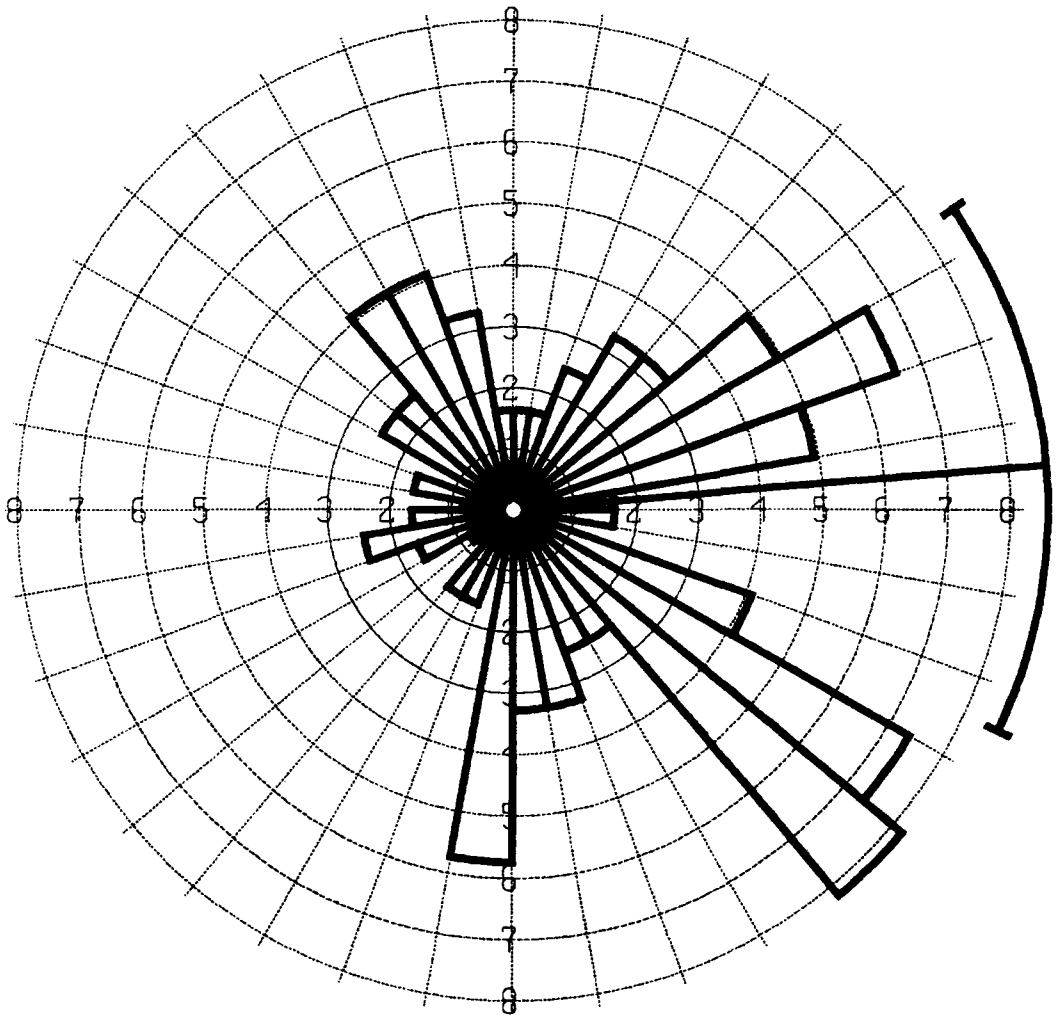
STRATUM YSS
Rose Diagram of Orientation Information for Cave Center



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Rotation Amount ..... 0 Degrees
Population .......... 122
Maximum Percentage ... 8.2 Percent
Mean Percentage ..... 3.1 Percent
Standard Deviation ... 1.86 Percent
Vector Mean ......... 85.03 Degrees
Confidence Interval .. 29.78 Degrees
R-mag ............... 0.24
```

Fig.20- Bois Laiterie, YSS cave center - slab, artifact and bone inclinations.

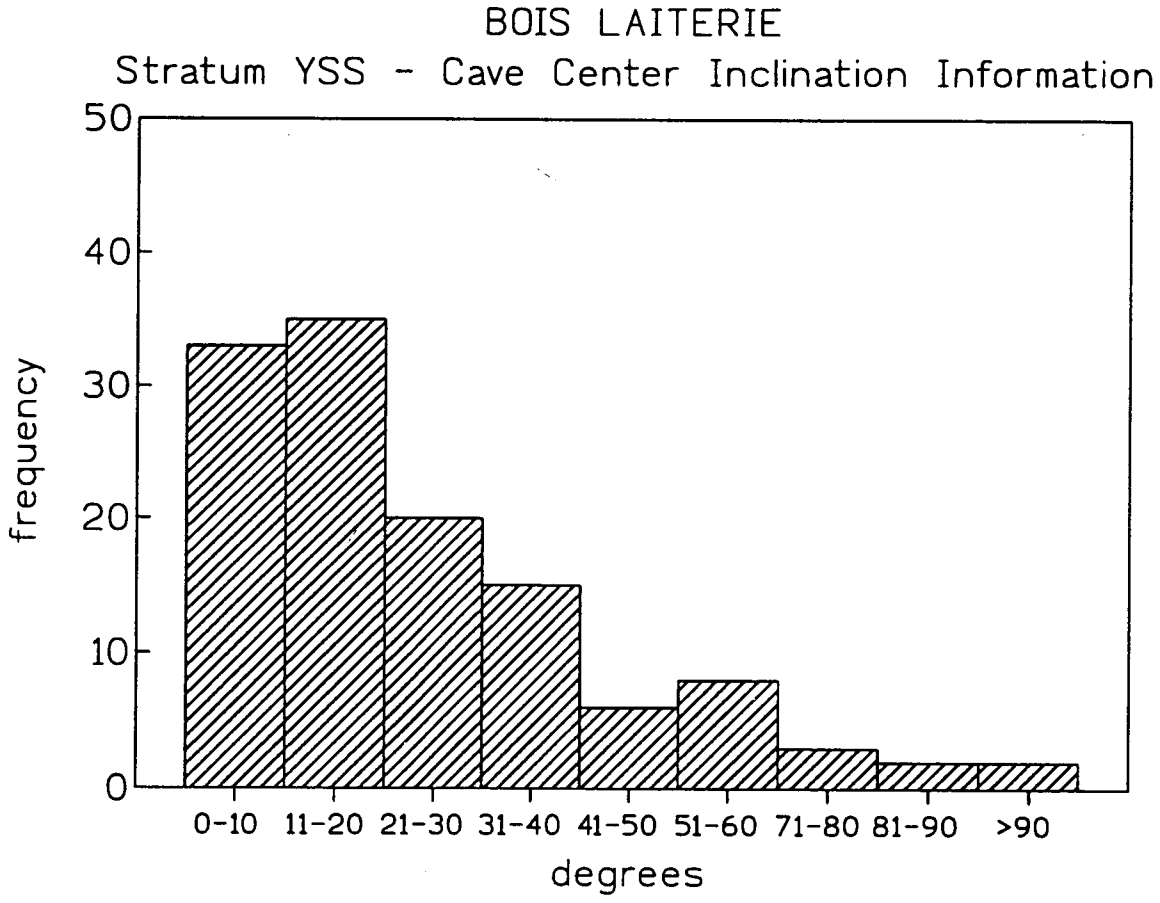
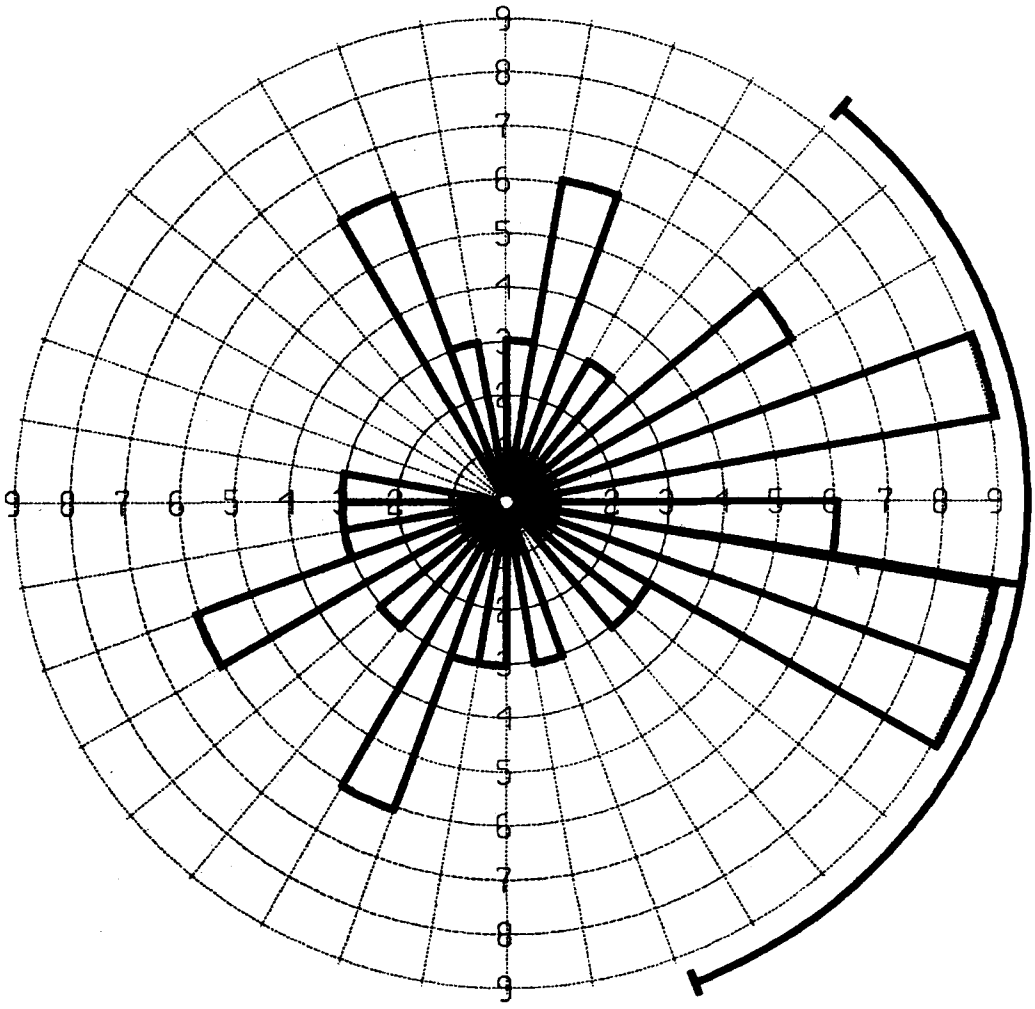


Fig.21 - Bois Laiterie, YSS cave center - slab, artifact and bone inclinations

GROTTE DU BOIS LAITERIE
Burnot, Profondeville
Namur Province, Belgium

STRATUM YSS
Rose Diagram of Orientation Information for Cave Rear



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Calculation Method ... Frequency
Class Interval ..... 10 Degrees
Filtering ........... Deactivated
Data Type ........... Unidirectional
Rotation Amount ..... 0 Degrees
Population .......... 33
Maximum Percentage ... 9.1 Percent
Mean Percentage ..... 4.8 Percent
Standard Deviation ... 2.26 Percent
Vector Mean ......... 99.41 Degrees
Confidence Interval .. 59.34 Degrees
R-mag ............... 0.23
```

Fig.22 - Bois Laiterie, YSS cave rear - slab, artifact and bone orientations.

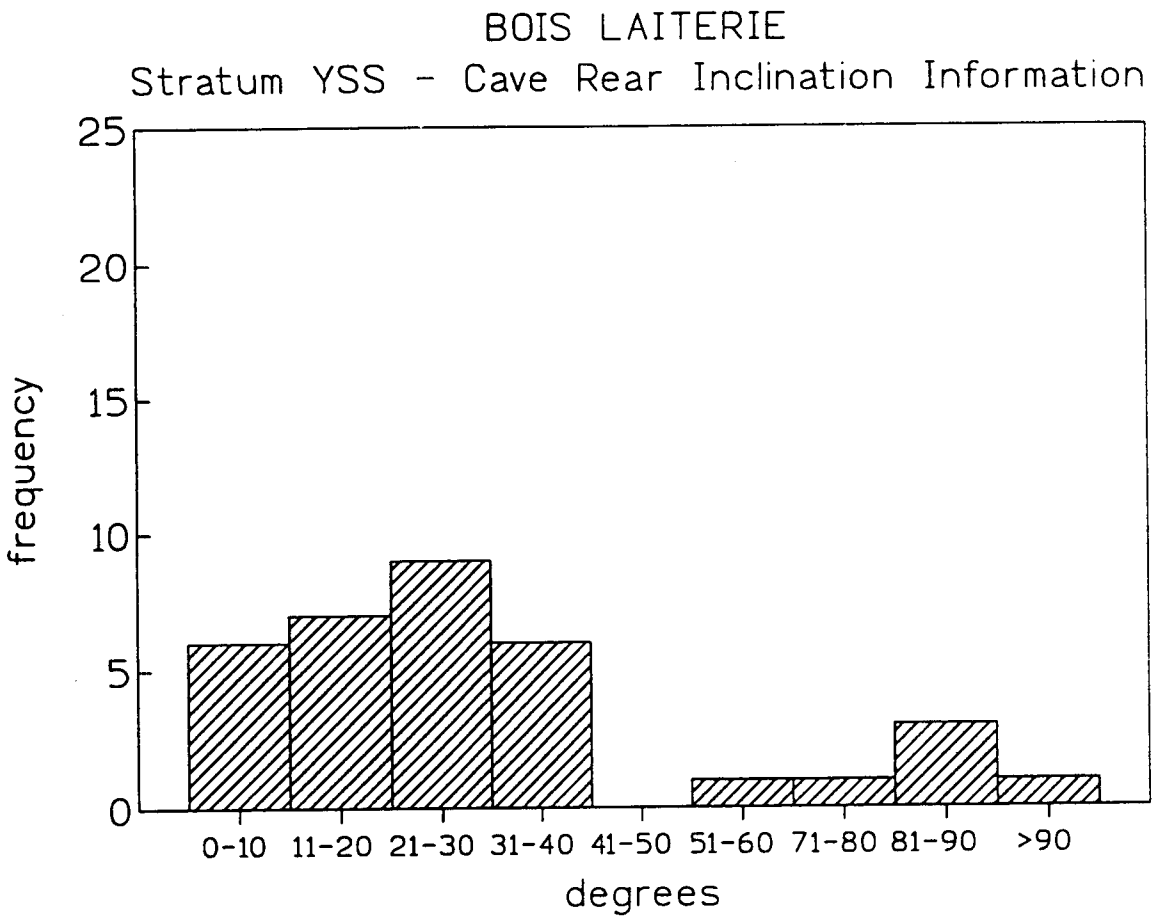
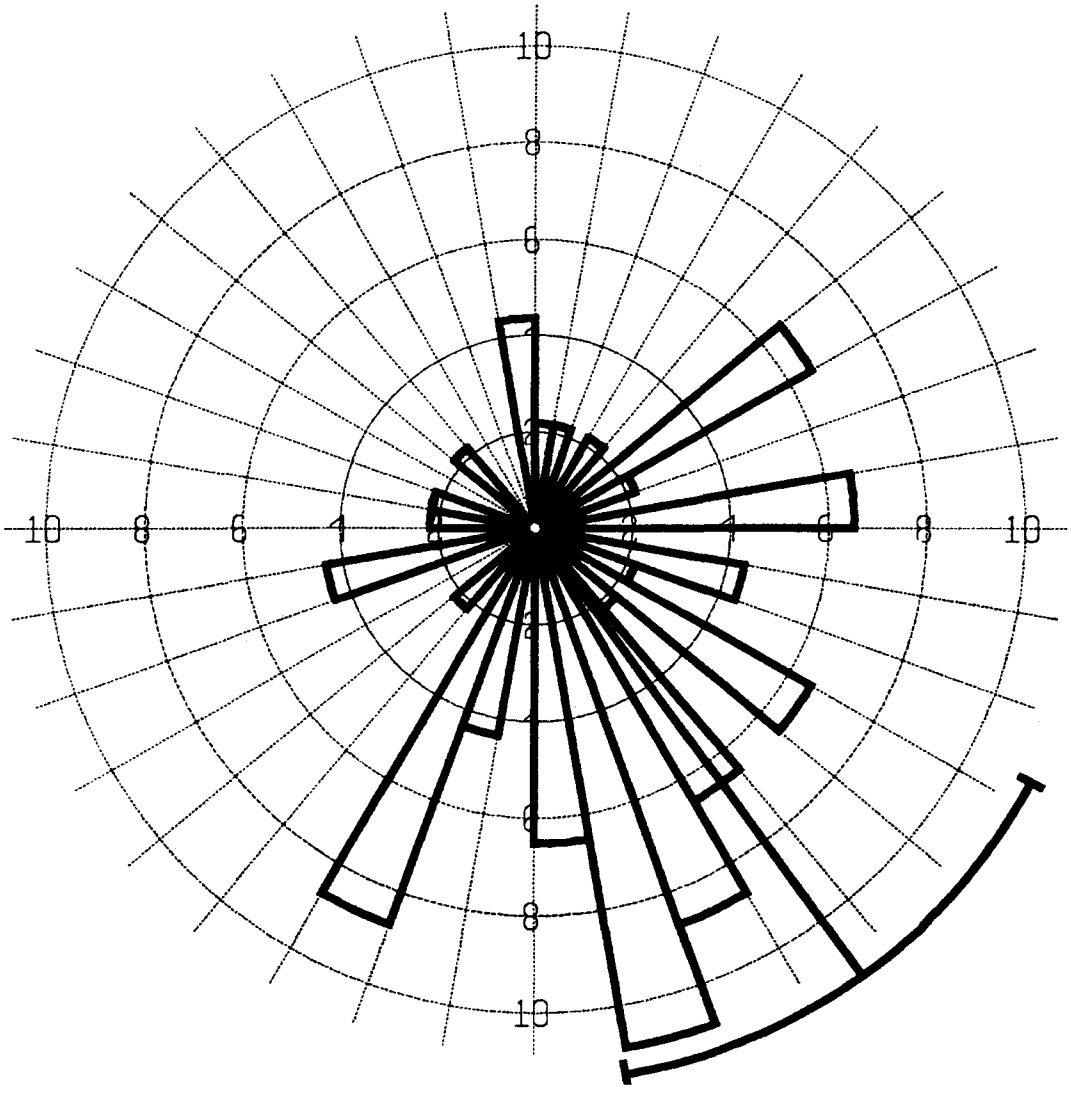


Fig.23 - Bois Laiterie, YSS cave rear - slab, artifact and bone inclinations.

GROTTE DU BOIS LAITERIE
Burnot, Profondeville
Namur Province, Belgium

STRATUM BSC
Rose Diagram of General Orientation Information

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Calculation Method ... Frequency
Class Interval ..... 10 Degrees
Filtering ........... Deactivated
Data Type ........... Unidirectional
Rotation Amount ..... 0 Degrees
Population .......... 46
Maximum Percentage ... 10.9 Percent
Mean Percentage ..... 4.5 Percent
Standard Deviation ... 2.68 Percent
Vector Mean ......... 143.98 Degrees
Confidence Interval .. 26.54 Degrees
R-mag ............... 0.42
```

Fig.24 - Bois Laiterie, BSC general - slab, artifact and bone orientations.

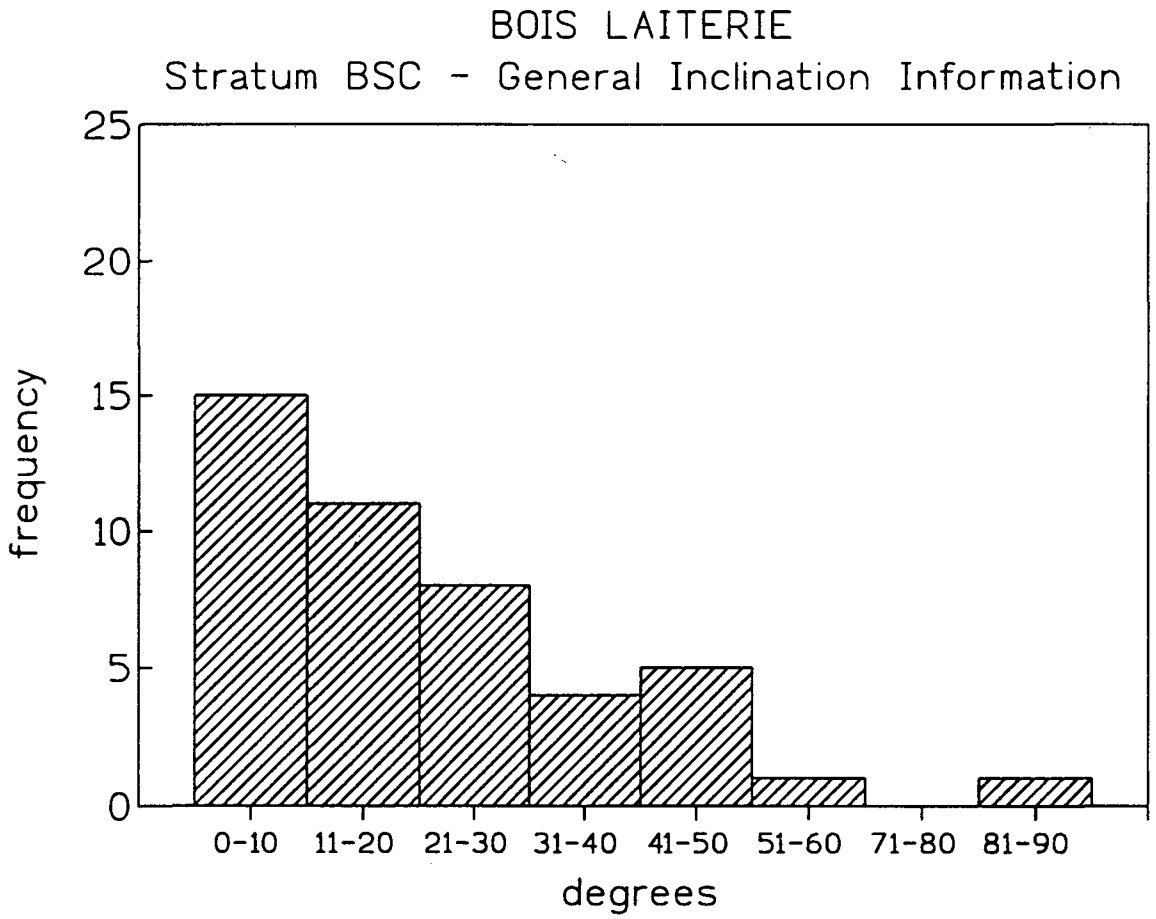

Fig.25 - Bois Laiterie, BSC general - slab, artifact and bone inclinations.

Although artifacts and faunal remains are scattered throughout the central and rear areas that we excavated (note, again, that there are gaps in the distribution plans that correspond to areas tested by Lacroix in 1990-91), there are no distinct clusters, except perhaps bones and teeth in and around W11 and in U-V/13. In general, artifacts are very scarce in the cave rear and plaquettes are virtually absent to the south of the «8» row. In general, these conclusions are supported by the plans that show distributions of non-piece-plotted («grid-collected») large debitage (Fig.26), microdebitage (Fig.27) and faunal remains (Fig.28) that were recovered in the screens. These plans and the piece-plot distributions not only show denser concentrations of artifacts at the east-front of the cave and on the terrace, but also hint at the nature of the activities that may have caused them. There seems to have been a paved area around U6-7 (no doubt including squares immediately upslope, some of whose plaquettes slid down and piled up against the eastern wall). This same area shows the only (albeit scanty) cluster of cortical lithics, a definite concentration of blades and large debitage of all sorts and an extraordinary concentration of microdebitage. The implication is that this area, sheltered, relatively well-lit and whose surface was made dry, flat and solid by limited slab paving, was a (the) principal locus for flint-knapping (probably tool + weapon production and reworking). This area is also rich in both piece-plotted and grid-collected faunal remains.

Formal, retouched tools are abundant both on the terrace and in the east-front area of the cave, but become progressively rarer toward the cave rear, south of the «7» row. It is as if tools were not used (or discarded) in the darkest areas of the cave, which makes eminent sense. On the other hand, the large sagaie fragments were found by Lacroix at the cave rear. But these are, after all, broken discards (and with traces of possible animal gnawing). One of the three cores was found at the very back of the cave in V13, as if it had been thrown back there once exhausted. It is likely that most activities producing lithic debris and tool abandonment (except in the cases of active «tossing» - either down the talus in front of the terrace and toward the cave rear) would have taken place in on the terrace under the rockshelter overhang and in the immediate (sunlit) front zone of the cave. This localization would really be obligatory, due to the north-facing and draughty nature of Bois Laiterie, with the cave center and rear being poor places to be or to try to do any craft activity for any length of time. The concentrations of manuports, debris, tools and (to a lesser exent) faunal remains tend to bear out this logical hypothesis.

One more distribution plan (Fig.29) lends further evidence to the notion that «latent structures» are perceivable even in this limited, slightly reworked spatial record: burnt items (bones and, especially, flints). There are virtually no burnt objects inside the cave. There is essentially one concentration of burnt objects: right outside the cave mouth on the terrace. This concentration corresponds to the area of the «grey lens» within/at the base of YSS, and probably represents an area of bonfire building. There was no evidence of firepit construction nor any concentration of fire-cracked rock. Fires may simply have been built on the surface of the rockshelter area and material from them eroded toward the talus. This burning area is *surrounded* by plaquettes. On the other hand the cluster of burnt objects corresponds to (overlaps with) significant concentrations of lithic debris (including two cores and cortical items), tools and faunal remains. In contrast to the «U6» concentration of artifacts, plaquettes and faunal remains, which has essentially no burning evidence, this terrace «bonefire» zone (centered on V-W/4-W3) suggests the existence of a second activity area. A rather *ad hoc* paved area around a fire was used to make (or rework) blanks, tools and weapons, to butcher, process and/or consume animal carcasses.

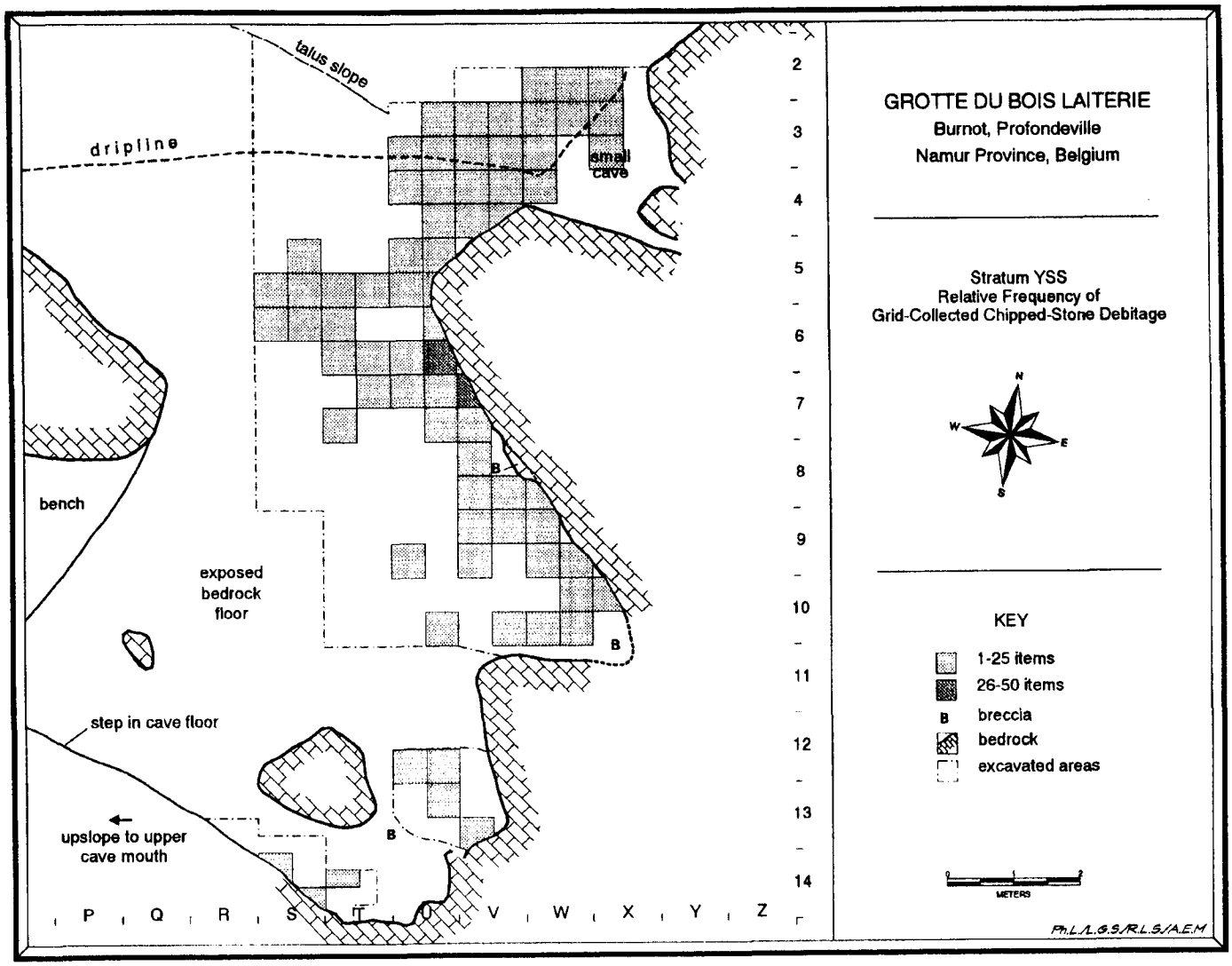

Fig.26 - Bois Laiterie, YSS, distribution of non-piece-plotted large debitage.

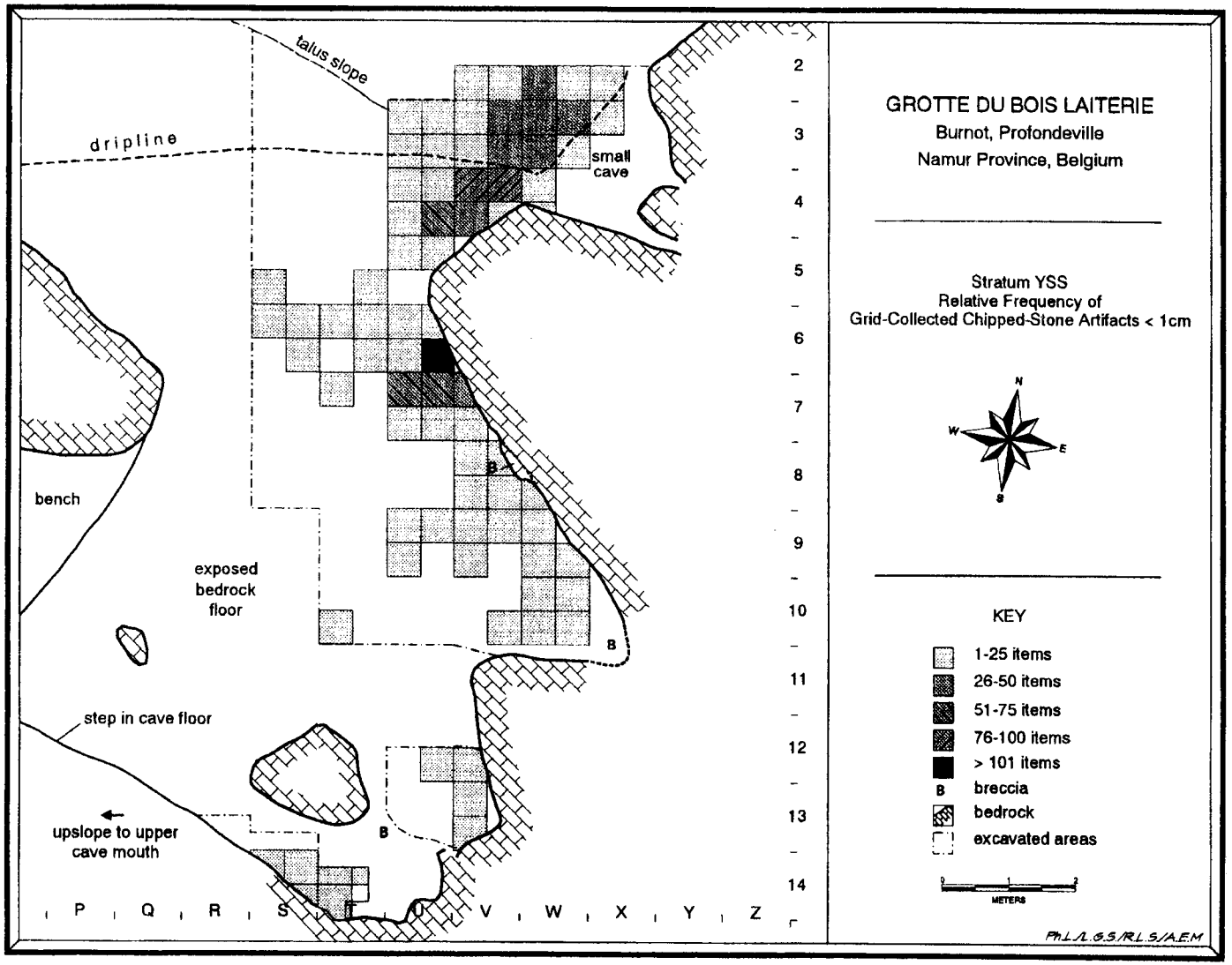

Fig.27- Bois Laiterie, YSS, distribution of non-pieced-plotted microdebitage.

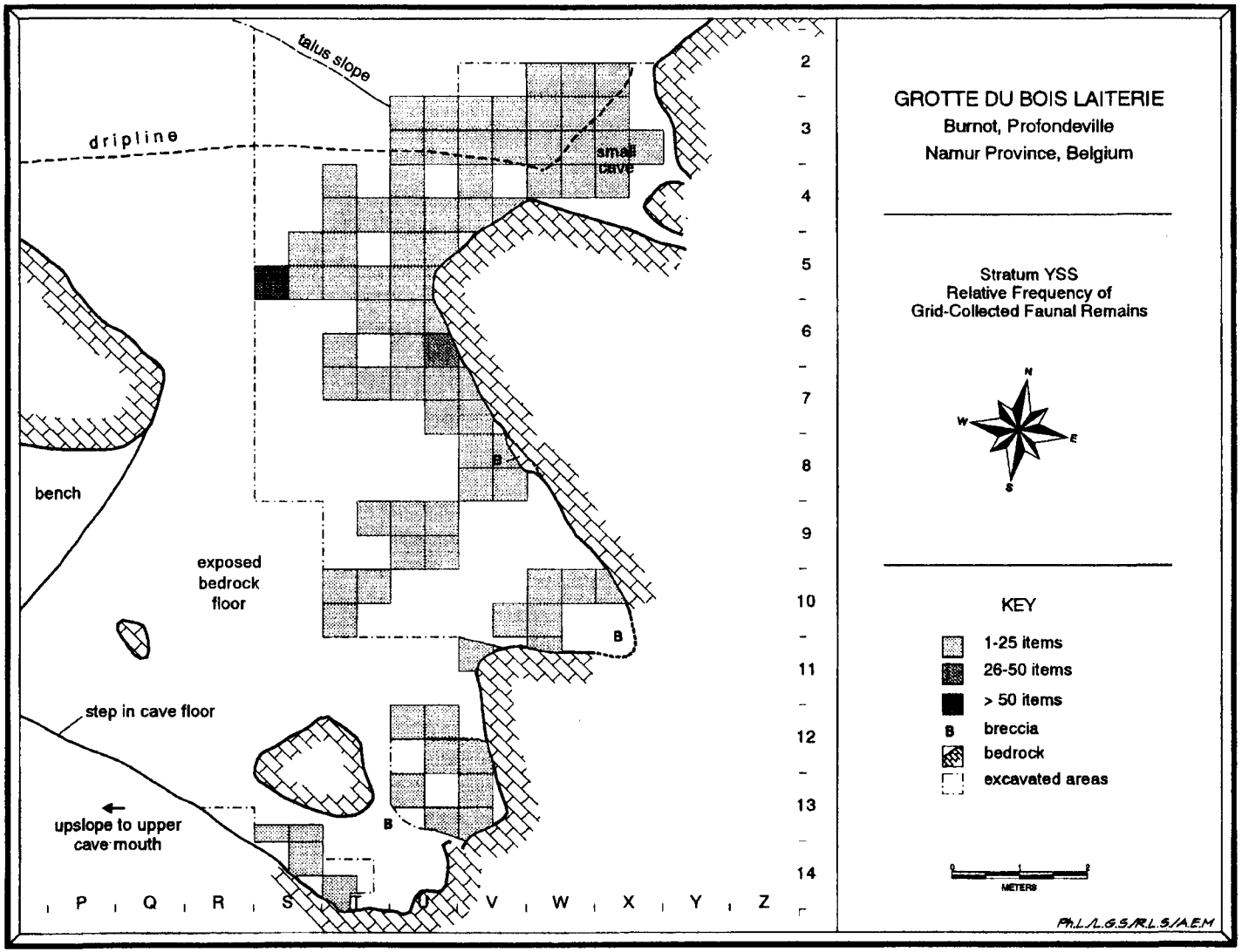

Fig.28- Bois Laiterie, YSS, distribution of non-piece-plotted faunal remains.

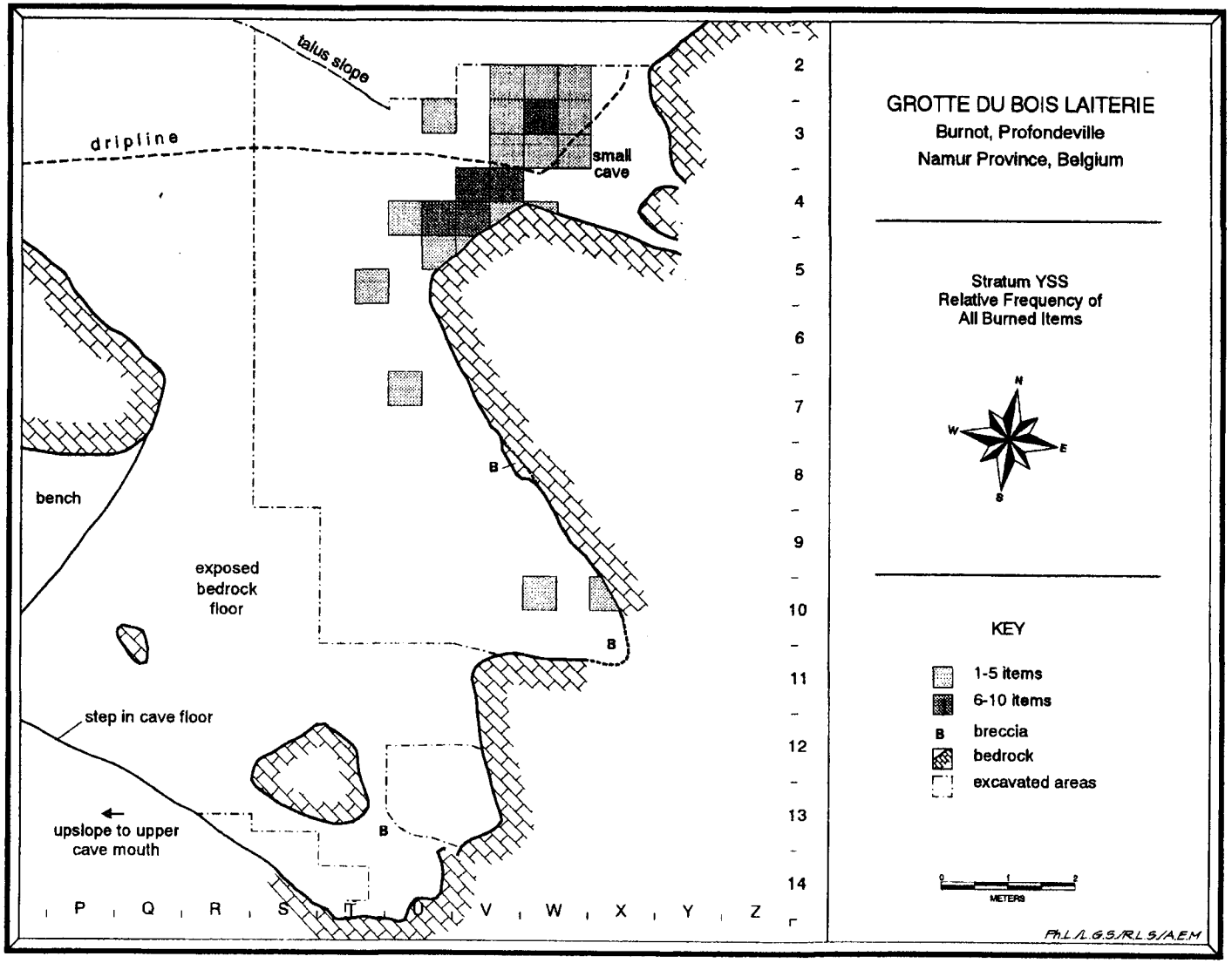

Fig.29 - Bois Laiterie, YSS, distribution of burned items.

Interestingly, the exotic Miocene and Eocene fossils shells show no real concentrated distribution within the site. The original two discoveries of perforated fossils were made by Lacroix near the cave rear. However our six discoveries (four perforated and two non-perforated) came from both the terrace and from the cave center. Other «oddities» that may have been collected more locally by Magdalenian humans (fossil sponge, corals, urchin spines, pyrite) were also widely distributed throughout the site (cave rear, center and terrace). The one worked «pendant» (unilaterally bored circular sandstone object) was found near the cave rear in a nook next to the eastern wall in W11. Its location might be suggestive of caching behavior.

The loci for actual activities (besides caching and toss-discard) at this site were thus mainly at the front of and immediately outside the cave on the sheltered terrace. This evidence of far more intensive human activity at and outside the front of the cave than in the deeper interior, is confirmed by the interpretation of micromorphological analyses (see Courty, this volume). Just as for us, the cave interior would not have been a pleasant (or even tenable) place for Magdalenian humans to stay very long - even in summer - because of its darkness, draughtiness, and humidity. In addition, the ceiling is very low at the cave rear, which we had to excavate on hands-and-knees. Light and the ability to keep dry from the rain and warm, away from the drafts of the cave interior, with the use of simple fires, were the chief locational criteria for the apparent activity areas at the front of the cave and on the terrace. A modicum of preparation was involved, namely the collection of psammite slabs in the immediate vicinity of the cave to provide dry, stable surfaces on which to stand, sit and squat atop the muddy, slippery clayey-silt ground (we needed to do the same kind of *ad hoc* preparation of the ground surface with flat stones in the areas of the talus where we screened and ate lunch). This leads us, finally, to a discussion of the psammite plaquettes (so characteristic not only of BL, but also of the other Magdalenian cave sites of the upper Belgian Meuse basin).

«Plaquettes» (Psammite and Sandstone Slabs)

We piece-plotted a total of 316 plaquettes and larger fragments (generally those more than about 5 cm in length). Another 427 small plaquette fragments were found among all the strata (including the old backdirt), collected by subsquare and spit, and weighed.

Most plaquettes are from YSS, but with a significant number from BSC, especially in the massive, thick, stratigraphically transgressive plaquette concentration centered on square U6 (Figs.30-32). As noted above, the «bonfire» area against the cliffbase on the terrace is «ringed» by plaquettes, mainly pertaining to YSS. There are virtually none in the cave interior, except for a small concentration of plaquettes (often «stacked up» against the eastern cave wall and generally quite tilted) in V8-9 at or near the top of YSS (as if they had slid downslope and come to rest in this spot). The presence of a few slabs (including some notably large ones) cemented to the bedrock cave floor in the T, S and R rows points to the source of some of the plaquettes that had moved down to the eastern edge of the cave and suggests that paved areas of the site were originally somewhat less localized along that eastern wall. Nevertheless, the presence of underlying sediments filling the bedrock «gully» (including the very clayey, plastic BSC in precisely the area with the greatest numbers of plaquettes in the cave front) at the time

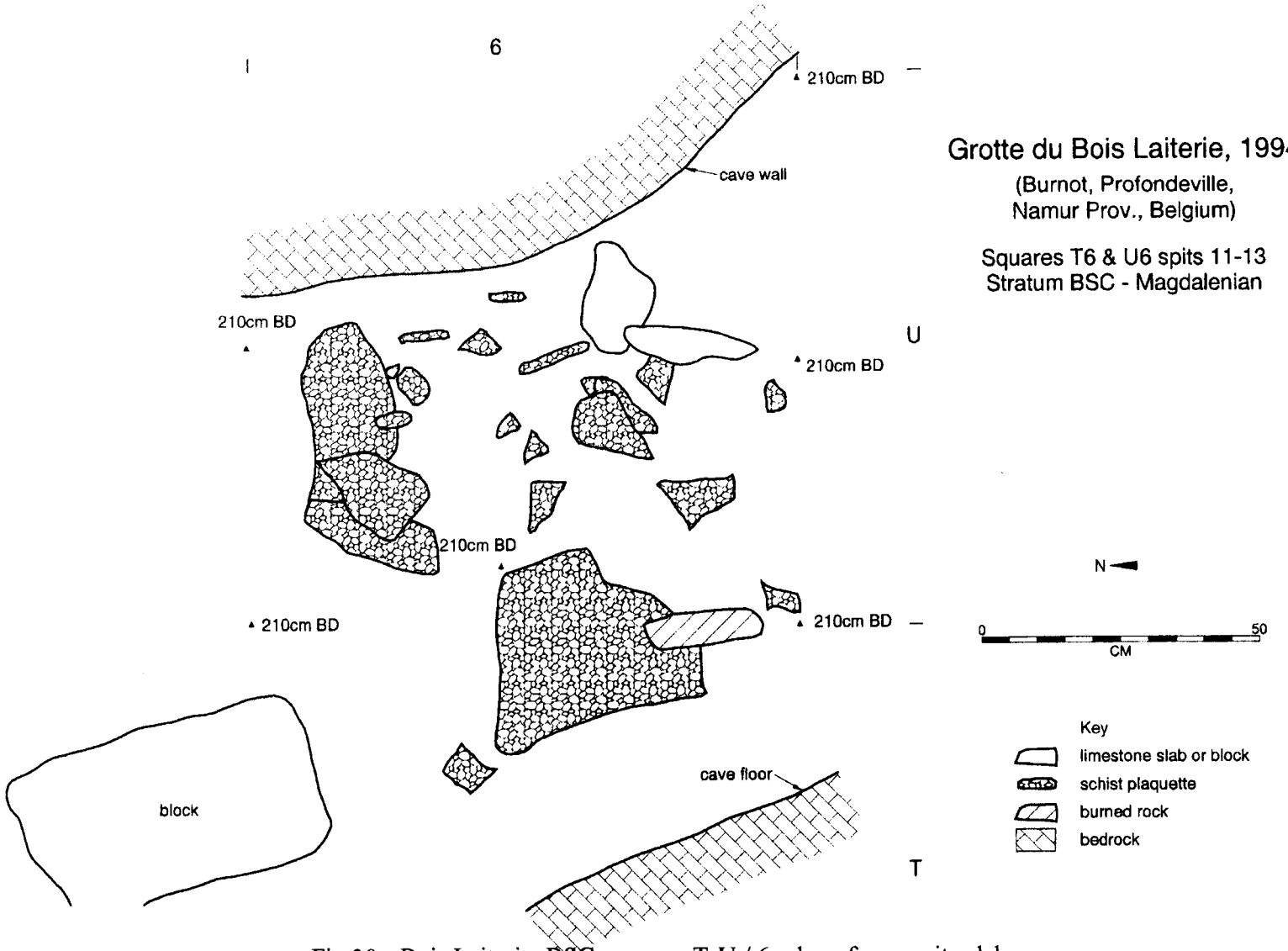

Fig.30 - Bois Laiterie, BSC, squares T-U / 6, plan of psammite slabs.

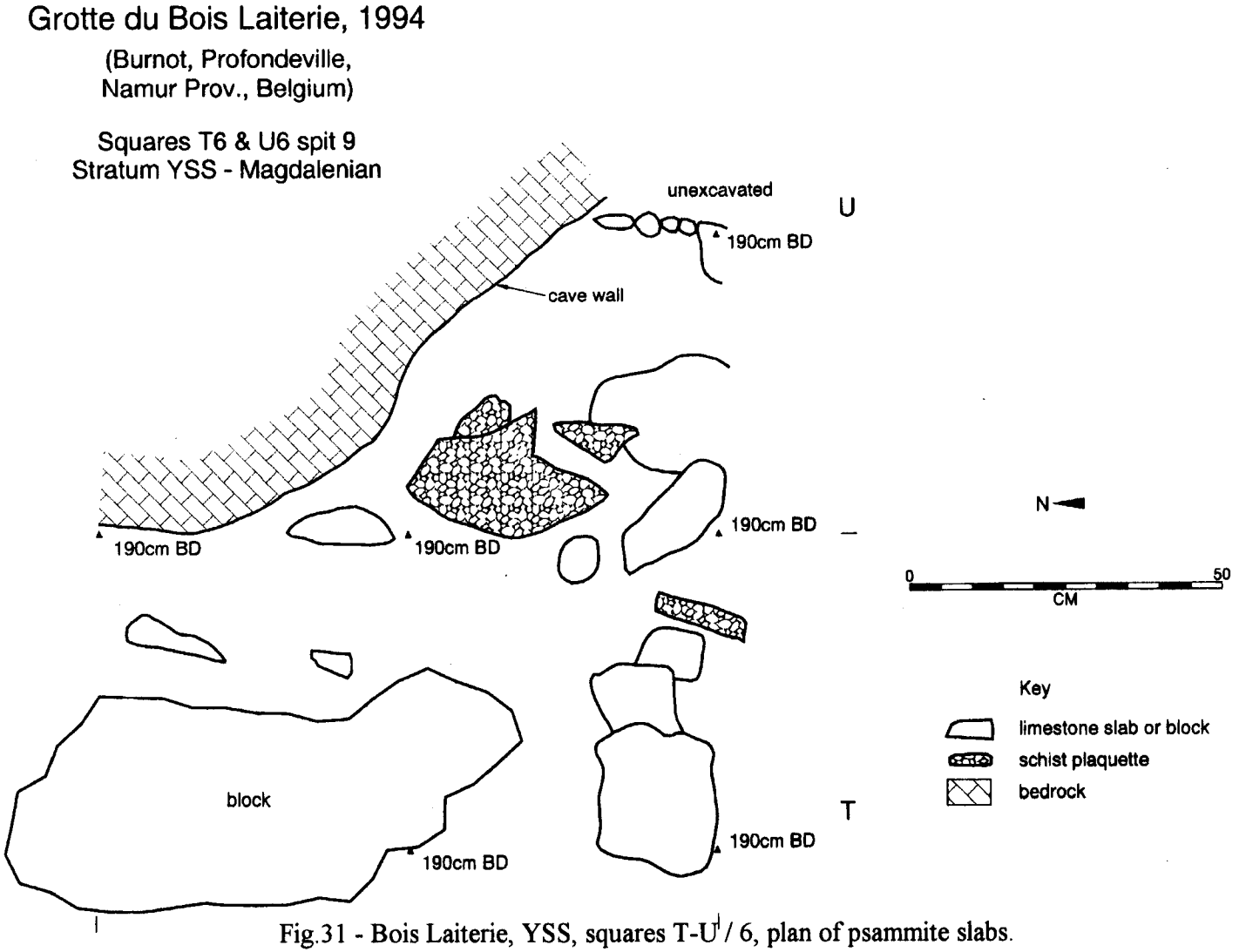

Fig.31 - Bois Laiterie, YSS, squares T-U / 6, plan of psammite slabs.

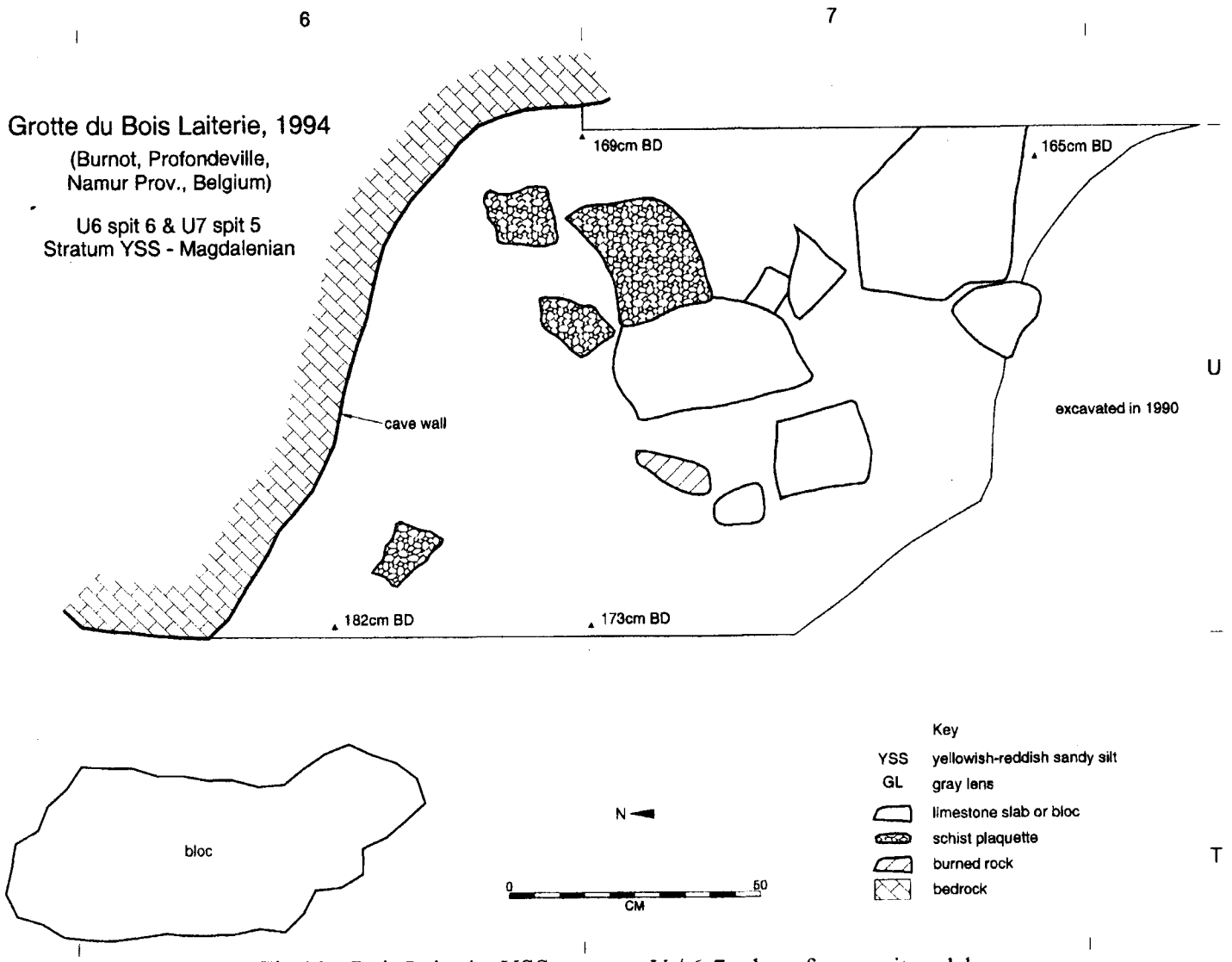

Fig.32 - Bois Laiterie, YSS, squares U / 6-7, plan of psammites slabs.

of Magdalenian arrival, would have necessitated particular emphasis on the paving of that potentially muddy, slippery, but relatively level strip, especially *vis à vis* the exposed bedrock areas upslope of the infilled gully.

Average length of piece-plotted plaquettes and fragments is 108.8 mm; average width is 75.4 mm; average thickness is 14.8 mm. Average area is 114 sq.cm and average weight is 243 gm. The largest slabs we found range between 30-40 cm long. and weigh about 1-1,5 kg. (or slightly more), but generally the surviving fragments are relatively small. Total weight of all piece-plotted plaquettes amounts to 82.5 kg, but when all the small, non-piece-plotted fragments (originally parts of large slabs) are added in, the total weight of all tabular psammite and sand-stone recovered from the site reaches 122 kg. The total area of the piece-plotted (and hence measured) plaquettes is 2,67 m^2, but a maximal estimate of the area all the slabs and fragments together could have paved would be c.3 sq.m. (but see Miller and López Bayón, this volume). So, even counting all the tiny fragments of what were once larger slabs, the amount of strictly local flag-stones brought to the cave for paving did not amount to a very large area. This suggests the *ad hoc* nature of this activity, and, probably, the relatively ephemeral, short-term nature of the human visits to the cave. They simply did not invest in much infrastructure at this site. It was not used for long-term residence, nor (because of its small size and uncomfortable nature) by many people.

In 1994, a preliminary effort was made to refit plaquette fragments. Eight sets involving 20 fragments were found. None crosscut intact strata, although one set links a piece from YSS in U6 with another from possibly disturbed surface fill atop bedrock in S5. This weakly supports the hypothesis that some of the slabs along the eastern cave wall (U-V rows) had slid downslope from the R-T rows. All the other refits are from the same stratum (either BSC or YSS) and from the same or adjacent squares. However, further information on plaquette refits and distribution is provided by Miller and López (this volume) who conducted more extensive refitting.

A few psammite plaquettes bear some cut marks, possibly suggesting their use as «cutting boards». Others have some reddish-brown stains (ochre?). But there are no signs of artwork on these objects - in distinct contrast to the zoomorphologically engraved slabs of Chaleux, Da Somme, Goyet and Roc-la-Tour. The modified BL plaquettes are described elsewhere by M.Lejeune (this volume).

Faunal Distributions

The macro-mammalian faunal remains (mainly of ungulate game species that were human prey) are also discussed at length elsewhere (Gautier, this volume), but a few additional remarks on the distribution of certain remains are in order here. This discussion was motivated by the observation that faunal remains seemed to be somewhat more evenly distributed throughout the cave than artifacts and especially lithic manuports (Figs.9 and 28). In particular, there seem to be relatively more faunal remains than artifacts and manuports at the rear of the

cave. This observation was coupled with the anecdotal finding of a whole wolf ulna in YSS at the rear of the cave in U13, an area rich in faunal remains. And it was also coupled with puzzlement over the surprisingly large number of fox bones and teeth found during our excavations (and in Lacroix's test pits). Could at least part of the accumulation and distribution of ungulate remains be due to the activity of carnivores? Could the rear of BL have served as a carnivore den in times (the majority of time) when humans were not using the cave?

Fig.33 shows the distribution of all identified fox (*Vulpes vulpes* and *Alopex lagopus*) remains (n = 68) for combined strata YSS+BSC. There are three distinct concentrations: on the terrace (W3), in the front of the cave (U5-6) and at the cave rear (U12). However the distribution is continuous (especially if one were to add in the areas of Lacroix's *sondages*). Although none of the fox bones have cut marks and none of the many canines are perforated (truly unusual, as fox canines were usually favorite pendant material for Upper Paleolithic people), it is highly unlikely that fox could have been responsible for much or any of the large-medium size ungulates brought to the cave; it is simply too small for that. And the hypothesis of fox denning at the rear of the cave is at least partly belied by the general nature of the distribution of fox remains - especially the large quantities on the terrace and at the front of the cave, in intimate association with the great mass of tools, weapons, lithic debris, plaquettes and other faunal remains. Therefore, the nature of the relationship between humans and foxes at this site remains enigmatic. Possibly the foxes were winter residents of BL when humans were absent.

As for the other, larger, carnivores (ones capable of being agents of accumulation of ungulate remains), they are very few (see Gautier, this volume). There are a couple of wolf remains (the complete ulna from U13 and a phalange from mixed deposits in the exterior test trench in the western terrace area: O-P/3-4). A lynx tooth also came from that test trench, while an ulna fragment was found in stratum LBS of square T4 (hence, post-Magdalenian) and some teeth were found in YSS, square U4. Bear is also represented by a phalange from the test trench and another from the «4» row in YSS. There is only one identifiable hyena part: a tooth from YSS in square X3 at the mouth of the small cave. Hyena coprolites were not found. No case for carnivore denning can be made on the basis of these few, scattered remains, especially when some are from intact deposits *outside* the cave. Evidence for carnivore gnawing on ungulate bones is scarce and is discussed elsewhere. The main conclusion would seem to be that carnivores played little or no role in the distribution of ungulate remains in BL. Humans, who probably butchered, processed and consumed at least parts of ungulate carcasses on the terrace and in the front zone of the cave, may have disposed of some faunal remains in the rear of the cave, using it as a «toss-zone». Such (noxious) behavior could be an additional indicator of the fact that humans did not intend to spend much time at the cave during their visits.

Lithic Refits: Site Formation Processes, Activity Areas and Reduction Sequences

Besides being useful in demonstrating the illegitimacy of separately analyzing collections from «strata» YSS and BSC by showing the existence of conjoins between the two units, lithic refitting is important in showing the horizontal integrity of the Magdalenian horizon

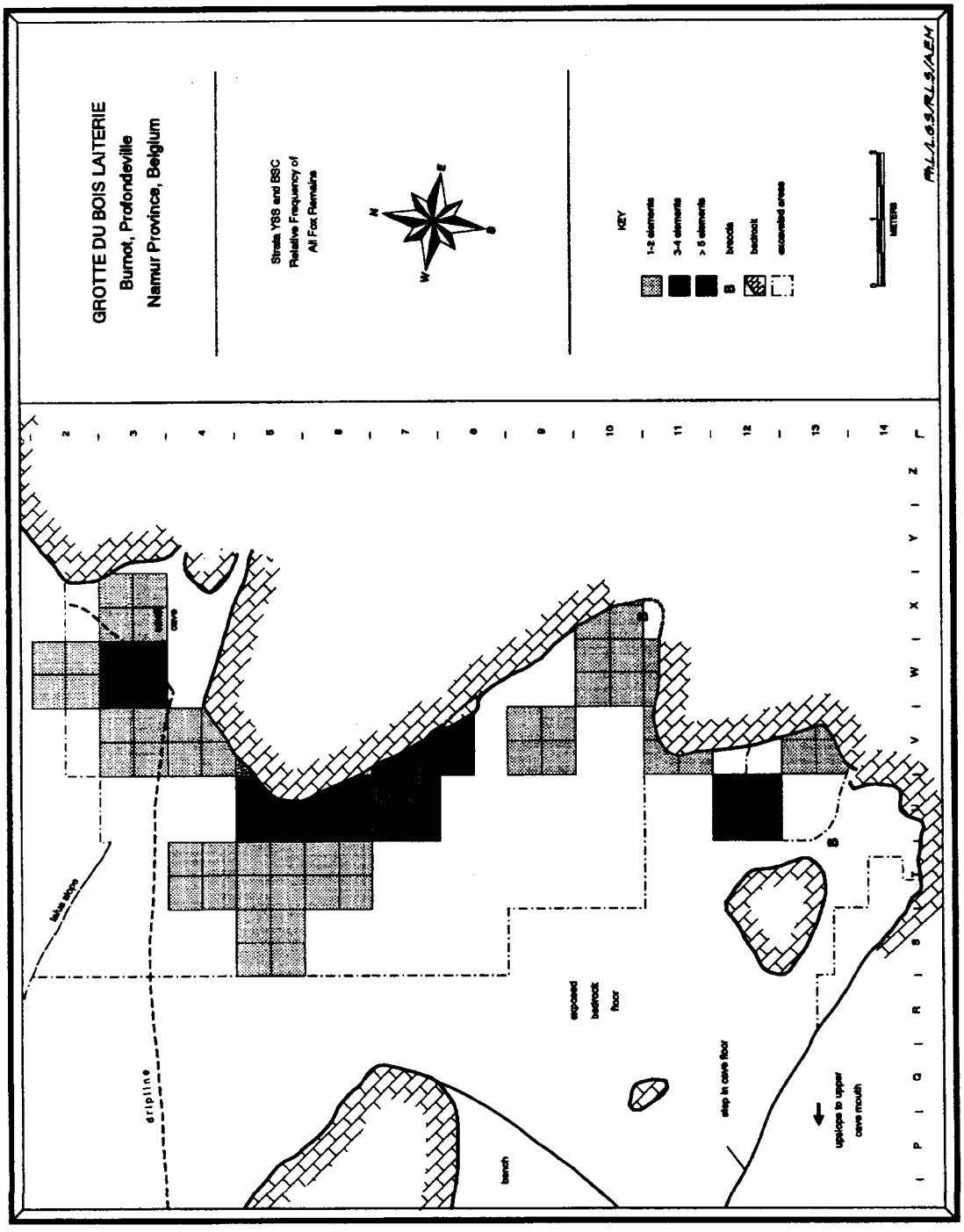

Fig.33 - Bois Laiterie, YSS + BSC distribution of fox remains.

(*i.e.*, by linking the cave rear, center, front and exterior). It is also useful to demonstrate that many other conjoin sets are made up, on the other hand, of pieces that have hardly moved at all since deposition (thereby eliminating the hypothesis of ubiquitous mass movements by solifluction or water erosion). Refitting can more or less confirm the homogeneity of the lithic assemblage, even if small-scale disturbances are almost certain to have occured within the deposit (if only by trampling, rockfall, short-distance downslope sliding and because of the weight of overburden on fairly plastic sediments). Finally, refitting can help us to understand some of the aspects of flint knapping that took place at the site (technological interpretation of the reduction sequence insofar as it is very partially represented here).

The methodology used in refit analysis involved the systematic inspection of all 1,297 large debris (*i.e.*, excluding trimming flakes and shatter) and all 254 tool blanks (excluding 128 debris and tools selected for microwear analysis), hence a total of 1,423 pieces. The flints were inspected for similar properties of (1) color and banding, (2) patination, (3) cortical surface, (4) grain size, and (5) distinctive inclusions. Pieces were conjoined to one another on the basis of any attributes of Hertzian morphology that might indicate a direct correspondence. Distribution plots detailing the location of all piece-plotted lithics were then prepared to assist in the evaluation of site formation processes in both horizontal and vertical dimensions (see Fig.13).

Of the 1,423 artifacts, 77 were found to refit into 32 separate conjoin sets (Tab.1; Fig.34). The majority (26) of these sets are simple two-element conjoins (including many snapped blades or flakes). The rest of the sets are composed of three or more elements. There are four triple conjoins, 1 quadruple and one set with 9 conjoined pieces. There are 5 sets which link the exterior with the front of the cave, 3 which link the front of the cave with the center, 3 which link the exterior with the cave rear, and 1 triple set which links the front, center and rear. The other refits either come from within the same square or nearby/adjacent squares. Twenty-eight of the sets include one or more blade(let). No cores are involved. Twenty-five of the refitted items have at least some cortex. One item each classified as a unidirectional and birectional crested blade and a platform renewal flake are included among the refits. Six of the sets include a total of 7 tools (one set is composed of 2 backed blades). One of the tools is a burin, one a notch, one a denticulate, and two are truncations. (In addition to actual physical refits, there are several groups of flint that by their color, texture, cortex, inclusions and general morphology, almost certainly came from the same block. Although some of these potential conjoin sets are quite interesting, as they sometimes contain widely distributed elements, they are not f urther considered here, owing to lack of absolute proof of refitting).

The greatest number of real refits in a single set is nine. The refits in this set come from both YSS and BSC; 6 of them are from square U6, 1 each is from adjacent squares U7 and V7 - all near the east-front of the cave - but the 9th flake is from W3 on the far eastern part of the terrace. This set amounts to a series of successive flake removals (see Fig.35). Analysis of the reduction strategy involved in production of these 9 conjoins (done in association with Michel Guilbaud) suggests that a multi-directional, hard-hammer percussion technique was used, most likely in an attempt to produce elongated blades. Primary cortex removal occurred before these artifacts (8 flakes + 1 blade fragment) were removed, though 4 bear at least a little cortex and 1 flake is classified as a possible platform renewal flake. None of this seems to have resulted in

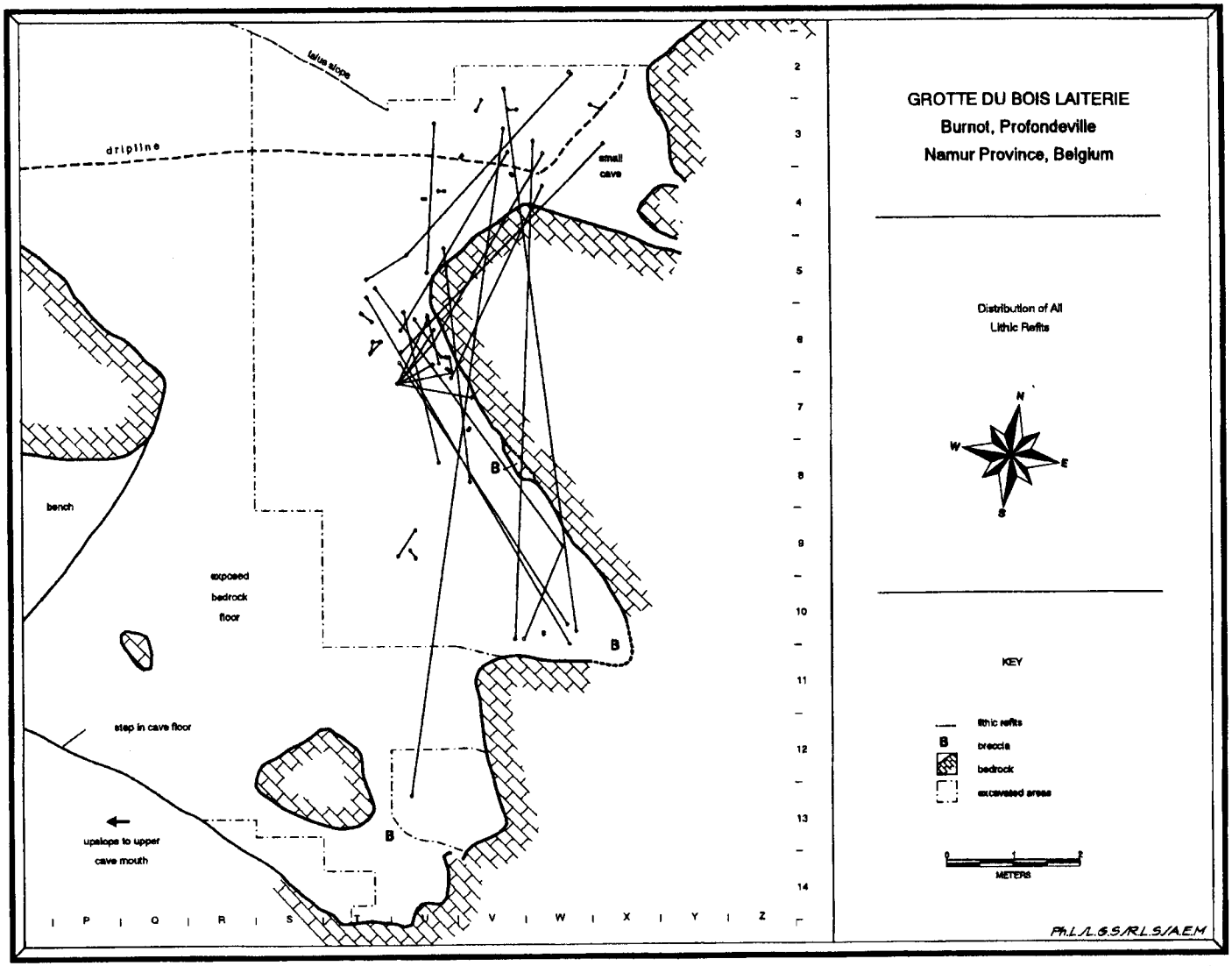

Fig.34 - Bois Laiterie. All lithic refits (piece-plotted and subsquares-provenienced items from both YSS + BSC).

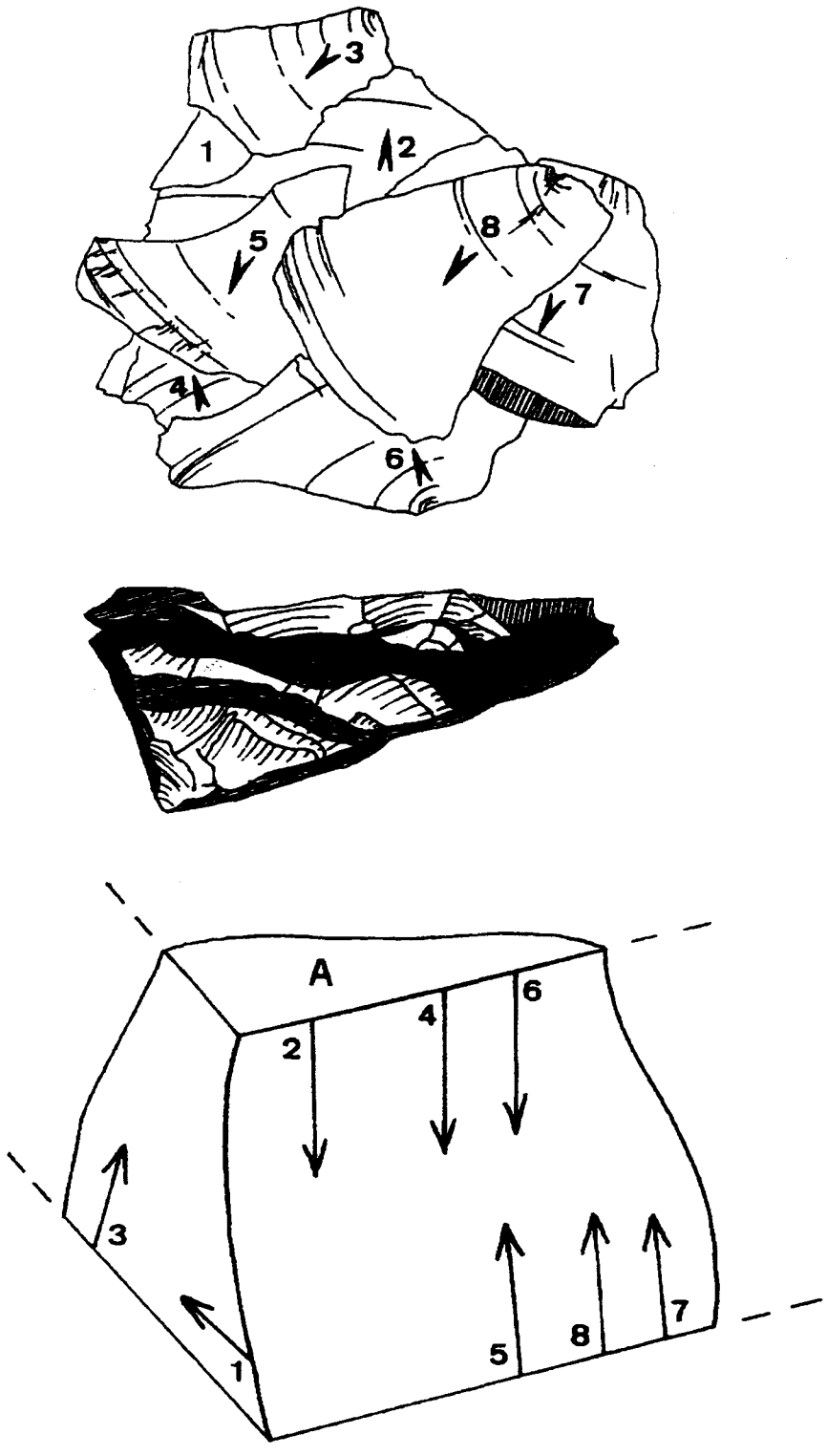

Fig.35 - Bois Laiterie.
Drawing and technological reconstruction of removal sequence of 9-item refit set.

the successful production of a complete, useful blade. The blade fragment was, however, later retouched into a notch (type 74). Ironically, although 8 of these refitted items are classified as type 10 chalk flint, one is classified as type 12, confirming what we have suspected, namely that flint types 10-12 intergrade and are often the same thing.

There are three other cases of refits of flint types 10+12 (one of which also includes an item of type 19 flint - also confirming our suspicion that type 19 is a chalk flint from the same source as 10-12). Another set conjoins a flint type 10 with a type 17.

The BL lithic assemblage exhibits several technological reduction strategies which are exemplified among the refit sets. First, the large number of non-cortical artifacts (94% of the total) indicates that earlier stages of lithic reduction occurred off-site. The refits do not involve primary reduction. Second, the small size of the lithic artifacts (see chapter on lithic assemblages by Straus and Orphal, this volume) suggest that lithic reduction at BL most likely consisted of tool maintenance and limited blade blank production using cores whose dimensions when introduced to the site were already small and from which most or all cortex had already been removed. Third, the total number of cores found at the site is very small (only 4), and they are reduced down to mere stubs. And there may never have been many cores. Based on examination of (1) raw material types, (2) patination types and states, (3) grain size, and (4) technological aspects of reduction strategy; it is estimated that the number of cores used as sources for generating the lithic assemblage may have been quite small, most of which probably were never actually brought to the cave, since many of the blade blanks may have been produced at the distant quarry/workshop sites. The reduction of the cores which were transported to BL was highly intensive. It involved the exhaustion of these valued materials through the repeated hammering of the cores, resulting in numerous step fractures on all the few cores which were recovered.

These factors, combined with the lithic refitting analysis, suggest several points concerning site formation processes. As the artifact distribution plans (see above) demonstrate that the BL artifacts were concentrated on the terrace, at the front of the cave and, to a lesser extent, at the cave rear. The distribution of refits mirrors this general pattern, with blade snap refits being found in all three of these areas. However, two very long-distance refits between the cave rear and terrace were found. In addition, numerous refits between the cave front and terrace were also found, as noted above.

As the micromorphological analysis of BL sediments from stratum YSS suggests (Courty, this volume), a fair degree of site integrity had subsisted. The explanation between the cave rear and terrace must be human transport. Although knapping seems to mainly have been conducted at the front of the cave and on the terrace, objects were taken to the back of the cave for purposes which remain unclear. The refits between the cave front and terrace are also curious, though less difficult to explain than the long-distance conjoins. The cave front and the terrace areas both contain virtually all categories of secondary lithic debris, while the space *between* the elements of these inter-area conjoins is virtually devoid of artifacts, suggesting that these were two separate (albeit nearby) activity areas (as also indicated by other facts mentioned above). Fully 19 of the refit items from 8 sets are from the concentration of artifacts

in square U6 alone (plus several more from adjacent squares). Another substantial group of refits (16 items from 10 sets) comes from the 2-3 rows on the terrace. There are 4 refits between these groups, suggesting that the two activity areas were contemporaneous or that flint from one was scavenged not much later for use in the other. Thus, the refits contribute to showing that even a small cave site such as Bois Laiterie can yield latent structural evidence indicative of a rudimentary organization of space.

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