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1997-2005 RESEARCH IN THE CAVES OF GOYET (GESVES, PROVINCE OF NAMUR, BELGIUM) Tongeren Neandertal symposium excursion, 19 September 2004

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Abstract: Excavated since 1868, generally without any method, the caves of Goyet are comprised of three principal areas of archaeological interest: the terrace and its caves entrances, the Upper Shelter and Trou du Moulin. They yielded rich occupations from the Middle Palaeolithic, Aurignacian, Gravettian and Magdalenian, as well as traces from later periods: Protohistory, Roman and Middle Ages. Bone and teeth remains from the first excavations (1868-70) and recently identified in the collections from the former excavations might be attributed to Neandertal Man.

Introduction

The caves of Goyet are one of the main prehistoric sites of Belgium, as much because of their role in the development of regional prehistoric studies as for the number of Palaeolithic facies represented and the wealth of material recovered. The scientific importance of the caves has been acknowledged since 1868, when E. Dupont, a geologist from Dinant (1841-1911; Twiesselmann 1952), renowned for his excavation campaign successes in the caves of the Lesse valley, initiated the first excavation (Toussaint 2001).

The Goyet cave system is located at Gesves, in the province of Namur (Belgium; fig. 1). It comprises three areas of major prehistoric interest complemented by adjacent areas that all stretch along the right bank of the Samson river, at the confluence of the Strud (Strouvia) stream (fig. 2). The Lambert coordinates of the centre of the main terrace are: x = 195.71 km; y = 126.20 km (I.G.N. map 48/5).

Numerous archaeological, palaeontological and palaeo-anthropological artifacts were found in the different caves of the site but, for the most part, with scant regard for stratigraphy or plan drawing. Like other emblematic karstic caves of the national prehistory (e.g. Engis, Spy and Fonds de Forêt) the caves of Goyet were excavated too early, at a time when researchers were mainly looking for archaeological material, at best within some semblance of a sequence of deposits, but with hardly any interest either in stratigraphic subtleties or sedimentology and palaeoenvironment (Toussaint & Pirson in press).

Dupont himself, although a better stratigrapher than his contemporaries, was more than casual when he described the layers he identified at Goyet, be it in the "Third Cave" or at Trou du Moulin. Since he had previously done some remarkable studies of cave deposits, notably at La Naulette (Hulsonniaux-Houyet), one can assume that he was already more concerned by his new duties as director of the Natural History Museum, in Brussels, than by furthering his cave research. It also seems that at that time, the last period of his fieldwork, technicians did most of the work on his behalf. At the same period, Dupont would nonetheless include the tools from the three upper ossiferous layers he thought he had identified at Goyet in his attempt at classification of Belgian prehistoric industries. The elements of this broad framework, in which precise typology is restricted to the most characteristic tools, are built on the distinction between six successive phases: layers of Hastière, Montaigle and Trou Magrite at the bottom (dating from the "Mammoth Age"), layer of Goyet with intermediate features, layer of Chaleux-Furfooz ("Reindeer Age") and last, polished stone age, found in the sediments from the "present age".

The many later excavations both on the terrace immediately outside the caves and within the different caves, either by individual collectors or large national institutions, were also perfunctory in character; and their context is badly known. No layer-based inventory of the documents collected by the successive diggers is available, and no distribution maps of the finds. The material is scattered in several private collections, museums and institutions - as well as outside Belgium. Laboratory analyses, conducted more than a century after the first excavations, represent the only significant work (essentially M. Ulrix-Closset (1975), M. Otte (1979) and M. Dewez (1987) for the archaeology and M. Germonpré (1996, 1997, 2000, 2001, 2004) for the palaeontology).

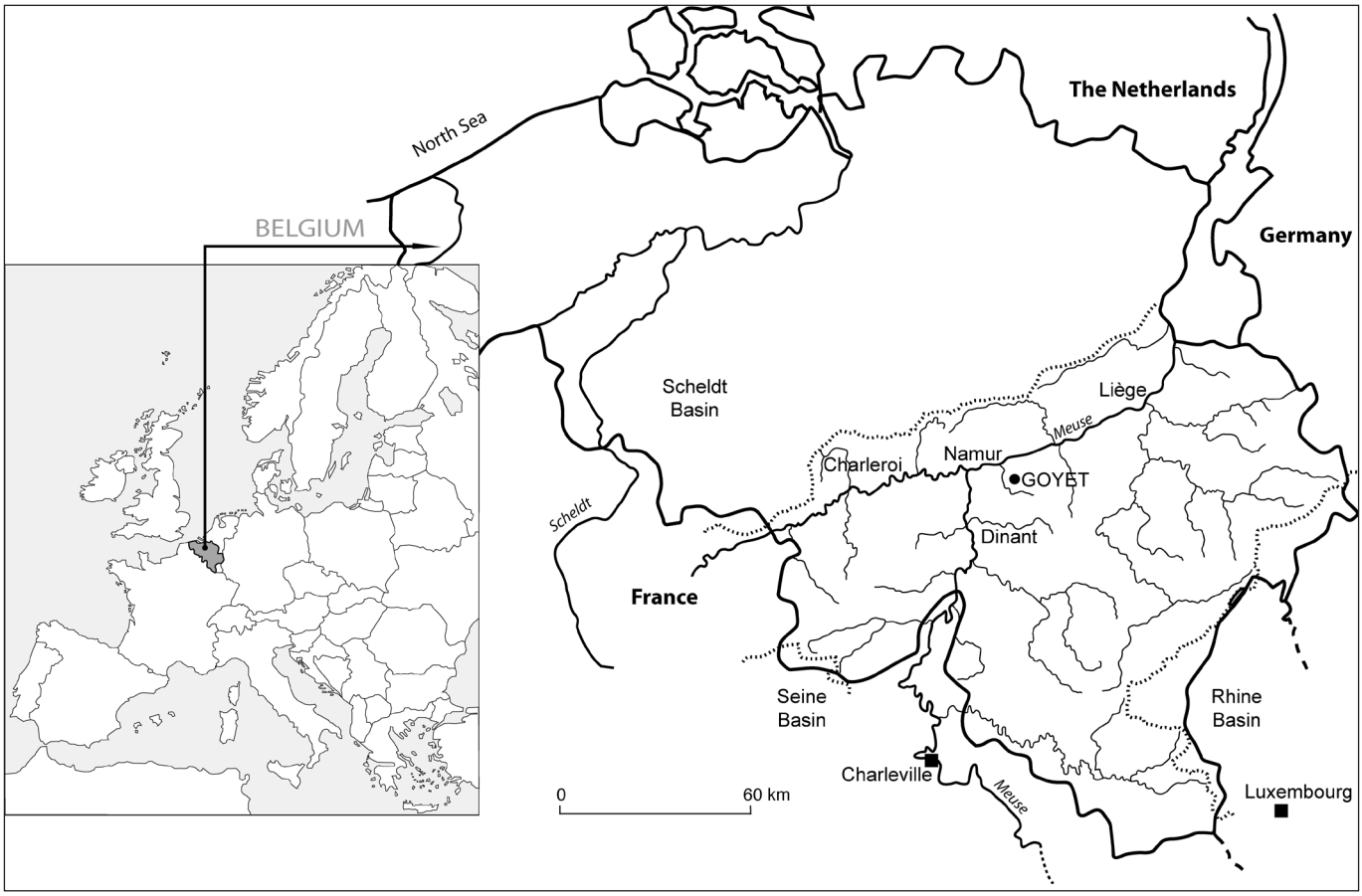

Figure 1. Location of the caves of Goyet in the Belgian Meuse river basin.

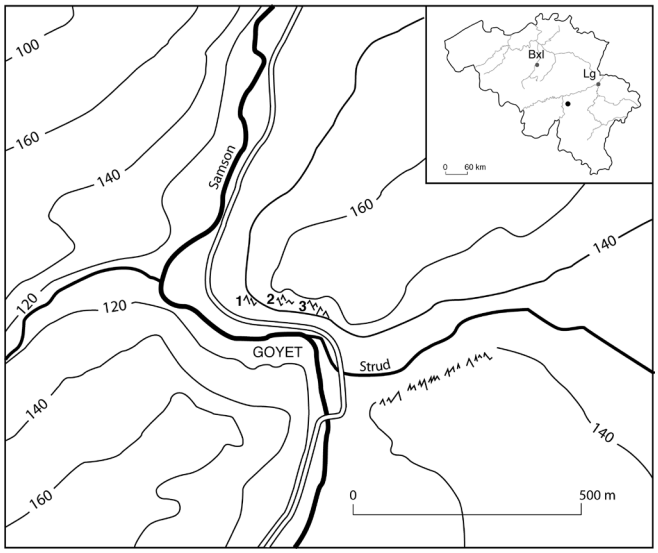

Figure 2. Map of the cliff of Goyet, with location of the main prehistoric sites. 1, Trou du Moulin; 2, Upper Shelter; 3, Main terrace and its cave entrances.

This sorry state of affairs prompted the resumption of field research at the Goyet caves in 1997 by the "Direction de l'Archéologie du Ministère de la Région wallonne", in conjunction with different non-profit organisations, especially "l'Association wallonne d'Anthropologie préhistorique" (Toussaint *et al*. 1998, 1999, 2004). The aim was to assess if some stratigraphic and palaeoenvironmental data was still recoverable from possibly undisturbed sediments on the terrace and in the numerous local caves, and to make new archaeological and palaeoanthropological discoveries at this ill-treated site.

The focus of the last eight years of modern field research was on the following aspects:
- a series of 11 stratigraphic trenches (1997-1998) down to bedrock in the main terrace and in Cave no. 3, where Dupont made most of his discoveries (fig. 3);
- multidisciplinary research (1977-1999) at the Upper Shelter, which, unfortunately, greedy collectors looted almost extensively half a century ago;
- from 1997 onwards, exploration of the newly discovered cave system located between Trou du Moulin and the Upper Shelter, which yielded a Neolithic burial, excavated and studied in situ from 1998 to 2004;
- digging and sieving in the main caves, notably in the "wastebin chamber", mostly from 2003 through 2005;
- in 2004, beginning of stratigraphic trenches in a newly discovered cave under the Upper Shelter, with undisturbed fill;
- study of some yet unpublished material, most notably a protohistoric knife carved in a human radius.

In parallel, colleagues from the Royal Institute of Natural Sciences of Belgium undertook a reassessment of the abundant palaeontological material from Dupont's excavations kept at their institution:

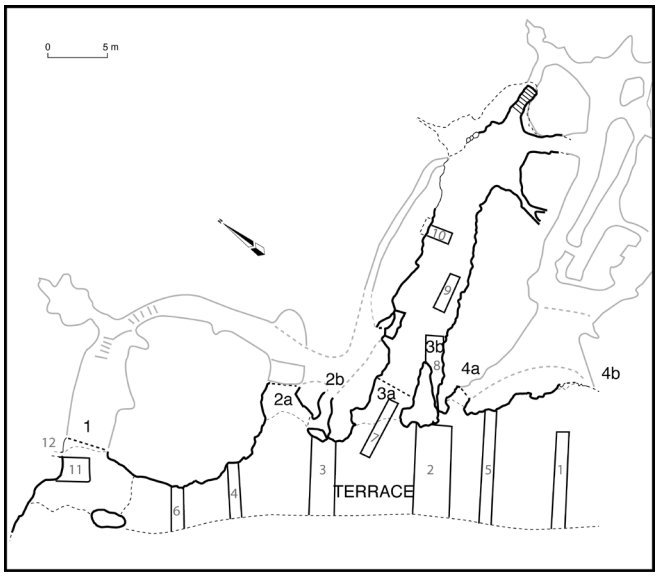

Figure 3. Goyet, the main terrace and cave entrances: numbering of the caves and location of the trenches dug in 1997-1999.

- M. Germonpré for animal palaeontology;
- P. Semal for human palaeontology.

The classic terrace and its cave entrances

History

Dupont was the first to visit the site, mainly the third cave, where he conducted a huge excavation in 1868. In 1891, Doctor F. Tihon dug a series of trenches through the terrace.

From 1907 through 1909, the "Service des Fouilles des Musées royaux du Cinquantenaire" explored the site, particularly the backfill from the previous excavations and portions of undisturbed layers in the second and third caves.

In 1937-38, the Royal Institute of Natural Sciences of Belgium, taking advantage of the construction of tourist facilities, carried out extensive excavations, particularly in the "sheep chamber", located behind the deep chamber called "wastebin" onto which entrances 4a and 4b open, as well as in two corridors connecting to the left wall of Cave no. 1.

Throughout the first half of the 20th century amateur prehistorians followed each other, between and after research of the two large national scientific institutions. They moved backfill from the first digs, and, in places, ruined areas of undisturbed layers without any caution for stratigraphy. Among them: J. Hamal-Nandrin in 1914; J. le Grand-Metz between 1914 and 1920; J. Colette and M. Beaulieu between 1920 and 1935; H. Angelroth between 1920 and 1944; L. Eloy, essentially during the 1940s; D. de Burnonville and M. Drion from 1950 through 1953.

And finally, a programme of modern research conducted jointly by the "Direction de l'Archéologie" and "l'Association wallonne d'Anthropologie préhistorique" has been under way since 1997.

Data from the former excavations

Stratigraphy

During his excavations, E. Dupont (1872: 105-124) identified "five ossiferous layers" alternating with "six alluvial layers" in the fill of the cave he described as "3rd cave of Goyet" (fig. 4). Such an interpretation of the stratigraphy mixes sedimentary data with archaeological and palaeontological data.

The study of the two lower layers, which have a rich fauna, especially in the darker areas of the cave, influenced the digger into thinking that at the corresponding periods, the site was the den of, alternatively, lions and cave bears and sometimes hyenas. The three upper ossiferous layers, essentially present near the entrance, associated numerous knapped flints and bone tools with a varied fauna. They were, partly in error, attributed to the "Mammoth Age". Flints from the third layer, the deepest of the upper layers, were related to those of "Montaigle type", and the flints from the second layer to the Montaigle and "Trou Magrite" type. The objects from the first layer comprise narrow and regular blades, related, though considered better knapped, to those from Chaleux and Furfooz. Clearly, the series of tools related to the three ossiferous layers are far from homogeneous and this testifies to Dupont's poor stratigraphic observations at Goyet.

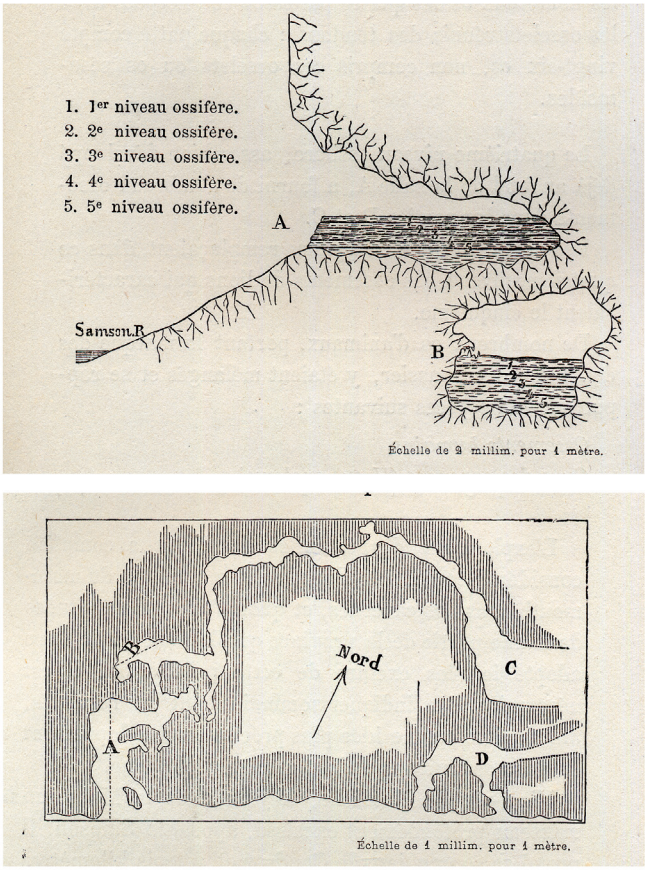

Figure 4. Stratigraphic section of the third cave (after Dupont 1872, fig. 12 et 13; captions: 12, 1st through 5th ossiferous layers, scale is 2 mm for 1 m; 13: scale is 1 mm for 1 m.

Prehistory

Notwithstanding the shortcomings of the first interventions, several prehistorians attempted to describe with some precision the sequence of Palaeolithic occupations of the site, which contains one of the most complete succession of industries of the north-west of Europe (Ulrix-Closset 1975; Otte 1979; Dewez 1987). But these attempts suffered from a number of shortcomings. It is quite probable that the main Palaeolithic periods identified on a strictly typological basis correspond to the artificial grouping of several occupation layers. In this respect, recent excavations in regional caves, notably Walou (Draily 2004), demonstrated the presence of several layers, each containing rare artefacts whose culture could not be identified on a strictly typological basis. Furthermore, numerous documents are difficult to attribute to a particular culture, e. g. several bone points or backed bladelets that may be as much Magdalenian as Perigordian. Finally, the Middle Palaeolithic classifications used, derived from F. Bordes' work in south-west France, are obsolete.

According to Ulrix-Closset (1975), there was some Quina Mousterian material at the bottom of the deposits, characterized by a limited use of Levallois reduction, by a large proportion of sidescrapers and by the presence of special artefacts such as bifacial sidescrapers, limaces, thick convex side-scrapers and thinned back side-scrapers (fig. 5). The different bifaces and leaf points might also have belonged to this industry of Quina type, even though it is not impossible that they belonged to a second Mousterian group. This may then be indicative of a Mousterian of Acheulean tradition or an evolved Mousterian (Ulrix-Closset 1975). The leaf points might also, according to some interpretations (Otte 1984), be related to industries known as "with leaf points" that might characterize the Middle to Upper Palaeolithic transition.

The abundant material typologically Aurignacian from the second and third ossiferous layers identified by Dupont might, according to Otte (1979), be attributed to two industries (fig. 6). Most of the material would in that case be closer to the Aurignacian of Spy cave while a less important group would exhibit features closer to the Trou Magrite Aurignacian.

One (supposedly, but more realistically, several) Gravettian occupation(s) follow(s) the Aurignacian, characterized by the abundance of backed bladelets, notably long points of Gravette type and long bitruncated bladelets, and by the scarcity of Font-Robert points and points with flat retouch (fig. 7).

The last Palaeolithic occupations at Goyet, found in the first ossiferous layer of Dupont, date from the Magdalenian, with possibly several phases represented (fig. 8; Dewez 1987). Two AMS dates were recently obtained from animal bones presenting cut marks that were gathered by Dupont in the first ossiferous layer of the third cave: GrA-3237, 12.770±90 BP; GrA-3238, 12.620±90 BP (Germonpré 1997). They might add new evidence to the theory of the "recolonisation" of the karst valleys of Wallonia by Magdalenian peoples (Charles 1996).

The Magdalenian lithic material of Goyet is comprised, among others, of piercers, some of "Chaleux" type, and backed bladelets. Single and double bevelled sagaies, a superb harpoon with double rows of barbs, eyed needles and a beautiful reindeer antler "arrow-shaft straightener" (bâton de commandement) decorated with fishlike motifs, among them a trout (Twiesselmann 1951), constitute the most interesting bone pieces.

Finally, several more recent artefacts, notably Neolithic, Roman or Medieval, testify to the sporadic occupation of the caves of Goyet after the Palaeolithic.

Palaeontology

Fauna from Dupont's excavations come up regularly in palaeontological research. Like the other studies of the material found at Goyet in the 19th century, both in prehistory and human palaeontology, this research is biased by the lack of precision of the stratigraphic context and the confusion between strata from different periods. The most recent work focus mainly on cave bear, studied from the point of view of the timing and length of its dormancy period which, at Goyet as well as in other Belgian caves, was proven to vary according to the changing climatic conditions of the Ice Age (Germonpré 2000, 2004; Germonpré & Sablin 2001). Some cave bear bones bearing cut marks or traces of ochre were also identified; this suggests brief encounters between cave bears and Palaeolithic Man (Germonpré 2000, 2001). Fauna from the Magdalenian layer(s) of the third cave was also re-evaluated from the perspectives of taphonomy and archaeozoology (Germonpré 1996, 1997).

Palaeoanthropology

Most of Dupont's anthropological finds come from the third cave, more precisely from what he called the "second layer". Some of these finds have previously been studied, in particular three fragments of differentmandibles (Hamy 1873), of which one (inventory no. I.R.Sc.N.B 2878-09; fig. 9:1-2) has sometimes been compared to the mandible from La Naulette (Hamy 1873; Walkhoff 1903). All three were also attributed to the Upper Palaeolithic (Twiesselmann 1971). It was recently suggested that another small, left, mandibular fragment found by Dupont (fig. 9:3; inventory no. I.R.Sc. N.B 2878-08), as well as an upper incisor (fig. 9:4), might be Neandertal (Semal *et al.* 2005). The mandibular fragment still has the two premolars and the first molar; the mental foramen is under the anterior portion of the M1.

All these fossils deserve a detailed inventory, modern anthropological studies and radiocarbon dating, in order to separate the Holocene fossils, for the most part Neolithic, from some possibly older fossils.

Radiometric dating

Table 1 lists all the radiometric dates obtained from animal and human bones found at Goyet, with or without relation with prehistoric occupations.

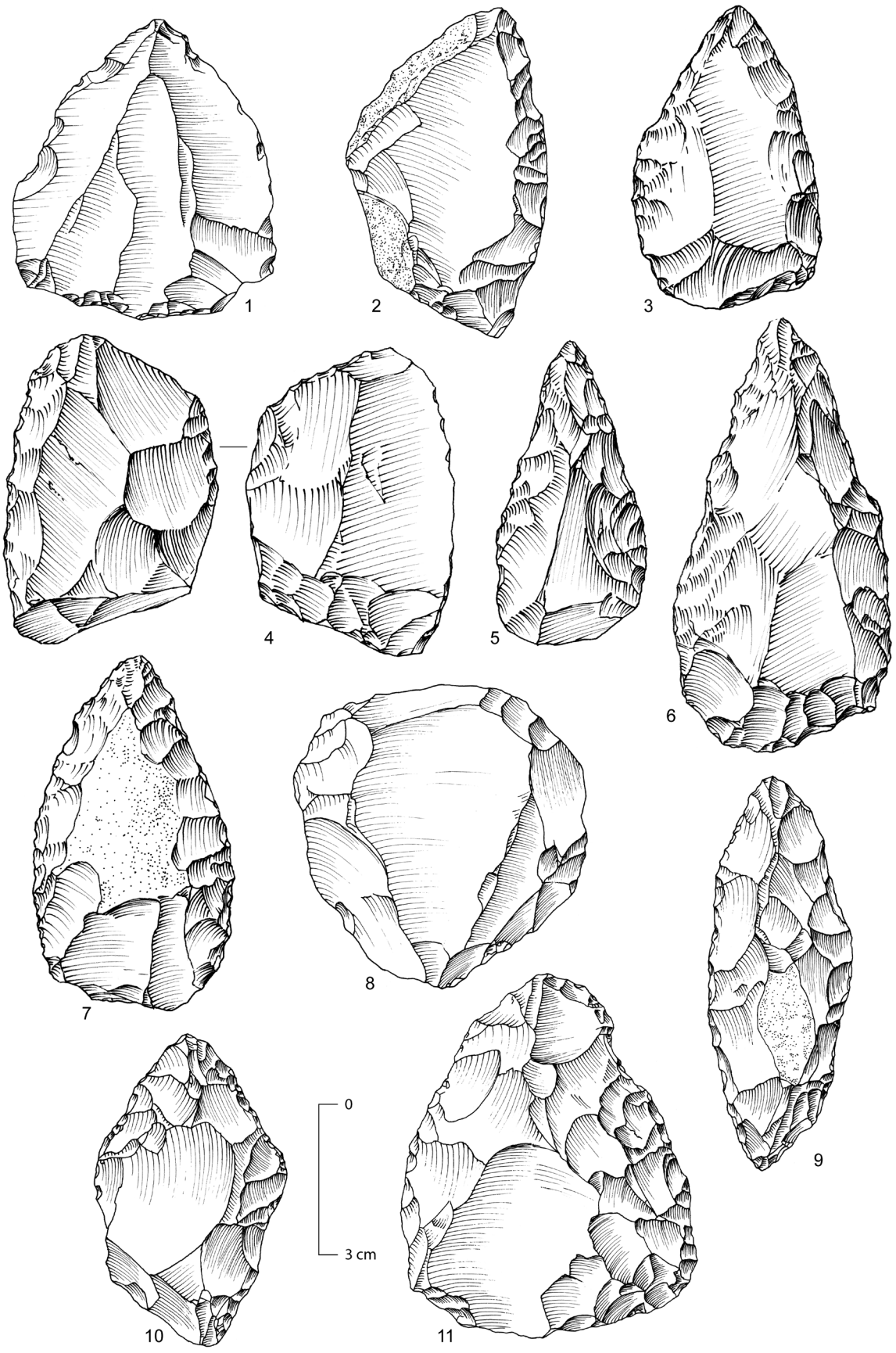

Figure 5. Goyet, the main terrace and its cave entrances, Middle Palaeolithic artefacts, former excavations. 1, Levallois point; 2, convex side-scraper, with atypical back; 3, convergent side-scraper; 4, convex side-scraper, with back thinned by bifacial retouch; 5, elongated Mousterian point; 6, elongated Mousterian point; 7, Mousterian point, on cortical flake; 8, disc on flake; 9, Limace; 10, leaf point; 11, subtriangular biface (after Ulrix-Closset 1975).

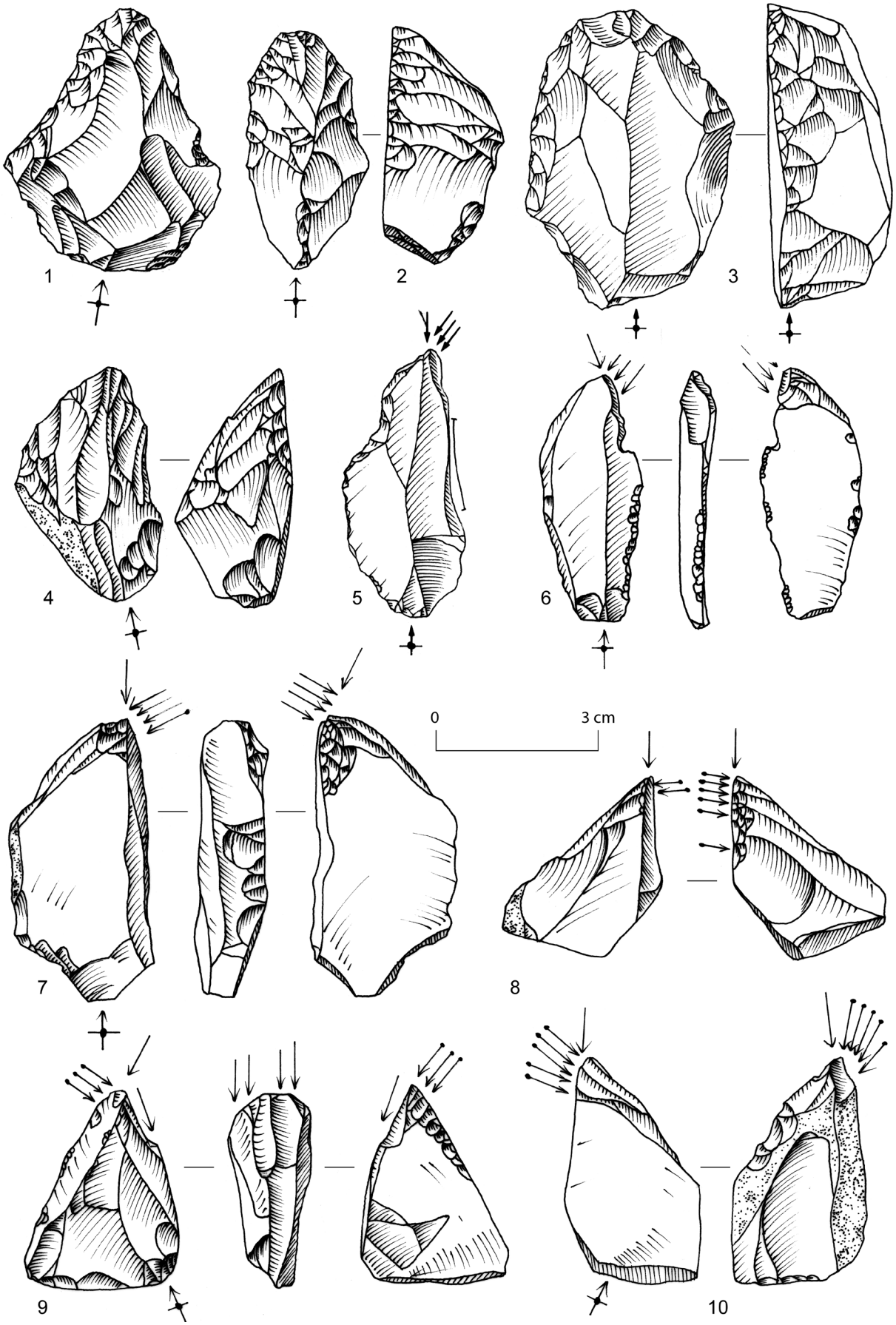

Figure 6. Goyet, main terrace and its cave entrances, Aurignacian artefacts, former excavations. 1, nose scraper; 2, simple keel-shaped scraper; 3, atypical keel-shaped scraper; 4, nose-scraper; 5, nosed burin; 6, keel-shaped burin; 7, keel-shaped burin; 8-9, keel-shaped burins, Les Vachons type; 10, nosed burin (after Otte 1979).

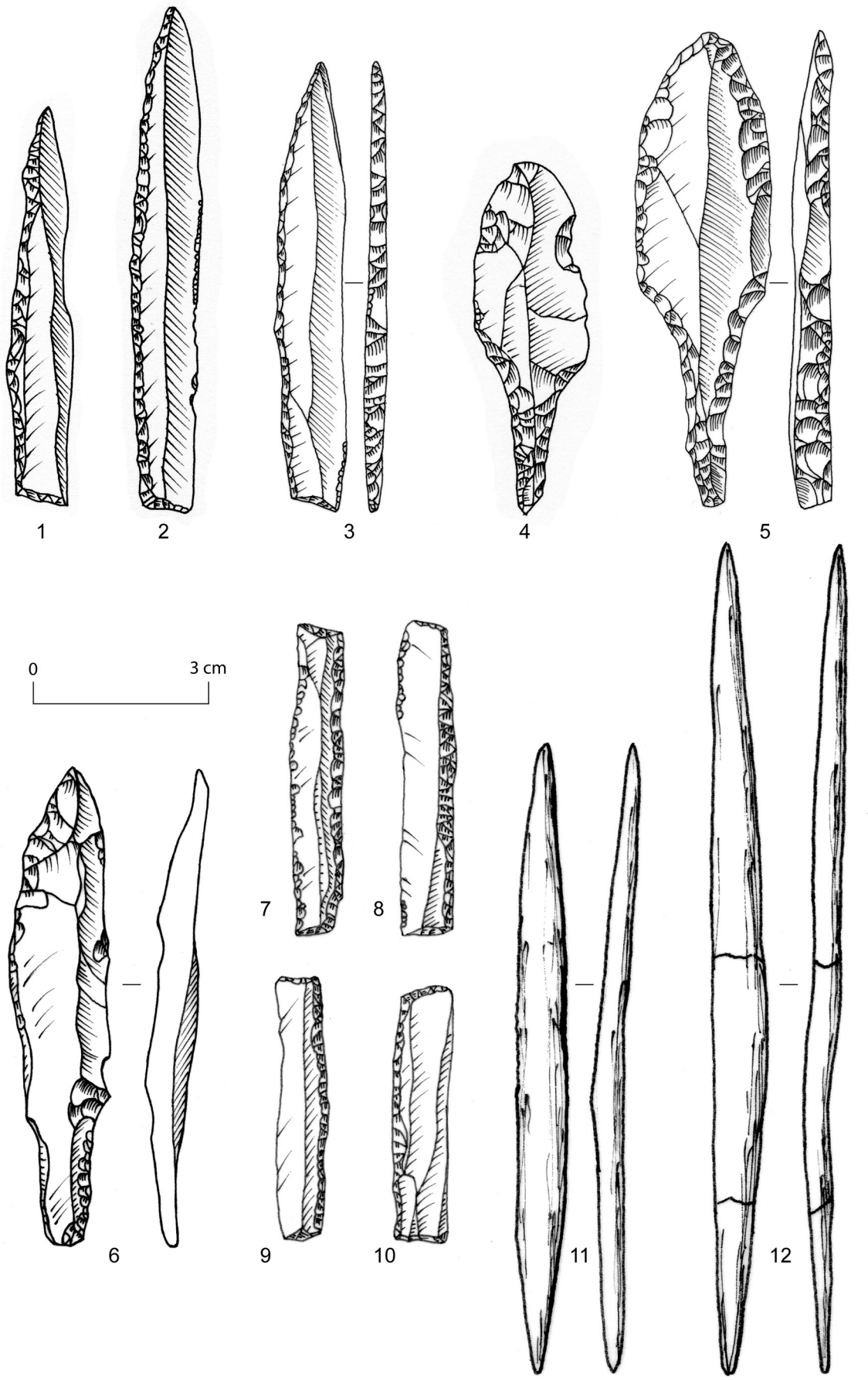

Figure 7. Goyet, main terrace and its cave entrances, Gravettian artefacts, former excavations. 1-3, backed points with troncated base; 4-6, stemmed points, La Font-Robert type; 7-10, bitroncated backed bladelets; 11-12, reinder double bone points (after Otte 1979).

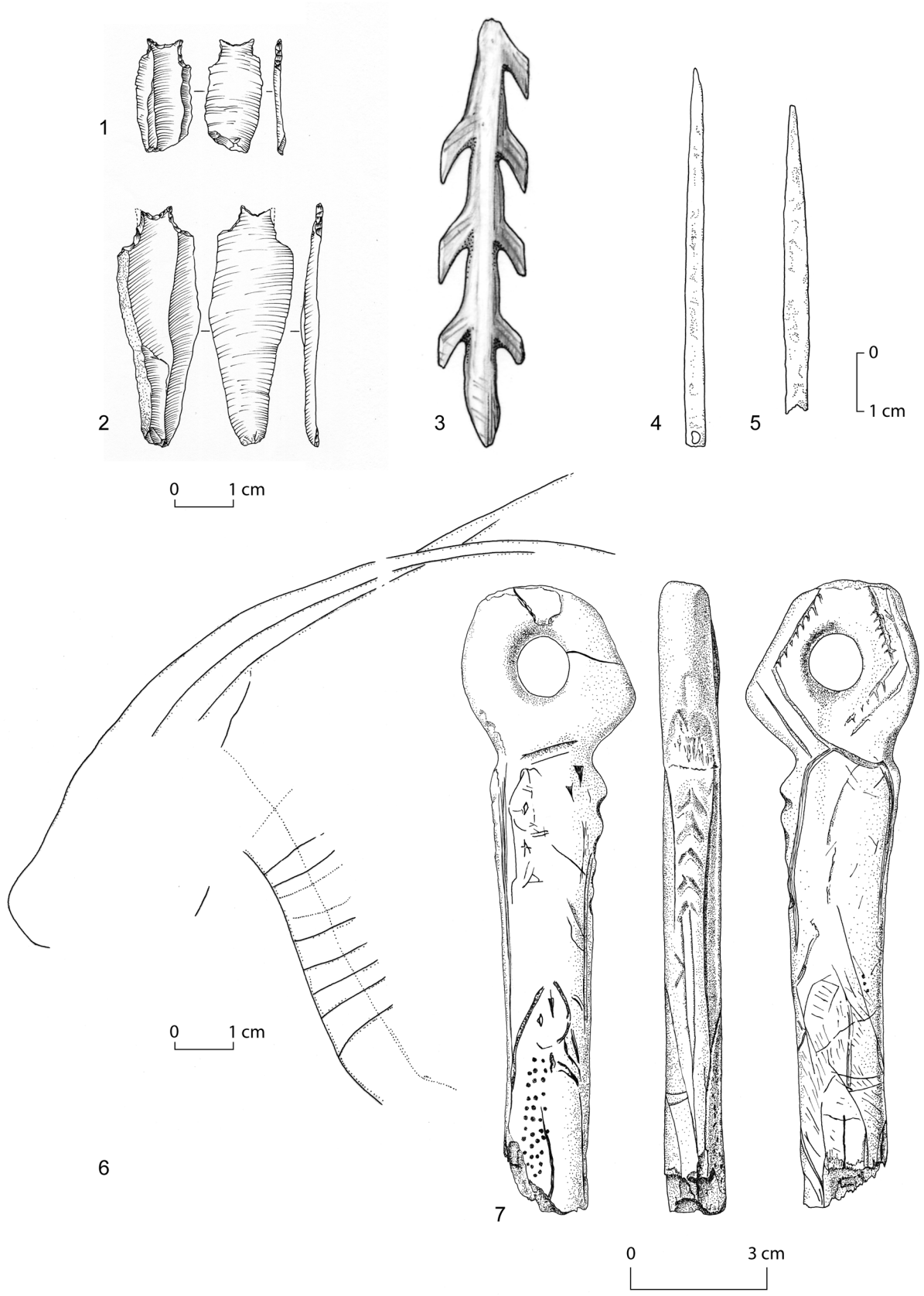

Figure 8. Goyet, the main terrace and its cave entrances, Magdalenian artefacts, former excavations. 1-2, piercers, Chaleux type; 3, harpoon with double rows of barbs; 4-5, eyed needles; 6, mobiliary rock art, ibex head; 7, reindeer antler bâton decorated with fishlike motifs (after Dewez 1987).

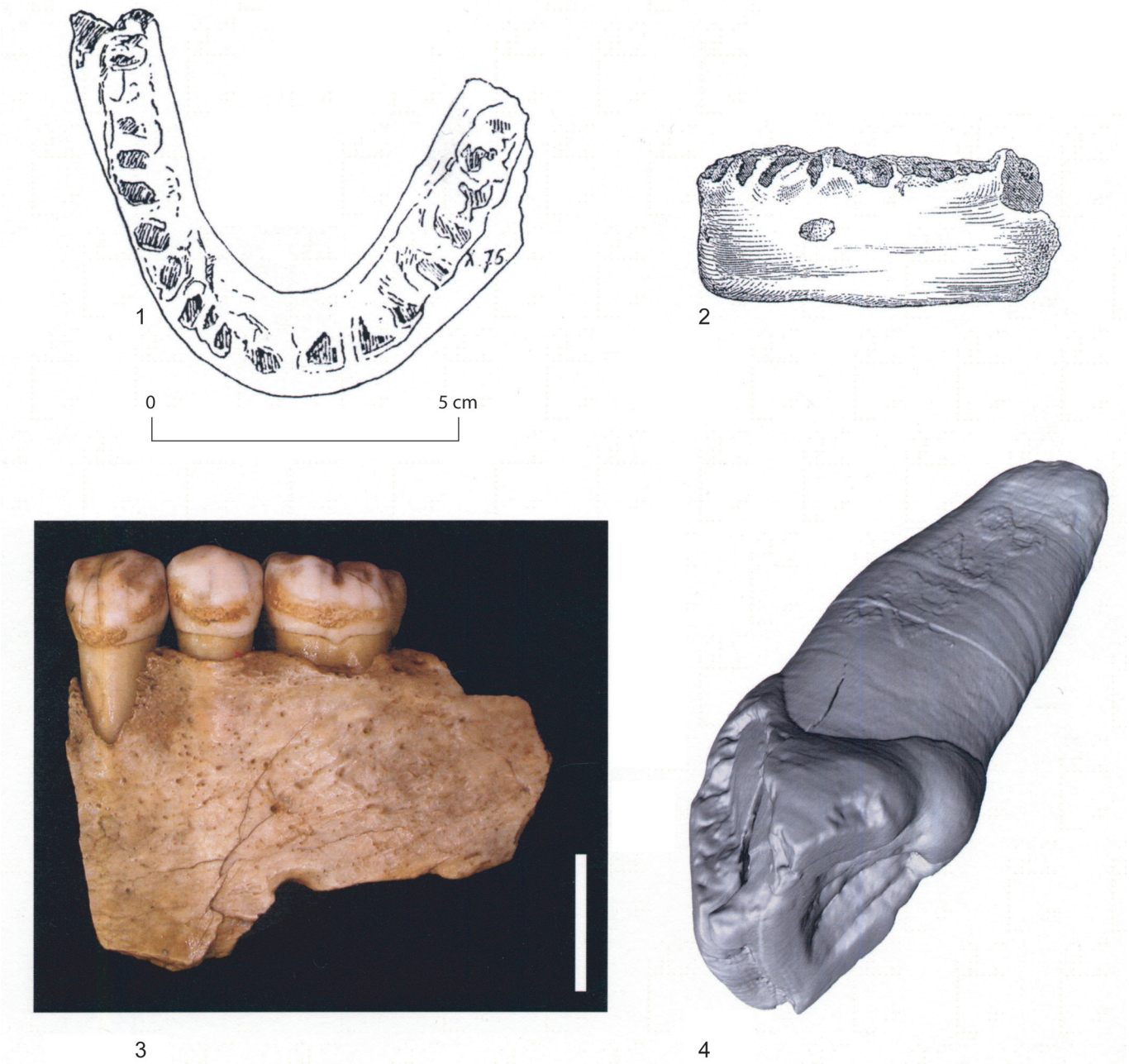

Figure 9. Goyet, third cave, "second layer". 1-2, mandible found by Dupont (inventory no. I.R.Sc.N.B 2878-09); 3, another fragment of mandible also found by Dupont (inventory no. I.R.Sc.N.B 2878-08); 4, left lateral upper incisor (1, after Hué 1937; 2, after Hamy 1873; 3, courtesy of Patrick Semal, I.R.Sc.N.B; 4, after Semal *et al.* 2005).

Modern excavations

Seven trenches were dug on the terrace (fig. 3:1-6, 11). Four others in the third cave; namely, trench 7 at the entrance, trench 8 inside the fissure no. 3b - which is an accessory passage to Cave 3 - and trenches 9 and 10 in the middle of the gallery (fig. 3). These eleven trenches were all dug to bedrock. Finally, trench 12 explored a vertical fissure at the west of the entrance of Cave no. 1.

Trenches 1-6 showed that the terrace in its current layout, flat and 4 to 10 m in breadth, is mostly artificial. It had been essentially modified by backfill moved out of the caves by the former diggers and by the construction of tourism facilities, which was attested by the discovery, between trenches 1 and 2, of the foundations of a 20th century drinking establishment.

In fact, the sections of trenches 2 and 3 reveal that the rock substratum of the "terrace" slopes down steeply. Such a slope is not well adapted to sophisticated prehistoric occupations. Furthermore, *in situ* sediments in contact with the bedrock, under the backfill, in these two trenches as well as in Trench 6 whose rock substratum slopes less, were extremely poor, archaeologically and palaeontologically speaking.

Goyet's so-called "terraces" of the second, third and fourth caves abundantly cited in the archaeological literature are therefore for the most part a mythic construction than a real prehistoric site.

Lab number	Results BP		Interest	Cave	Bone bearing layer of Dupont	Taxon	Cut marks	Industry	References
OxA-4926	24.440	± 280	Prehistory	Upper Shelter		Bovid	no	Gravettian	Eloy & Otte 1995
GrA-3237	12.770	± 90	Prehistory	3	1	*Equus*, vertebra	yes	Magdalenian	Germonpré 1997
GrA-3238	12.620	± 90	Prehistory	3	1	*Ovibos*, phalynx	yes	Magdalenian	Germonpré 1997
UtC 8957	12.560	± 50	Prehistory	3, chamber A	1	*Equus*, MC		Magdalenian	Germonpré 2001
OxA-8875	2420	± 40	Prehistory	classic caves		*Homo s. sapiens*	yes	Protohistory	Toussaint 2005a
Beta-124825	4410	± 50	Palaeoanthropology	Trou du Moulin		*Homo s. sapiens*	no		Toussaint 2005b
OxA-10534	5345	50	Palaeoanthropology	Upper Shelter		*Homo s. sapiens*	no		Toussaint 2002a
OxA-5678	1985	± 50	Palaeoanthropology	3, chamber A	3	*Homo sapiens*			Preud'homme 1995-1996
GrA-9606	35.470	+ 780-710	Palaeontology	3, chamber B	4	*Ursus spelaeus*, metacarpal	no	-	Germonpré & Sablin 2001
GrA-9605	38.770	+1180-1030	Palaeontology	3, chamber A	1	*Ursus spelaeus*, pisiform	no	-	Germonpré & Sablin 2001
KIA-18986	27.440	± 165	Palaeontology	3, chamber A	3	*Ursus spelaeus*	no	-	Germonpré 2002
KIA-16289	34.920	+330-320	Palaeontology	3, chamber A	2	*Ursus spelaeus*	no	-	Germonpré 2002
GrA-2812	27.230	± 260	Palaeontology	3, chamber A	1	*Crocuta crocuta*, calcaneum	no	-	Germonpré 1997
UtC 8958	35.000	± 400	Palaeontology	3, chamber A	1	*Crocuta crocuta*, P4	no	-	Germonpré & Sablin 2001
KIA-13550	10.640	± 50	Palaeontology	3, chamber A	3	*Ursus arctos*, mandible	no	-	Germonpré 2001

Table 1. Radiocarbon dates from the different sites of the Goyet cave system.

These observations suggest that the former excavations conducted on the terrace essentially consisted in reworking the backfill from the inner caves, notably that from the initial excavations of E. Dupont. The fact that the backfill was stratified added to the quantity of material it contained, both archaeological but above all palaeontological, may easily have misled diggers who used to work in small areas, regardless of stratigraphy, only interested as they were in laying their hands on nice objects.

On the other hand, a large fissure located in the floor underneath the arch, just before the entrance no. 1, did not seem particularly engaging at first since the bedrock was visible in places; yet it yielded some promising archaeological data (fig. 3:11).

Trenches 7, 9 and 10 (fig. 3) brought evidence that the third cave had been almost completely emptied to bedrock by Dupont and the numerous diggers who succeeded him, although sediments very low in archaeological content were found in fissure 3b (fig. 3:8).

Trench 12 explored the rift in the west wall of the first cave's entrance area, just outside the iron grid; it was filled essentially by sediments reworked by former explorations. Still, it yielded some flint artefacts and morphologically modern human bones that might come from a disturbed Holocene burial.

The Upper Shelter

History

The shelter is ca. 50 m north-west of the terrace of the 'classic' caves, 12 m above them, 25 m above the alluvial plain (fig. 2:2). This Gravettian site was excavated without any method around 1952, then recently re-excavated with a multidisciplinary perspective by the "Direction de l'Archéologie" (Toussaint *et al*. 1999).

Results from the 1952 excavations

An abundant lithic material has been gathered over the years, as much by L. Keyser, at the time manager of the tourist caves, then by a series of amateur archaeologists to whom Keyser gave permission to loot the site on a regular basis, among them L. Eloy, whose collection is the only one published to date, 4 decades after the fact (Eloy & Otte 1995).

The brief stratigraphy recorded in 1952 comprises only three units: blocks fallen from the cliff, a humic layer and, at the bottom, the archaeological layer "made of a light powdery sediment loessic in aspect", with "fine strata corresponding to past human occupation".

The archaeological material (fig. 10) was gathered without precise measurements or sieving. It includes blades and bitruncated backed bladelets, backed points with truncated bases as well as bi-points which make up most of the arrow points, the latter also comprising some backed bladelets and fragments of Gravette and microgravette points. A stemmed point of Font-Robert type and a fragment of point with flat retouch are also reminiscent of the famous Maisières site industry. Common tools include different burins, composite tools and scrapers of which some, with thick front, are problematic in that they suggest either the persistence of Aurignacian typologies or the presence of an Aurignacian layer underneath the Gravettian.

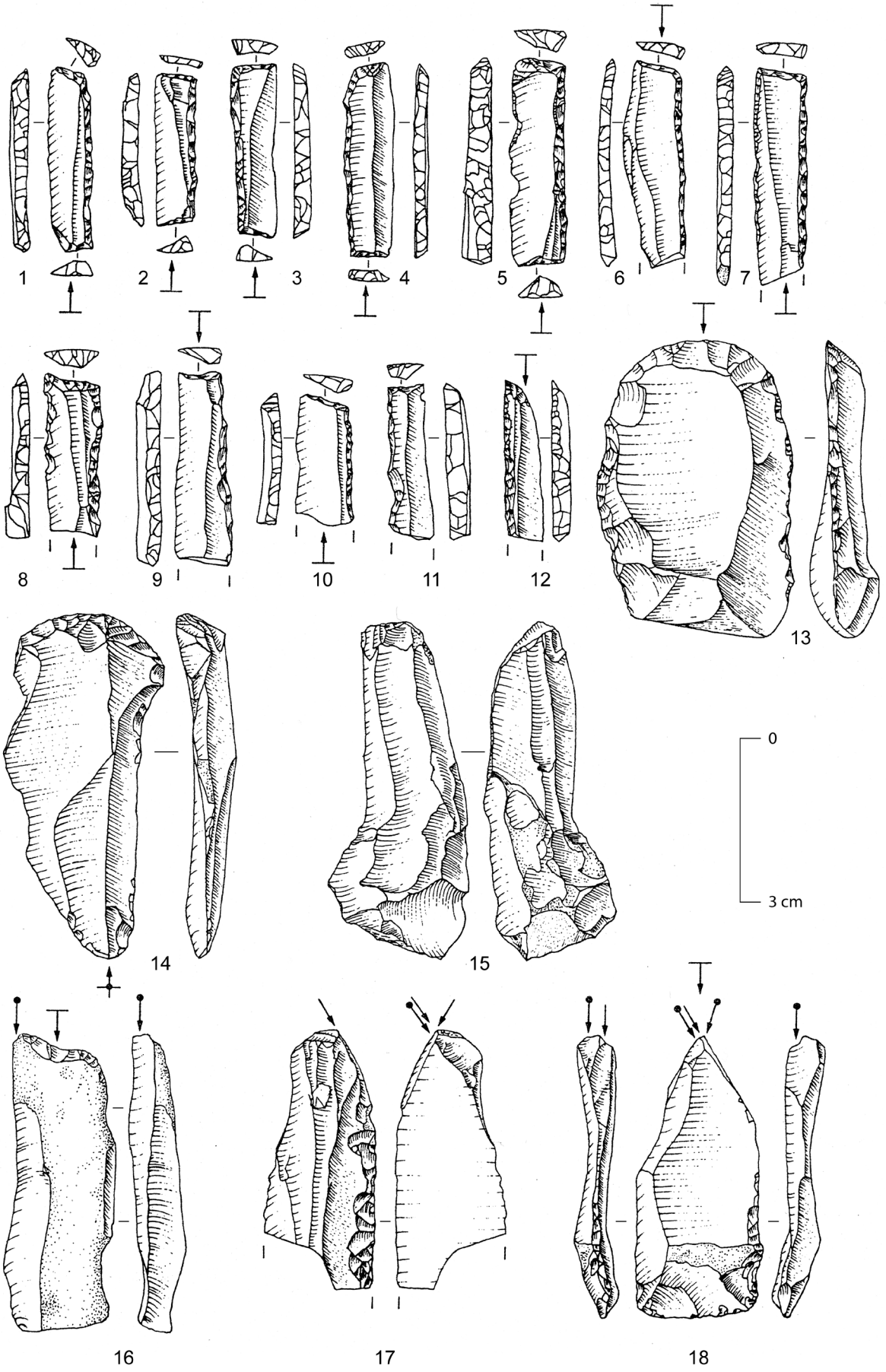

Figure 10. Goyet, Upper shelter, Gravettian artefacts, recent excavation by the "Direction de l'Archéologie" (after Toussaint *et al*. 1999). 1-5, bitroncated backed bladelets; 6-11, troncated backed bladelets, broken; 12, pointed backed bladelet, broken; 13-14, scrapers; 15, core; 16-18, burins.

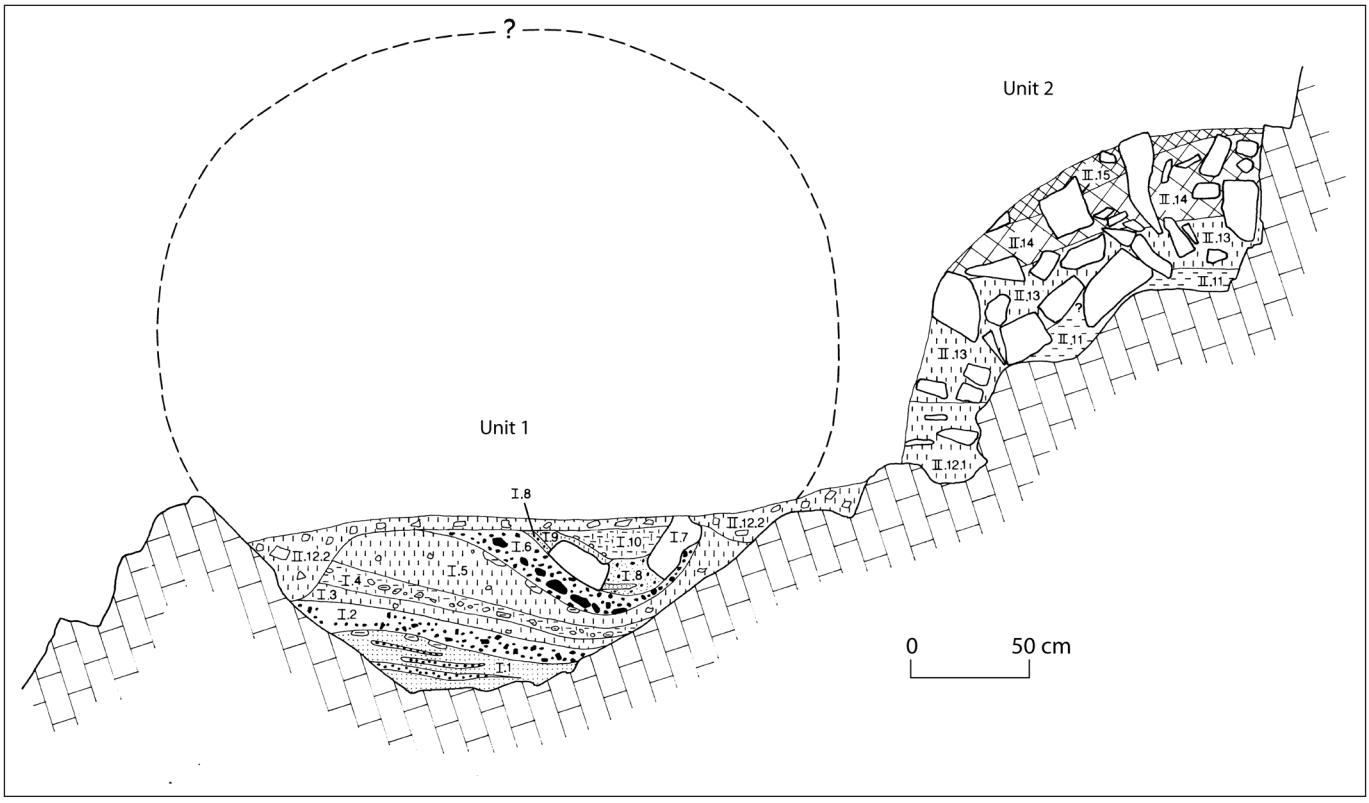

Figure 11. Goyet, Upper Shelter, section drawn by the geologist S. Pirson during the excavation of the "Direction de l'Archéologie" (after Toussaint *et al*. 1999).

Fauna included woolly rhinoceros, cave bear, aurochs, red deer and ibex, but mostly horse and reindeer. AMS dating of a bone fragment from a "large bovine" yielded 24.440±280 BP (OxA-4926).

Modern excavations

The stratigraphic sequence of the Upper Shelter observed after the three years of recent excavations appears more elaborate than that described during the first explorations. These deposits, studied in detail by the geologist S. Pirson (in Toussaint *et al*. 1999) are divided into two units differing by their deposition processes. A series of erosion sequences was also identified.

The first unit (layers I.1 to I.10 and II.12.2; fig. 11) represents deposits filling a decapitated karstic gallery. Layers I.1 to I.8 represent an evolution in karstic context, with high energy fluviatile deposits (layers I.1, I.2 and I.6.1, I.6.2, I.8) interspersed with calmer phases, maybe also of a fluviatile origin (layers I.3 and I.4). Layer I.5 is different in that its input contains deposits probably aeolian in origin, interspersed between two fluviatile phases. Layer I.7 corresponds to blocks collapsed from the roof of the gallery when the streamway was active. Layers I.9 and I.10 have probably been deposited in the karst, before the collapse of the gallery roof; however, no layer can be directly correlated with this collapse, probably because of the perturbations produced by the former amateur excavations and because of strong erosion. A significant hiatus certainly separates this collapse (probably posterior to layer I.10) and the deposit of layer II.12.1. On the other hand, the top layer of the first unit, II.12.2, is clearly related to a rock shelter context, as is the second unit.

The stratigraphy of the second unit (layers II.11 to II.16) - whose stratigraphic links with the first unit were in great part truncated by the 1950's work - starts with a loess-like sediment containing Gravettian archaeological material (layer II.12.1). Layer II.13 represents a phase of strong cryoclasty. Finally, layers II.14 and II.15 are affected by Holocene pedogenesis.

The new research yielded a few bones from large mammals, a marine mollusc shell (*Glycimeris* sp.*)* and abundant samples of microfauna and terrestrial molluscs. The bone remains are deteriorated and very small. They essentially belong to: *Bos primigenius, Equus* sp.*, Cervus elaphus, Rangifer tarandus,* woolly rhinoceros and *Vulpes vulpes*. This little series suggests a predatory way of life in the context of a gallery forest and thus, climatic conditions slightly milder than that deduced from the identifications based on photographs of about 20 bones from the 1952 excavations (Eloy & Otte 1995).

Several hundred lithic artefacts including dozens of tools were found in the still undisturbed archaeological layer and in the backfill from the first excavations. The flintwork consists of cores with blades, numerous blades and bladelets as well as flakes of various shapes. The classic tools are represented by scrapers (fig. 10) and burins, essentially on truncations and dihedral There are also backed pieces with two truncations, backed pieces with a truncation at one end and a fracture at the other end, that are probably nothing more than broken bitruncated pieces, as well as bladelets with pointed back

that might be fragments from bi-points. Some simple backed bladelets were also found. Typologically speaking, this material belongs to the Gravettian, like the one from the previous excavations to which it is closely related.

A small set of teeth and human bones was found during the latest excavations, notably in a horizontal fissure in the back wall of the Upper Shelter, more or less at the level of the superficial deposits that must have filled the site before its exploitation. These remains belong to at least one morphologically modern child and one adult. This places them within the Middle Neolithic: 5345±50 (OxA-10534), 4250-4040 BC after calibration at 1σ.

Trou du Moulin and its new cave systems

History

Trou du Moulin (Mill Cave), sometimes referred to as "Cave no. 1" or "Mathot Cave", is located downstream of the Upper Shelter. E. Dupont was the first to explore the site, apparently after his important excavations at the "classic" caves of Goyet but before 1872, when the site is mentioned in his main book (Dupont 1872). The site was later transformed by the construction of a shelter during the First World War. In 1948, H. Danthine (1952) had large trenches dug through the terrace and in the cave itself.

Since 1998, our research team has found several new galleries and chambers by exploring a small cleft in the right wall of the main cave (Toussaint *et al*. 1998).

Data from the former excavations

From the limited information available in E. Dupont's book (1872, synoptic table) and the accompanying labels of the material he found (Danthine 1952) that is conserved at the Royal Institute of Natural Sciences of Belgium, there were three ossiferous layers at Trou du Moulin, all belonging to the "Mammoth age". The first two layers yielded some archaeological material, among them a small series of flint artefacts. The purported homogeneity of the groups defined by Dupont must, however, be treated with some caution, as the presence of pottery shards and some human bones found in the second ossiferous layer suggests. While excavating Trou du Moulin, H. Danthine found only disturbed sediments containing various faunal remains belonging to the same species as those found by the first digger, as well as a fragment of a retouched flint and a chert point. This poor lithic material might indicate a short occupation by a "Levallois-Mousterian" Middle Palaeolithic group (Danthine 1952).

Cave bears, hyenas and some rhinoceros were the most represented species in these three layers. The so-called "evidence of human occupation" as identified by Dupont in his "first ossiferous layer" is limited (Danthine 1952) to ten flint artefacts including 3 retouched blades and one core, a chert blade and two rolled cobbles of which one would have served as a hammerstone. The "second ossiferous layer" yielded for its part two rolled cobbles and 13 flint artefacts including 3 scrapers and a long point. Some human bones were also found in the second of these ossiferous layers. Pottery shards coming from the two layers make the homogeneity of the groups as advanced by Dupont disputable.

The child from the new cave systems

The newly discovered (1998) cave systems of Trou du Moulin extend to the Upper Shelter. A series of chambers and connecting corridors, forming an approximate square, constitute the "Central System" (fig. 12). Three long sub-systems with magnificent concretions start from three of the four corners of the Central System: "Régal des Fées", "Atlantide" and "Salle de Cristal".

Bones from a child about 12 years old, probably a boy, were found in two areas of one of the "Central System" chambers (Toussaint *et al.* 2004; Toussaint 2005b). Most of the bones came from a vertical fissure ca. 2 m high and 30-40 cm wide near the roof of "Salle de l'Enfant" (fig. 12). Others were found 4 m below, in the chamber proper, either on fragments of stalactite curtains and stalagmites covering the floor or underneath these fragments. No archaeological material was associated with it. AMS dating of a foot bone yielded a date of 4410±50 BP (Beta-124825), i. e. 3100-2920 BC after calibration at 1σ. This fits well in the rich corpus of dated human bones from the Belgian Meuse basin (Toussaint 2002a). It corresponds to the beginning of the Late Neolithic.

Since the fissure was too tight to allow access to the skeleton, an *ad hoc* methodology had to be developed, comprising precise measurements with laser surveying equipment of small plastic landmarks scattered amid the bones, photographs taken with a digital camera fitted to a pole, software correction of the photographs to recreate a faithful map of the bone distribution based on the surveyed landmarks, and finally dismantling of the burial with a 70 cm long articulated pair of pliers.

Initially, the scattered bones seemed in utter disorder. But after having divided the fissure in sections numbered 1 to 6 (7 being the chamber immediately below the fissure), from back to front, and having studied the distribution of the different types of bones according to this plan, some minimal order became apparent. As shown on figures 13 and 14, most of the cranial fragments were at the back, in section 1. The maxillae and the mandible were closer to the front, respectively in sections 3 and 4. Isolated teeth were in the bottom half of the fissure. Most of the pectoral girdle bones were in section 3, the rest in sections 2 and 4. Vertebrae were found everywhere, a few cervical vertebrae at the back, in section 1, and a concentration in section 3. The ribs were mostly concentrated in sections 3 and 4. The upper long limb bones were somewhat grouped in section 3 and in the back of 4 (fig. 14). Most of the hand bones were in 3. The pelvis parts were in majority in 5 and the front of 4. The femora, broken, were in section 5. The left tibia was in section 4 and the right much further back, trapped by stalagmite B, in section 3. The right fibula was also in section 3. Several bone fragments had fallen in the chamber down below, section 7.

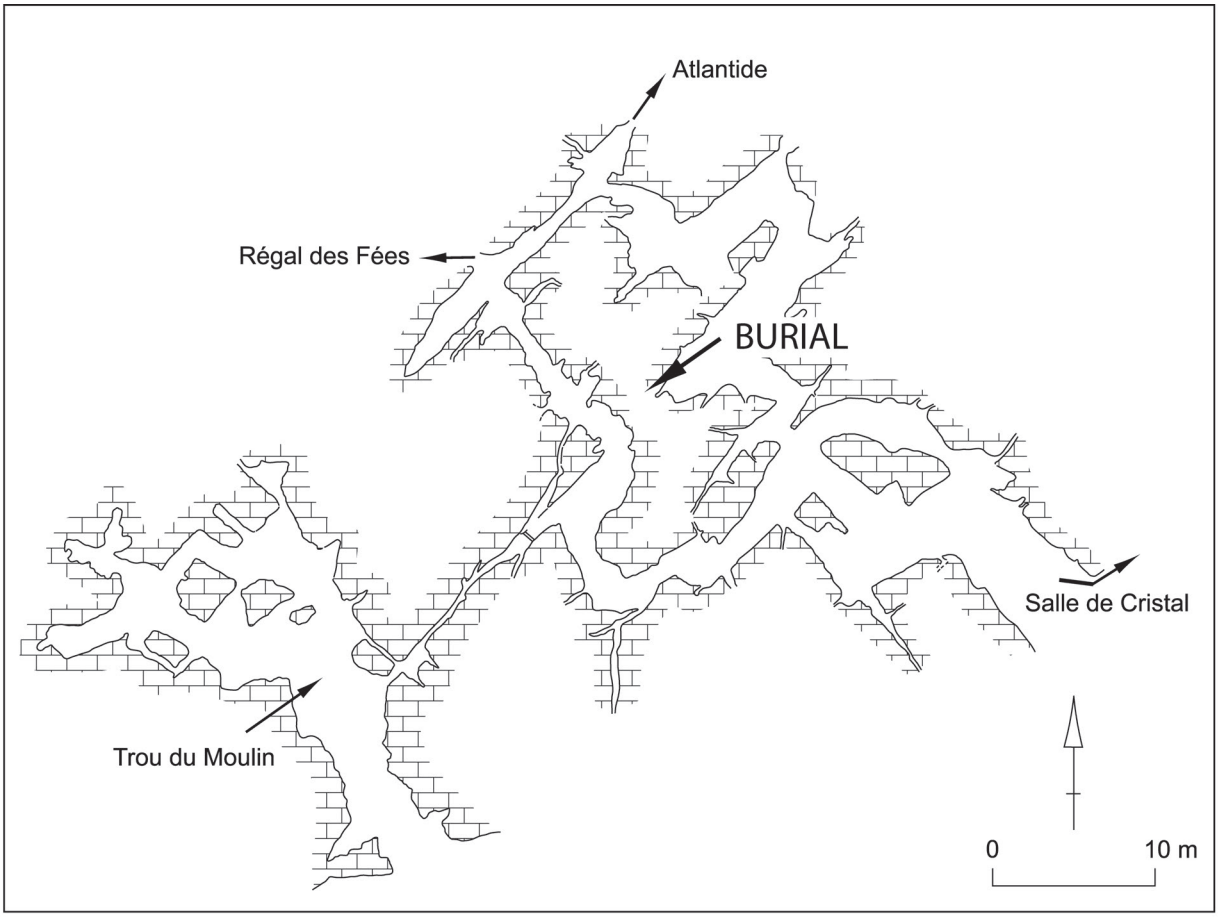

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Figure 12. Goyet, Trou du Moulin, Neolithic grave of the new cave systems. 1, map of the "Central System", a series of chambers and connecting corridors forming an approximate square, with location of the Neolithic child burial; 2, general view of the grave; 3-4, detail views of the grave.

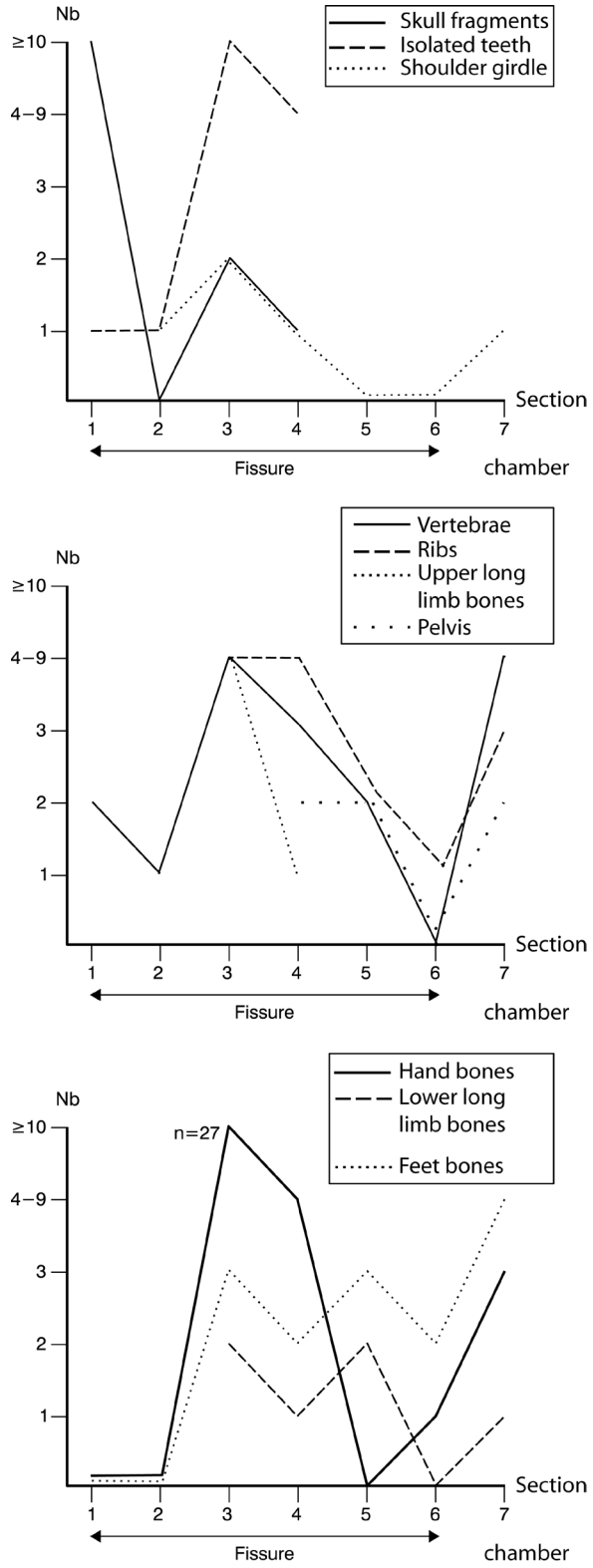

Figure 13. Goyet, Trou du Moulin, Neolithic grave of the new cave systems: distribution of the different types of bones in six sections defined along the longitudinal axis of the grave, from back to front, section 7 being the chamber immediately below the fissure.

This distribution pattern suggest the body had been lain with its head at the back of the fissure and its feet near the entrance, which is supported by the fact that most of the skeletal remains had their proximal epiphysis towards the back of the fissure, where the skull was located.

However, two interesting irregularities appeared during our analysis. First, the femora were turned over, their head towards the entrance, while the orientation of the tibiae was more in accordance with what was expected from a body with its head at the back. Second, the ulnae and radii were further back in the fissure than the left humerus, like the majority of the small hand bones; furthermore, the proximal end of the right ulna was oriented towards the entrance. The comparison between these two sets of observations provides solid evidence in favour of a folded position of the body, of foetal type.

The combination of three intriguing characteristics of the burial, namely: the body was alone, completely sheltered from daylight and in an all but unreachable fissure, confers on this burial a quite specific quality in comparison with the other burial sites from the Late Neolithic Meuse basin.

It seems also that the body of the child decomposed in the open air, as evidenced by the lack of sediments over the bones as well as the numerous bones displaced out of the initial area of the burial, the displacement further back of the skull parts, the displacement of the mandible, the flattening of the pelvic area, fragments from the same bone found separated by a certain distance, etc. Decomposition occurred in a primary burial, which is confirmed by the persistence of "unstable connections" and a certain level of spatial organisation in the distribution of the bones.

As a conclusion, the following sequence of events can be proposed. Neolithics decided, after the death of a child about 12 years old, to bury him in a fissure situated 4 m above the floor, inside the Goyet karstic system. To achieve this, they had to hold and sometimes drag the corpse through tight corridors, in order to access the chamber where they hauled the body in the fissure and laid it to rest with its head at the back. It seems that the legs and forearms were folded. No sediment was deposited on the corpse and no natural sedimentation covered it later. Two stalagmites, formed by water dripping from the roof of the fissure, froze two small sections of the burial. Later, small animals disturbed the distribution of the bones, eroded the ends of some of them and pushed some bones into the chamber below the fissure. Seismic tremors later shattered stalactite curtains adorning the walls of the "Salle de l'Enfant" as well as stalagmites and stalactites and toppled them on the floor, covering in the process the first bone fragments fallen from the burial fissure. Finally, burrowing animals again pushed some bones out of the fissure, the resulting fragments then falling over the pieces of stalactite curtains and other concretions covering the floor of the chamber.

Post-Palaeolithic archaeological evidence

Apart from several series of teeth and human skeletal remains reminiscent of Neolithic Meuse basin collective burials, some post-Palaeolithic prehistoric material found at Goyet was recently studied. The caves have also yielded traces from later periods: Protohistory, Roman and Middle Ages, whose study falls outside the scope of this paper.

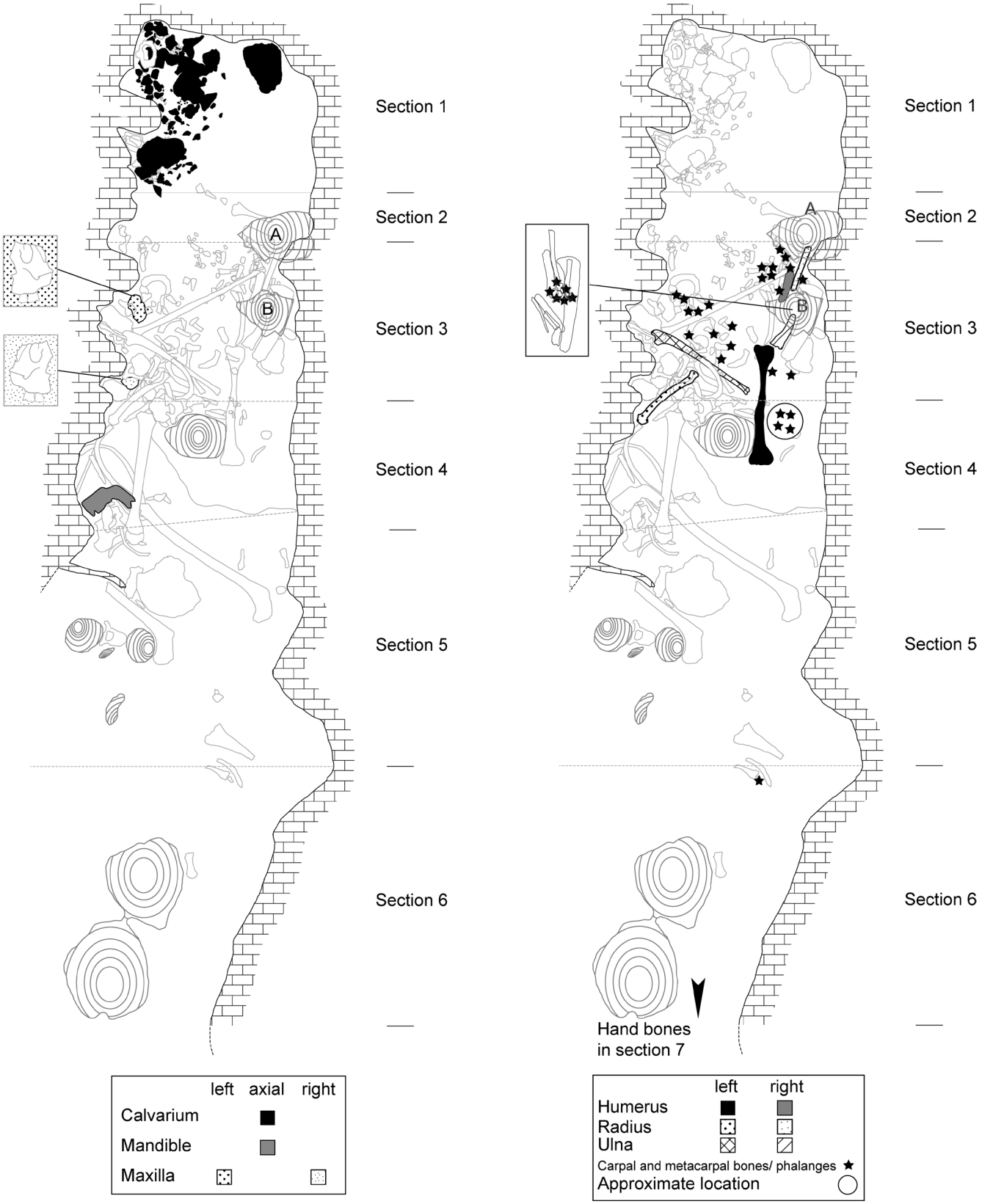

Figure 14. Goyet, Trou du Moulin, Neolithic grave of the new cave systems. 1, distribution of the skull fragments; 2, distribution of the upper limb bones.

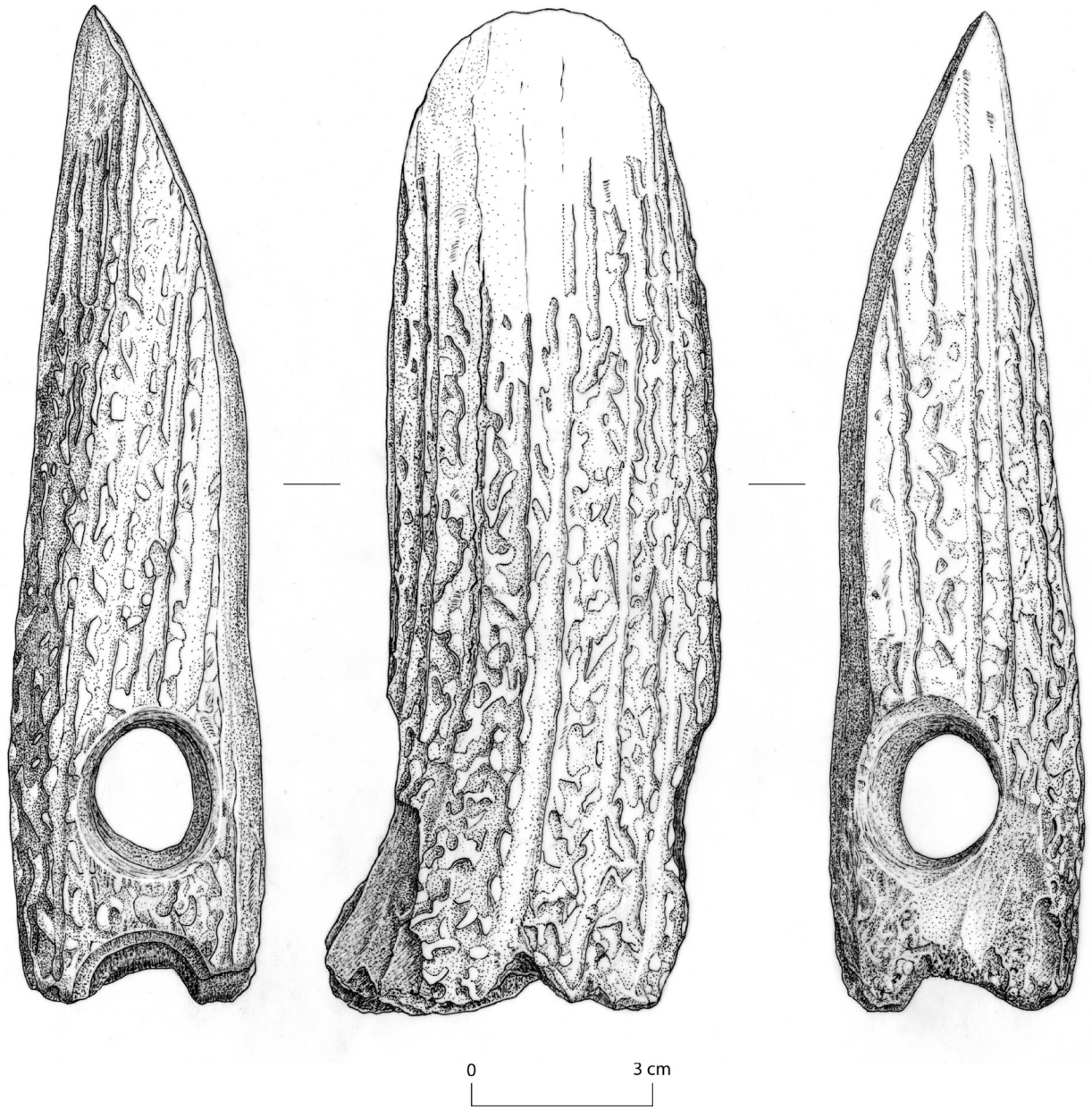

Figure 15. Bevelled antler tool.

The bevelled stag antler mattock

A bevelled and double-perforated stag antler mattock was found at an unknown date (fig. 15). The two perforations are parallel; the first, incomplete, in the axis of the central antler, and the second, complete, about 1 cm from the first one, towards the bevel. The bevel was obtained by obliquely sectioning the beam; it exhibits several microtraces. It matches type ba3 in Hurt's classification (1982). Chronologically, bevelled tools of type Ba seem to make their appearance around 6500-6400 BP (Smith 1989) or 6100 BP (Crombé *et al.* 1999) until, depending on the regions, 5400-5300 BP (Smith 1989) or even 4700 BP (Crombé *et al.* 1999). They date from the end of the Mesolithic or the Early and Middle Neolithic. Without radiocarbon dating, the age of this tool remains undetermined.

The Protohistoric knife (fig. 16)

A tool manufactured on a human radius was discovered between 1935 and 1945 in the classic cave system (Toussaint 2002b, 2005a). A splinter from the artefact yielded an AMS date of 2420±40 BP (OxA-8875), i.e. between 760 and 400 BC after calibration at 1σ and between 770 and 390 BC at 2σ. Such a result dates the object to the Iron Age, although the size of the standard deviation due to large plateaux on the calibration curve prevents greater precision.

The tool was shaped on an adult left radius, perhaps from a male. The distal end of the bone was removed during tool preparation. On the distal part, there is a partial longitudinal edge, prepared by scraping of the palmar and dorsal surfaces and practically aligned with the prolongation of the interosseous crest, from which, however, it is easily distinguished. The lateral face of

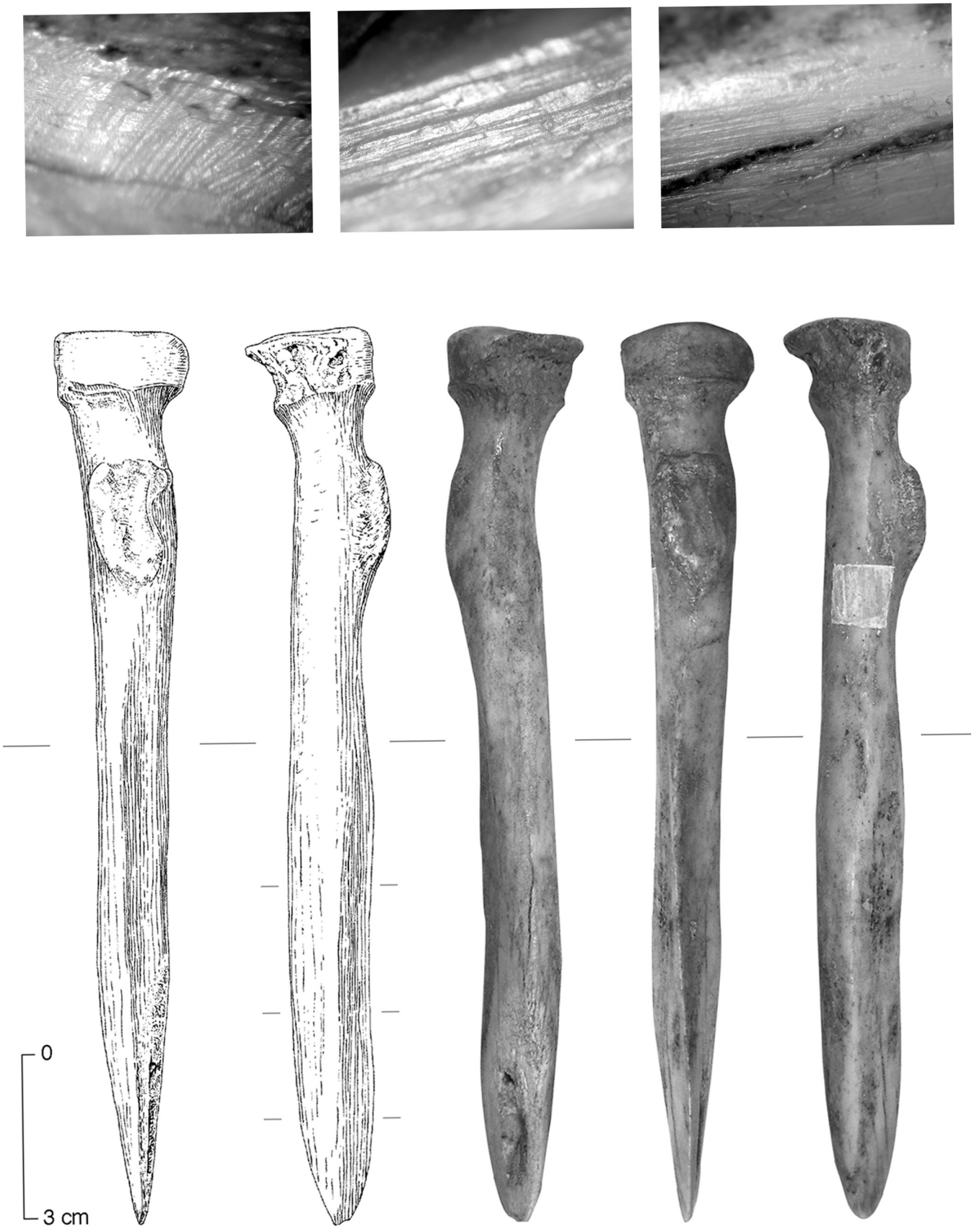

Figure 16. Protohistoric knife from the “classic” caves.

the bone is a longitudinal back opposite the prepared edge. Unworked on all of the central part of the object, this back was, however, worked on the most distal part to contribute to the formation of the point.

Strictly speaking, the object cannot then be considered a dagger. In spite of the relative shortness of the worked edge, it corresponds rather to the definition of a knife. Typologically, the tool is exceptional. On the basis of archaeological literature, it is the only sharp-pointed tool created on a radius known both for the prehistoric and protohistoric periods in Europe and North Africa; the few other tools made from human long bones are typically on fibulae and, more rarely, on ulnae and humeri. In addition, these comparable tools are characterized primarily by their point, which often qualified them as daggers, while the specificity of the Goyet knife is the association of the point with a worked edge opposed to a natural back.

Conclusion

The archaeological richness of Goyet caves was already known back in 1870. The intensity of the careless explorations this site has undergone has profoundly altered the sedimentary deposits and the rich prehistoric material it contains. Data essential to the accurate understanding of the stratigraphy and palaeoenvironment have been lost forever. Both palaeoenvironmental and archaeological studies are consequently seriously penalized, inasmuch as they have to compile documents most probably originating from different strata. Barring the discovery of an undisturbed sedimentary fill, we will never know in detail the different Middle Palaeolithic, Aurignacian, Gravettian and Magdalenian industries present at Goyet.

However, during the research undertaken since 1997, partial layers have been found *in situ*, for example at the Upper Shelter, and the virgin area, in the new systems of Trou du Moulin, where a Neolithic child burial, has been excavated. Much more, though, must still be done if we are to better understand the prehistory of the caves of Goyet.

In the field, several untouched areas should be excavated. Among them, a fissure in the floor of entrance no. 1 of the "classic" terrace stills contains undisturbed deposits. By far the most promising perspectives, however, lie in the pristine gallery directly under the Upper Shelter; filled with sediments to the last 60 cm under the roof, its entrance yielded, as much on the surface as in stratigraphy, lithic material from the Early Upper Palaeolithic and bones from large Quaternary mammals. Finally, diverse small caves spread out along the cliffs of Goyet still contain multiple unexplored burials.

As for laboratory work, analyses of the deposits from the Upper Shelter must be finalized, particularly the sedimentology and palynology, and a monograph has yet to be written. The study of both the collections kept in museums and the private collections might also bring some surprises, as proven by the recent re-discoveries of a knife on human bone unearthed half a century ago as well as a fragment of a mandible found by E. Dupont around 1870.

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