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Title

Industry and art on osseous materials from Courbet cave (Penne, Tarn, France) in the British Museum collections: evidence of Magdalenian connections

Industrie et art sur matières osseuses de la grotte du Courbet (Penne, Tarn, France) au British Museum : témoins de contacts magdaléniens

Authors

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Abstract

The Magdalenian site of Courbet cave in the Aveyron valley is renowned for a significant contribution to the nineteenth century debate about human antiquity and an outstanding set of engraved and sculpted artworks. The typological content of the assemblage nevertheless remained poorly known, making it difficult to assess the place of Courbet cave within Magdalenian settlements of south-western France. This paper presents a review of over 1300 pieces of osseous industry recovered during the main excavation led by the Vicomte de Lastic in 1863-64 and now curated at the British Museum. The assemblage composition corroborates the attribution of most of the collection to an Upper Magdalenian characterised by the prevalence of double bevel base points primarily decorated on the lateral faces, numerous barbed implements, and half-round rods decorated with a new variety of engravings. An earlier component includes single bevel base points and typical artworks documented in Middle Magdalenian layers at other sites. Locally, the osseous assemblage from Courbet cave bears a strong resemblance to that from Fontalès and there is abundant evidence of contacts beyond the Aveyron valley. While some representations are indicative of close connections to the Pyrenean and North Aquitaine areas, the actual movement of some objects over long distances is confirmed by the unexpected identification of two artefacts made of whale bone imported from the Atlantic coast. This finding clearly shows the Magdalenian inhabitants of the Aveyron valley were part of wider networks.

Résumé

Le site magdalénien de la grotte du Courbet, dans la vallée de l'Aveyron, est bien connu pour sa contribution au débat du XIX^e siècle sur l'antiquité de l'Homme et son extraordinaire série d'œuvres gravées et sculptées. La composition typologique des assemblages lithiques et osseux est néanmoins restée peu connue, ne facilitant pas l'évaluation de la place de la grotte du Courbet parmi les gisements magdaléniens du sud-ouest de la France. Cet article présente une série de plus de 1300 pièces d'industrie osseuse exhumées lors de la principale fouille du site, menée par le Vicomte de Lastic en 1863-64, et aujourd'hui conservées au British Museum. Le reclassement et l'enregistrement de cette collection ont permis de préciser la composition typologique de la série et d'identifier des pièces remarquables, parmi lesquelles figurent deux objets en os de baleine et 27 pièces d'art mobilier inédites. Ces nouvelles données apportent de plus amples informations pour l'attribution chrono-culturelle du Magdalénien de la grotte du Courbet et la compréhension de ses relations avec les zones environnantes.

La composition de l'industrie osseuse confirme l'attribution de la plupart de la série à un Magdalénien supérieur caractérisé par la prédominance des pointes à biseau double essentiellement décorées sur les faces latérales, de nombreux éléments barbelés (pointes barbelées et foënes), et des baguettes demi-rondes présentant une nouvelle variété de décors. La

diversification de la thématique figurative se traduit par une présence non négligeable d'espèces auparavant rares (poissons, saïgas, représentations difficilement identifiables), de gravures de pointes barbelées et d'un motif végétal. Les décors géométriques typiques du Magdalénien supérieur comprennent de courts arcs de cercles « en coup d'ongle », des petits reliefs ovalaires, des rainures crantées et un motif tressé. Une occupation à la charnière du Magdalénien moyen et supérieur est suggérée par la présence d'une pointe à base fourchue. Par ailleurs, une composante plus ancienne inclut quelques pointes à biseau simple et des types d'œuvres gravées et sculptées documentés dans des niveaux du Magdalénien moyen d'autres gisements, en particulier des crochets de propulseurs sculptés en forme de tête de cheval et des baguettes demi-rondes à parenthèses et trèfles.

Localement, l'industrie osseuse de la grotte du Courbet ressemble largement à celle de Fontalès par sa composition générale et certains caractères rares, tels qu'une quantité relativement importante de foënes ou la présence de pièces à épaulement. La collection du Courbet présente aussi de nombreux indices de contacts au-delà de la vallée de l'Aveyron. Alors que certaines gravures suggèrent des liens étroits avec les zones pyrénéenne et nord-aquitaine, le déplacement d'objets sur de longues distances est confirmé par l'identification inattendue de deux objets en os de baleine importés de la côte atlantique. Ces nouvelles données démontrent que les habitants magdaléniens de la vallée de l'Aveyron faisaient partie de réseaux largement étendus.

Keywords

Aveyron valley, osseous industry, portable art, whale bone, circulation network

Vallée de l'Aveyron, industrie osseuse, art mobilier, os de baleine, réseau de circulation

Text

Introduction

Courbet cave is a significant Magdalenian site in the Aveyron valley. In the nineteenth century, the discovery of human remains, lithic and osseous artefacts in association with the remains of animals no longer extant in the region, as well as animal representations on bone and antler made the deposit famous (Garrigou et al., 1863; Lastic, 1868). Beside well-known engraved and sculpted artworks (Sieveking, 1987; Cook, 2013), the typological content of the assemblage is poorly known apart from succinct comments in early publications (Cartailhac, 1903). This grey area makes it difficult to review the place of Courbet cave within Magdalenian settlements of south-western France. The largest available collection, excavated under the auspices of the Vicomte Louis Marie de Lastic Saint-Jal in 1863-64, includes a rich collection of osseous artefacts housed at the British Museum. Recent curatorial work has focused on improving the classification and documentation of this collection, providing a new opportunity to review the osseous industry. This paper presents the composition of the assemblage and highlights some of the remarkable pieces, in particular the whale bone artefacts and portable art recently identified. These data are then used to reassess the chrono-cultural span of the occupations and the relationships with surrounding areas.

1- Courbet cave

Formerly known as *Roc du Courbet*, *Trou des Forges* or *Caverne de Bruniquel*, Courbet cave is situated in the commune of Penne, Tarn (44° 03' N Lat, 1° 40' E Long; Barker et al., 1969; fig. 1), on the right bank of the Aveyron River next to the Chaussée de Borie-Basse ford (Pajot, 1969). The cave opens East in a Jurassic limestone escarpment a few metres above the Aveyron

River (fig. 2A) and has a single, daylight chamber, rather ovate in shape, measuring ~19 by 15 metres (Owen, 1870; Ladier, 1988; fig.2B).

1.1- History of research and collections

As the first Palaeolithic site discovered in the Aveyron valley, Courbet cave was explored before the concept of 'Prehistory', which did not appear until 1859, was even launched. In 1838 Marcel de Serres first reported the presence of ancient bones at Courbet cave (Serres, 1838), and the deposit subsequently attracted the attention of numerous nineteenth century scholars. Investigators including Charles-Félix de Boucheporn, Fernand Pottier, Eugène Trutat, Alfred Caraven-Cachin, Victor Brun, and Félix Garrigou visited the cave and gathered small collections of implements (Boucheporn, 1848; Garrigou et al., 1863; Caraven-Cachin, 1899; Cook and Welté, 1995; Ladier, 2020). These researchers recorded the first basic stratigraphic observations which contributed evidence to the debate surrounding human antiquity in which it was essential to establish the association of human traces with the remains of animals no longer living in the area, such as reindeer. This coexistence was subsequently confirmed by the discovery of their depiction on osseous artefacts recovered from the cave (Milne Edwards and Lartet, 1884; Owen, 1870; Cook and Welté, 1995).

As digging was taking place without his permission, Vicomte de Lastic blocked access to the cave with a wall and led the main excavation of the deposit himself in 1863-64 (Lastic, 1868; Owen, 1870; Cartailhac, 1903). This extensive excavation provided additional stratigraphic data and two substantial collections. The first one was purchased by the British Museum in 1864 (Cook and Welté, 1995) after Richard Owen, the Superintendent of the Natural History Collection at the British Museum, was invited to visit and dig. He published a description of the site with an in-depth study of human and horse remains (Owen, 1870). In 1885 the completion of the grand new building of the Natural History Museum, London resulted in the split of the Courbet collection with the human and animal remains being sent there and the artefacts remaining at the British Museum. The division was not fool-proof. Inevitably some artefacts, including an engraved image of a horse head on a metatarsal (Kaagan et al., 2011), were later discovered at the Natural History Museum while the British Museum actually retains ~700 elements of macro- and micro-fauna in addition to the 1980 osseous and over 6000 lithic artefacts from Courbet cave. Unfortunately, the whereabouts of the second de Lastic collection are unknown. Some pieces were exhibited in Paris *Exposition Universelle* in 1889, after being selected by Émile Cartailhac who described this collection as "*plus belle que la première*" when he published valuable drawings and comments on the osseous industry (Cartailhac, 1903, p. 299). Purchased by the Berlin Ethnological Museum at the beginning of the twentieth century (Pajot, 1969), the second de Lastic collection has been lost since World War II, apart from a few pieces bought by the Wellcome Institute for the History of Medicine from the antique dealer Schleicher and now part of the British Museum collections. Schleicher's catalogue presents a list of 202 pieces from this second de Lastic collection, of which 61 can be found at the British Museum.

In the twentieth century, various collectors still gathered limited but interesting samples of objects from the site, including from the spoil heaps of previous excavations (Pajot, 1969). As illegal digs persisted, a rescue excavation of the 27 m² deposit preserved at the entrance of the cave was directed by Edmée Ladier in 1985-86, along with sieving of earlier excavation spoil tips (Ladier, 1988). This fieldwork provided a usefully detailed record of the lower part of the stratigraphy and associated small collection curated at the Musée d'Histoire Naturelle of

Montauban, and notably yielded a female sandstone statuette (Ladier, 1992). In addition, further studies focused on some portable art (Alaux, 1972; Sieveking, 1987; Welté and Cook, 1993; Ladier and Welté, 1999; Aurière, 2012; Cook, 2013; Ladier, 2016), personal ornament (Ladier and Welté, 1994), spearthrowers (Welté, 2000a), barbed points (Julien, 1982; Langley, 2014; 2015), and other barbed implements (*foënes*; Breuil and Saint-Périer, 1927; Bellier et al., 1995) from earlier excavations. Apart from these remarkable objects, most of the osseous industry from Courbet cave remains poorly known and the rich British Museum collection still deserves further analyses.

1.2- Stratigraphy and chrono-cultural attributions

Courbet cave originally contained stratified deposits up to 5.5 m thick (Ladier, 1988), that were first described by F. Garrigou, L. Martin and E. Trutat from a 3 m deep trench (Garrigou et al., 1863). Below a stalagmitic floor (22 cm thick), they encountered an “osseous breccia” (1.48 m thick) but provide no detail. Beneath this breccia they noted a stratigraphic unit formed of alternating pebble beds and black clayey layers incorporating abundant charcoal, faunal remains, lithic and osseous artefacts, and two human mandibles. Underneath these layers, they observed a similar stratigraphic unit without charcoal.

These first descriptions partly match the stratigraphy observed during de Lastic’s extensive excavation but the absence of a distinct “osseous breccia” in between the stalagmitic floor and the black layers in the latter is a significant difference (Lastic, 1868). However, de Lastic mentioned that except for remnants adhering to the cave walls, the osseous layer located above the stalagmitic floor no longer existed by the time of his excavations. He describes finding a stalagmitic floor 20 cm thick directly overlaying three broad stratigraphic units as follows:

- Upper black silt, ~86 cm thick. This black silt, described as the richest stratigraphic unit, included a lot of charcoal, faunal remains abundant in reindeer, lithic and osseous artefacts, most of the engravings, a few wooden pieces (?) and human mandibles, as well as a quantity of stone pebbles and slabs. In the British Museum Antiquities Register, the thirty-four pieces recorded from this upper unit, referred to as “*cendres ou limon noir*” (table 1), notably include ten uniserial and biserial barbed points (fig. 3F and H), nine other barbed implements (*foënes*; fig. 4I-J), four double bevel base points (fig. 3C), and a spearthrower sculpted in the form of a musk ox ([BM Palart.455](#)).
- Red and black middle layers, ~1.5 m thick. De Lastic indicated that the underlying red and black layers still included charcoal pockets with numerous artefacts, some sculptures and human remains, however, the faunal remains were less abundant and limestone clasts formed a larger part of the deposit. The twenty-six pieces reported to the middle unit, referred to as “*deuxième gisement, couches diverses*” in the Antiquities Register (table 1), notably include twelve uniserial and biserial barbed points (fig. 3E and G), a half-round rod with pointed base (fig. 4F), a mesial fragment of half-round rod engraved with arcs ([BM Palart.478](#)), a probable foreshaft with a single bevelled end and engraved lateral arcs (fig. 9E), a double bevel base point, a ‘feminine-shaped’ ivory bead (Cook, 2013, p. 237; here fig. 5J), an elongated pendant (fig. 5K), and a distinctive thin implement (fig. 6A).
- Lower red silt, ~2 m thick. Described as mainly constituted of limestone clasts embedded in red silt, the lower stratigraphic unit yielded rare lithic artefacts, a fragment of human skull, and some faunal remains. Only five pieces are recorded as coming from this lower stratigraphic unit, referred to as “*limon rouge à roches concassées*” in the Antiquities Register (table 1). They include a spearthrower sculpted with a horse ([BM Palart.453](#)), a

bird bone engraved with a reindeer head ([BM Palart.506](#)), a mesial fragment of half-round rod engraved with arcs and a quadrilateral pattern (fig. 9C), and a shouldered piece (fig. 6F).

This broad stratigraphy was confirmed by R. Owen who described a stalagmitic flooring overlying a “conglomerate of mud with water-worn stones” subdivided into three stratigraphic units (Owen, 1870, p. 3-4). The top layer of dark colour owing to burnt elements, 1.2-1.5 m thick, might encompass part of the bicolour unit presented by de Lastic and is followed by a reddish middle layer also rich in organic contents 0.9-1.2 m thick, while bones become less abundant in the lower part of the stratigraphy.

More recently, the 1980's excavation dug into the lower part of the stratigraphy from the lower red layers to the base of the middle layers, preserved over 27 m² at the entrance of the cave (Ladier, 1988). E. Ladier distinguished ten layers within dense stone clasts embedded in reddish sandy clay (fig. 2C: 1-10), above a layer of scree, including massive blocks, directly overlying the substratum of the cave. The limited set of associated finds notably include two short single bevel base points from layers 6 and 8.

All authors agree on the presence of a stalagmitic floor sealing the Palaeolithic occupations at the top, under which black layers with abundant combustion elements turn into red layers, with increasing clasts and decreasing archaeological remains toward the bottom (fig. 2D). Depending on authors, there are still significant differences in the depth of the broad stratigraphic units, which can be explained by noticeable lateral variations within the cave (Ladier, 1988) in addition to slightly different definitions of the middle layers, based primarily either on colour or contents. Although the stratigraphic context of a limited number of objects was recorded during early excavations, sediments still encrusted on numerous osseous artefacts of the British Museum collections might allow further consideration of their stratigraphic context in the future. Furthermore, numerous osseous pieces present evidence for burning, notably resulting in localised brown colorations compatible with a combustion-rich context.

The collections from Courbet cave were first ascribed to the “*Âge du Renne*” defined by Édouard Lartet in 1861 (Lartet, 1861) and as early as 1903 Émile Cartailhac noted their similarity with those from the upper layer with barbed points of Plantade rock-shelter, a few kilometers downstream (Cartailhac, 1903). Subsequently, Henri Breuil published twelve pieces from Courbet cave as part of his classification of the Magdalenian into six stages (Breuil, 1912, p. 45; 49; and 53-54). These artefacts included a half-round rod engraved with complex diamond signs placed with geometric patterns attributed to his Magdalenian III-IV, while eleven pieces were presented as typical examples of the Magdalenian V with uniserial barbed points. These latter artefacts include a uniserial barbed point, five barbed implements (*foënes*), and five half-round rods engraved with deer heads, fishes, indeterminate animals, arcs, and diamonds. The attribution of most of the collections from Courbet cave to the Magdalenian V was further supported by Ann Sieveking who considered the portable art, in particular the presence of numerous decorated half-round rods, the schematisation of reindeer antlers, and the internal shading of animal heads (Sieveking, 1987). Most authors also considered a Magdalenian VI presence indicated by the biserial barbed points, which led overall to a general attribution of the site to the Upper Magdalenian. The female profile of Gönnersdorf type engraved on a dished stone slab ([BM Palart.518](#)) also fits with this period (Welté and Cook, 1993). In addition, a possible discrete occupation during the Middle Magdalenian, or Magdalenian IV, has been suggested in discussions of the spearthrowers sculpted with horses (Sieveking, 1987) and two short, single bevel base points (Ladier, 1988).

Few radiocarbon age estimates are available for Courbet cave (table 2). The first two estimates obtained on fragments of barbed point (BM-302: 11750 ± 300 BP) and an antler debitage piece (BM-303: 11110 ± 160 BP) from de Lastic collection (Barker *et al.*, 1969) are probably too recent (Ladier and Welté 1999; Welté 2000a). Four other dates are consistent. An age of 13380 ± 120 BP (GifA-97311) was obtained on a fragment of bone unearthed from the top of the black layer (Ladier and Welté, 1999). Two ages were obtained on two fragments of bone from red layers excavated in the 1980's, dating layer 7 to 13400 ± 260 BP (GifA-90169) and layer 10 to 13490 ± 260 BP (GifA-90-170) (Tisnerat-Laborde *et al.*, 1997). Moreover, an age of 13230 ± 90 BP (OxA-6667) has been obtained on a horse tooth (NHM PA 39325) of unknown stratigraphic context (Kaagan *et al.*, 2011).

1.3- Recent curatorial work on the osseous collections at the British Museum

The de Lastic collection was partly registered and marked upon arrival at the British Museum. The Antiquities register presents a list of 1177 entries (1864,1226.1 to 1177) referring to osseous artefacts, faunal remains, stone slabs, pebbles, or implements. Even though none of the flint artefacts were registered, many of them are marked 'L' indicating Lastic as on the numbered bone pieces. Part of the collection was displayed alongside items from the Peccadeau de l'Isle and Christy collections from the 1920s until the late 1940s (Smith, 1926, p. 45-50). In storage, the objects were arranged roughly in typological order. The boxes labelled as the de Lastic collection from Courbet cave contained registered and marked pieces, as well as unmarked pieces. Two of the unmarked osseous artefacts present a label on which "Bruniquel" is beautifully handwritten. Similar labels are glued on an antler base core boxed within the Peccadeau de l'Isle collection from Montastruc, as well as lithic artefacts in the Sturge collection. The pieces labelled 'Bruniquel' most probably belong to the William Allen Sturge collection, that Reginald A. Smith records as including "three bone implements" from Bruniquel (Smith, 1937, p. 127), and nineteenth century references to Bruniquel likely indicate Courbet cave, known as *Caverne de Bruniquel* before neighbouring sites were identified. Nevertheless, the boxing of these objects within different collections suggests possible confusions between Courbet and Montastruc under the Bruniquel appellation, possibly casting doubt on the provenance of other unmarked pieces. Besides, the set of 634 unlabelled and unmarked osseous artefacts do not fit perfectly well with the typological composition of the marked collections presented hereafter; the presence of an Aurignacian split base point and numerous biserial barbed points (49 pieces) could suggest mixed collections. Wellcome collection from Courbet cave has been stored in a separate box and is clearly identifiable by its marking with British Museum numbers (1982,1004.4679 to 4688) and/or previous Wellcome and Schleicher numbers. The portable art from both collections was separated, renumbered (Palart.450 to 517), and catalogued by A. Sieveking (1987). More recently, three additional registered pieces were identified as showing feminine representations (Cook, 2013, p. 235-243) and added to the Palaeolithic art collection (Palart.518 to 520).

In 2015-18, new curatorial work has been done to upgrade classification and accession records for the osseous collections from Courbet cave. As part of the new sorting, the de Lastic collection was laid out and joins between broken fragments were attempted before re-boxing the objects by typological order. The 46 joins found mainly refitted unmarked fragments with fresh breaks on marked or unmarked objects, while only three joins clearly stemmed from ancient breaks (1864,1226.300/522; 1864,1226.460/502; and 1864,1226.501/502). Numbers 1864,1226.1178 to 1875 were then assigned to the remaining unmarked items boxed with the de

Lastic collection (except 1181, still marked 'L' although it was not numbered), but these new numbers were not marked directly on the objects. The new typological classification is of course based on typological and technological observations, carried out on each piece in line with the most recent research outcomes on Magdalenian osseous industries. However, no comprehensive technological analysis was conducted at this point, most likely leaving a higher number of indeterminate pieces. Finally, all osseous pieces were registered in the British Museum database, accessible online ([BM Collection On Line](#)).

Three main outcomes of this curatorial work are presented in this paper. First, the typological classification provides an overview of the composition of the assemblage that can then be compared with those from other sites. Second, two artefacts made of whale bone were identified and analysed as part of the *PaleoCet* research project ([PaleoCet](#)). Finally, additional portable art pieces were found within the osseous industry. Four engraved pieces regarded as lost and therefore not illustrated in Sieveking's catalogue (1987) were recovered and four of the published objects were joined with additional fragments completing them. Moreover, 23 unpublished pieces with organised engraved patterns have been identified, significantly increasing the number of pieces with geometric patterns within the portable art repertoire. The sets of parallel lines engraved on various objects, longitudinal grooves on projectile points, and numerous engravings on barbed points, including arcs on barbs and various other lines linked to the shape of the barbed point, were not selected as part of the portable art collection since they may have played a role in the manufacture or use of the objects (Allain and Rigaud, 1986; Julien, 1982; 1999; Lucas, 2014).

2- Osseous industry curated at the British Museum

The osseous industry from Courbet cave housed at the British Museum includes 1344 marked pieces, 1337 of which occur in the de Lastic collection and a further seven in the Wellcome collection. This assemblage consists of finished objects, preforms, and debitage pieces, made of antler, terrestrial mammal bone, ivory, bird bone, and whale bone (table 3).

2.1- Assemblage composition

The assemblage is dominated by weapons (table 3). Amongst the projectile points, there is a strong prevalence of double bevel base points, with 264 pieces including 56 complete (or nearly complete) points measuring 60 to 220 mm long, 4 to 13 mm in maximum width, and 4 to 11 mm in maximum thickness (fig. 3A-C). They show bifacial or, rarely, bilateral bevels with usually straight and sometimes convex or concave ends, many of which are engraved with adherence striations. Some double bevel base points present longitudinal grooves or oblique dashes engraved on the mesial and distal parts. The assemblage also retains numerous barbed points, with 100 pieces, including a clear majority of uniserial barbed points (59 pieces) and fewer biserial barbed points (17 pieces). There are 23 complete barbed points, measuring 67 to 160 mm long, with curved or angular barbs of variable dimensions, more or less widely spaced out, and often engraved with arcs (fig. 3E-H). The pointed proximal ends usually show basal protuberances and are sometimes engraved with adherence striations that happen to run up to the first barb, while the engravings on the shaft mainly form longitudinal grooves and inter-barb arcs or oblique lines. Single bevel base points are much less abundant with 38 pieces, including 11 complete points measuring 60 to 107 mm long, 6 to 11 mm in maximum width, 5 to 9 mm in maximum thickness, and narrowing down shortly after the bevel (fig. 3D). Rarer types of projectile points include pyramidal base points (11 pieces with a quadruple bevelled base

forming a pyramid; fig. 4B), pointed base points (at least 5 pieces; fig. 4A), and a forked base point (fig. 4D). In addition, another 248 mesial and distal fragments tapering toward a point fit with projectile points. Overall, they are usually made of antler, rarely of bone, and show frequent evidence for reworking by resharpening the distal end or sectioning above the proximal part, as well as reuse as chisels (see Langley, 2014 for barbed points maintenance and recycling).

Amongst probable elements of weaponry, half-round rods (*baguettes demi-rondes*) are well represented with 53 pieces including a complete bi-pointed half-round rod 67 mm long engraved with a fish on a line and another fragment showing the same that may be parts of the same object (fig. 8E-F). A further 51 fragments measuring 5 to 20 mm in maximum width and 3 to 9 mm in maximum thickness often show adherence striations on the lower face. When preserved, the bases of antler half-round rods are similar to those observed on projectile points, being pyramidal (4 pieces; fig. 4G), bevelled on the upper or lateral face (3 pieces; fig. 4E), or pointed (at least 2 pieces; fig. 4F). The presence of eleven short barbed implements (*foënes*) for which the function remains unsure (Bellier et al., 1995; Julien and Orliac, 2003) is unusual. The nine complete examples measure 38 to 72 mm long and show a thin double bevel end, often concave on the lower face and in cases lobed on the edges, followed by two to six barbs of variable arrangement (fig. 4I-J). They are engraved with oblique and longitudinal lines following the shape of the object. The five well-known unweighted antler spearthrower ends include four pieces sculpted with horse heads on which the mane forms the hook (fig. 4H) and one fragment sculpted with a musk-ox showing a wide longitudinal groove in line with the hook ([BM Palart.455](#)). Finally, four pieces with a single bevelled end may be interpreted as projectile foreshafts. A complete antler foreshaft (fig. 4C) 165 mm long, presents a short, pointed end with side protuberance, as on barbed point bases, opposite the single bevelled end, and a shaft with parallel edges measuring 7 to 8 mm in maximum width and thickness. Another three long fragments, respectively made of antler (fig. 9E), ivory, and whale bone (fig. 7B) show a shaft with nearly parallel edges slightly widening from the single bevelled end and measuring 9 to 14 mm in maximum width and thickness.

The most common tools are chisels. At least 33 pieces were deliberately shaped as such but many reuse broken projectiles. Intentional chisels have a bevelled and/or rounded end and are usually stocky, being made on a large portion if not the full cross-section of reindeer or red deer antler that was not much further modified (fig. 5A and C). The 24 complete examples measure 70 to 162 mm long, 17 to 46 mm in maximum width and 9 to 38 mm in maximum thickness. There are 24 large bevelled rods (fig. 5B), a fairly homogeneous category of antler objects with a thick sub-quadrangular cross-section (9 to 14 mm thick) and long parallel edges, that may be interpreted either as intentional chisels or the result of recycling large points (such as fig. 3A) depending on authors (Saint-Périer, 1936; Deffarge et al., 1977; Allain and Rigaud, 1986; Sacchi, 1990; Pétilon, 2006; Lucas, 2012 and 2014). Needles are also well represented with 51 pieces, including 13 complete perforated needles measuring 20 to 78 mm long and 1 to 3 mm in maximum width and thickness (fig. 5F-G). However, smoothers are scarce with only two distal fragments, including a typical thin smoother made on a split flat bone (fig. 5E) and a thick smoother made on the full cross-section of a rib (fig. 5D), while there are only a few possible mesial or proximal fragments. Awls are not particularly abundant with just 18 pieces, six of which are complete and measure 50 to 107 mm long (fig. 5H).

The eight pieces of personal ornamentation include a perforated bovid incisor with bilaterally thinned root (fig. 5I), two ivory beads of distinctive shape indicative of Upper Magdalenian female profiles (Cook, 2013, p. 237; here fig. 5J), and five pendants. Two flat elongated

pendants made of bone show different hanging methods; one presenting a notched and perforated end (Ladier and Welté, 1994, cat. 61) while the other elliptical pendant thins toward a missing perforated annular projection (*ibid.*, cat. 64; here fig. 5K). The two ivory pendants have completely different shapes. One is a cylindrical perforated stick (*ibid.*, cat. 58) while the other has a bulbous head ([BM Palart.450](#)). A perforated scapula may also have been used as personal ornament (Ladier and Welté, 1994, cat. 65).

Amongst other finished objects, there are seven perforated antler batons, one of which is engraved with lines radiating around the perforation ([BM Palart.500](#)), six engraved fragments of antler or bone, three bipoints, a tube made by sawing off the end of a bird bone ([BM Palart.512](#)), and eleven miscellaneous objects that do not fit in any of the types presented above. Miscellaneous objects notably include three shouldered antler pieces (fig. 6F) similar to the examples from Fontalès reminiscent of Central European composite points (Bosinski, 2010), and a distinctive, flat, thin implement with triangular ends (fig. 6A). In addition, 62 fragments of indeterminate objects may be part of one or another type presented above.

Alongside these finished objects, eight preforms indicate the manufacture of needles (fig. 6E), uniserial barbed points (fig. 6C-D), perforated batons (fig. 6B), points, and probably awls on site. The production of needles is also attested by a long bone diaphysis with close, parallel longitudinal grooves. However, the majority of the 287 debitage pieces result from the manufacture of objects on antler rods. Antler rods are quite numerous with 83 pieces including sizeable unused blanks (fig. 6G). In addition, various debitage pieces, such as antler base cores (fig. 6H), triangular antler wastes, and other grooved antler fragments, show the debitage of antler by multiple grooving method. Finally, another 83 modified pieces are currently indeterminate.

2.2- Imported materials: whale bone artefacts

Two objects, one a debitage piece (fig. 7A) and the other a probable foreshaft (fig. 7B), have been identified as potentially being made from whale bone. The debitage piece is a tabular object, 19 mm thick, that was bifacially grooved along one edge. The three other edges show ancient fractures. While the upper face retains the irregular, natural outer surface of the bone, an alteration of the lower face is attested by indistinct manufacturing traces. The cross-sections visible at both ends show alveoles of varied sizes across the thickness of the piece (fig. 7C). The probable foreshaft is an elongated object with a single bevelled end engraved with oblique adherence striations. The opposite end is missing owing to recent damage. The circular cross-section, measuring 9 mm in maximum width and thickness, retains compact bone tissue although discrete alveoles appear on all faces. Despite being 132 mm long, this fragment does not taper toward a point and the shaft slightly widens from the bevelled end as noticed on some foreshafts.

To determine taxonomic identification, both objects were analysed using zooarchaeology by mass spectrometry, or ZooMS. In brief, ZooMS is a method of collagen peptide mass fingerprinting used for the taxonomic identification of faunal remains. It relies on differences between species in the amino acid sequence of collagen type I, which is generally the most abundant protein in archaeological faunal remains. Collagen is extracted from the material, digested using trypsin, analysed via Matrix Assisted Laser Desorption/Ionization Time of Flight Mass Spectrometry (MALDI-ToF-MS), and the resultant spectra are identified using a database of known species (Buckley et al., 2009 and 2014; Kirby et al., 2013, Speller et al., 2016, Welker et al., 2015).

Shiny patches and/or bubbles identified on the debitage piece prior to analysis (fig. 7C) suggest it had been consolidated using an unknown material, most likely an animal-based glue, a common consolidant in the late nineteenth century. Using a modified extraction method to remove or at least reduce the effect of the suspected consolidant, the debitage piece (BM 1864,1226.896) was identified as right or bowhead whale, two species that are indistinguishable using ZooMS, and the foreshaft (BM 1864,1226.375) was identified as sperm whale. For both objects, the ZooMS data confirmed that an animal-based consolidant had been used, in this case cow-based collagen glue, as the resultant spectra for both objects showed markers for both cow and whale (fig. 7D). While the modified extraction method was able to reduce the impact of the contaminating consolidant allowing for a reliable identification of the actual material, it did not completely remove the cow glue as some cow markers were still present.

If geochemical or biological analyses, such as radiocarbon dating, stable isotope analysis, proteomics or DNA analysis, are planned for biological material from museum collections, it is absolutely essential to first exclude the presence of natural or synthetic consolidants as these can greatly affect the results (Nicholson et al., 2002; Devière et al., 2021). While FTIR-ATR is a minimally destructive technique that can reveal the presence of synthetic consolidants, the presence of animal-based glues has only been identified thus far with DNA analysis (Tejero et al., 2023) and the extent of racemisation of serine (Nicholson et al., 2002). As shown here, this type of glue can also be identified through the use of ZooMS. Few studies exist regarding the removal of animal-based glues before radiocarbon dating, and the results from those studies that do are not very promising (Takahashi et al., 2002; van der Sluis et al., in prep.). While in some cases, the radiocarbon results seemed to concur with their contextual chronology, it is, with the currently available methods, impossible to exclude the presence of glue remnants. Any radiocarbon dates performed on such samples can therefore at best be considered 'minimal ages'. Fortunately, the cleaning methods reported in Takahashi et al. (2002) and van der Sluis et al. (in prep.) seemed sufficient for carbon and nitrogen stable isotope analysis and hopefully future research will reveal how to remove this type of contamination adequately prior to radiocarbon or other analyses.

2.3- Portable art on osseous materials

Most figurative representations engraved or sculpted on the osseous objects from Courbet cave have long been recognised; only two clear, additional animal depictions were identified during the recent curatorial work. First, a cervid head facing left is engraved on the right lateral face of a middle fragment of antler point (fig. 8A). In the absence of antler, the long, pointed ears measuring almost half the head length support an identification as a hind. The crossed double ears are immediately followed by a set of oblique lines forming a short forelock, before a slightly concave front-to-nose line. In between the nostril and the eye, the narrow face is covered in long, oblique lines indicative of the pelage. Similar stylistic features are known on other cervid depictions from Courbet cave showing crossed double ears ([BM Palart.459](#)) or a hairy face marked by long pelage lines (fig. 8B). The hind head is associated with a pair of oblique parallel lines engraved on the same lateral face, while the upper face of the point is covered in oblique, parallel lines. The second additional animal depiction is a caprid head facing left engraved on the upper face of a middle fragment of antler half-round rod (fig. 8C). The slightly curved horn is followed by a frontal convexity, located just above a large ovate eye, and forming an angle with the rising bridge of the nose. Unfortunately, the snout is missing owing to an ancient break. The shading of the face is structured by two concave lines marking the reliefs of the nose and cheek,

in association with superficial parallel dashes over this area as well as across the large ear. These anatomical features are suggestive of a male saiga antelope rather than an ibex, although the specific identification remains unsure in the absence of the snout (Cook and Lucas, 2018). Behind the caprid head, engraved lines interrupted by the break could be the beginning of another similar head back to back. In addition, a small fragment of a flat object (possibly part of a smoother or pendant) is engraved with a curving outline and superficial parallel dashes that might belong to an indeterminate animal depiction.

Adding up previously published pieces (Sieveking, 1987; Aurière, 2012; Cook, 2013), the British Museum houses a total of 28 osseous pieces with 44 figurative depictions (table 4) amongst which there is a clear prevalence of horses and cervids, including reindeer and red deer when the species can be identified (fig. 8A-B and D). Together, the thirteen horses and thirteen cervids account for over half the figurative depictions while other animals only occur once or twice. Besides an ibex (fig. 8B), there is a variety of representations that are generally rare in Palaeolithic art. In addition to the probable saiga antelope presented above, these representations include two humans (women; Cook, 2013, p. 237; here fig. 5J), two fish in unusual fishing scenes where the fish are caught on lines being pulled out of the water (Cook, 2013, p. 207; here fig. 8E-F), two uniserial barbed points ([BM Palart.457](#); [BM Palart.468](#)), a musk-ox ([BM Palart.455](#)), a probable vegetal pattern (fig. 8G), and a pattern perhaps indicative of cordage ([BM Palart.486](#)). Moreover, five of the indeterminate depictions also fall within uncommon species since their shapes do not fit with the usual terrestrial mammals, possibly evoking insects, fish, and a whale (fig. 8H; [BM Palart.468](#); [BM Palart.473](#); [BM Palart.475](#)). The possible whale (fig. 8H, right figure) is an oblong shape infilled with short dashes oriented in the long axis, showing a convex edge with a long, curved and pointed excrescence (fin?) but there is no caudal fin. Four parallel curves coming out of the straighter edge seem to give a sense of motion. Altogether, the fifteen uncommon depictions account for a third of the figurative thematic.

The unpublished portable art mainly consists of geometric patterns that were not selected as part of Sieveking's catalogue. Twenty-four additional pieces with organised geometric patterns, three of which have been refitted to published pieces (fig. 9C-E), show a higher proportion of geometric decoration, at least twice as numerous as figurative decorations with a current total of 60 pieces. As ever, parallel lines or dashes appear to be the dominant pattern although the total number of pieces decorated with parallel lines remains uncertain owing to their resemblance with numerous functional modifications. There is a relatively high frequency of arcs (13 pieces excluding the numerous arcs on barbed points for which the technical role is uncertain), zigzags or sinuous lines (eight pieces), and chevrons (seven pieces), amongst various other motifs (table 5).

Overall, most of the 83 decorated pieces are parts of weapons, including 25 half-round rods, 25 points, five spearthrowers, four large bevelled rods, a barbed point, and a probable foreshaft. Other decorated objects include six engraved bones, four chisels, three debitage pieces, two beads, a pendant, a perforated baton, a tube, and four indeterminate objects. When considered in proportion of the equipment, decoration is particularly frequent on the spearthrowers (5/5) and half-round rods (25/53). Four of the five spearthrowers present the same type of decoration, being sculpted with horses on which the mane forms the hook (fig. 4H). The half-round rods show a greater variety of representations, notably including over half the uncommon depictions and the most elaborated geometric patterns. Nevertheless, some recurrent types of decoration is also observed on half-round rods. First, the half-round rods with complex diamonds signs are represented by three pieces ([BM Palart.464](#) / [BM Palart.465](#) that may be parts of the same object,

and a narrow piece recently identified; fig. 9A). Second, there are six half-round rods with two symmetrical rows of arcs opening toward the longitudinal edges of the piece, one of which clearly presents the type with arcs and trefoils (fig. 9B) while another shows an association with transverse dashes (fig. 4G) that may be part of the same type of decoration (Lucas, 2021). Three pieces present short arcs engraved with a distinctive technique creating wider grooves previously named “*coup d’ongle*” (Feruglio, 2003), in one case associated with a partitioned quadrilateral pattern (fig. 9C). In addition, a fragment of half-round rod engraved with sets of small ovate reliefs (fig. 9F) is reminiscent of the half-round rods with notched grooves, ovate reliefs, and braided patterns (Lucas, 2021). This decoration occurs on a rib bone from Courbet cave engraved with a pair of notched grooves and a braided pattern (fig. 9D).

When the points and objects on large rods, including large bevelled rods and foreshafts, are decorated, the engravings are mainly located on the lateral faces (22 pieces) rather than on the upper face (8 pieces). Among them, points and large bevelled rods with lateral zigzags are well represented with seven pieces. Nevertheless, only one large bevelled rod shows the most typical lateral zigzags made of wide grooves with a flared cross-section while the other pieces present zigzags made of thinner incisions fitting better on the narrower lateral faces of thin points (fig. 9G) or sinuous lines. Conceptually close, six pieces are engraved with sequences of double arcs (or triple arcs in one case), also incised on the lateral faces. These lateral double arcs notably appear on a probable foreshaft with a single bevelled end (fig. 9E) and a pyramidal base point ([BM Palart.491](#)). Moreover, they are associated with the engravings of a uniserial barbed point and an indeterminate depiction, perhaps a fish, on a mesial fragment ([BM Palart.468](#)). Another typical lateral decoration consists of a small ovate relief followed by a slightly curved line that can be observed on two pieces including a mesial fragment ([BM Palart.466](#)) and a pointed base point (fig. 4A).

3- Discussion

While the second de Lastic collection is lost, comments from É. Cartailhac (1903) suggest that it compares closely to the British Museum collection. His paper highlights the large quantity and variety of barbed points, the relative abundance of short barbed implements (eight or nine *foënes*), an outstanding set of spearthrowers sculpted with horses (five additional specimens), and frequent geometric decorations on half-round rods and points notably including symmetrical arcs, arcs and trefoils, and pairs of notched grooves. From this report it seems probable that the British Museum collection may well be a representative sample of the osseous equipment from Courbet cave.

Most of the technological and typological characters of the osseous industry presented in this paper are compatible with a general attribution to the Middle and/or the Upper Magdalenian. The typology of the projectile points provides more precise indicators (Pétillon, 2016). The abundance of barbed implements (barbed points and *foënes*) and double bevel base points shows the dominance of the Upper Magdalenian component in the assemblage, in line with previous chrono-cultural attributions. The single forked base point hints at an occupation episode at the end of the Middle Magdalenian or the beginning of the Upper Magdalenian, according to the chronological distribution of this type at other sites. The presence of single bevel base points suggests that another part of the assemblage pertains to the Middle Magdalenian. Amongst the tools, the stocky chisels made of red deer antler would fit well in the Upper Magdalenian when similar objects are documented at Duruthy (Dachary, 2006, cat. Dur 477, Dur 518, and Dur 533).

The portable art from Courbet cave also bears intrinsic cultural traits of the Middle and/or Upper Magdalenian. Typical Upper Magdalenian designs include profile female figures of Gönnersdorf type that occurs from the Aquitaine plain to the Polish uplands (Bourrillon et al., 2012; Cook, 2013), depictions of barbed points and vegetal patterns emerging during this period (Man-Estier and Paillet, 2013), and peculiar geometric patterns such as short arcs made of wide grooves (Feruglio and Averbouh, 2016), small ovate reliefs, notched grooves, and braided patterns (Lucas, 2021). Beyond such characteristic artworks, the attribution of many engravings from Courbet cave to the Upper Magdalenian is further supported by the lateral location of most engravings on points (*ibid.*), as well as the figurative thematic featuring a variety of species that are generally rare in Palaeolithic art. Artworks that might rather belong to the Middle Magdalenian include the significant set of spearthrowers sculpted with horses and the half-round rods with arcs and trefoils. These two types are documented in Middle Magdalenian layers and may have survived into the Upper Magdalenian as has been suggested without decisive evidence (Cattelain, 2016; Lucas, 2021). The stratigraphic location of a spearthrower sculpted with a horse and two single bevel base points in the lower red layers of Courbet cave is consistent with techno-typological changes in a sequence that started in the Middle Magdalenian and mainly developed during the Upper Magdalenian. However, the survival of some transitional types in an Upper Magdalenian context cannot be ruled out given the scarce stratigraphic data.

Locally, the osseous assemblage from Courbet cave bears a strong resemblance to that from Fontalès (Darasse and Guffroy, 1960; Pajot, 1969). Both are marked by the prevalence of double bevel base points and barbed points, and Fontalès also yielded a typical forked base point (J.-M. P., pers. obs. in the Darasse collection at the Muséum d'Histoire Naturelle de Toulouse); this object and the one from Courbet are the only occurrences of this point type in the Aveyron valley (Pétillon, 2006). Rarer characteristics, such as a relative abundance of short barbed implements (22 *foënes* at Fontalès: Bellier et al., 1995) and the presence of shouldered antler pieces (Bosinski, 2010) and elliptical pendants with perforated annular projection (Ladier and Welté, 1994, p. 80), are also shared by both assemblages. While half-round rods are not numerous at Fontalès, decorations on the lateral faces of double bevel base points are prevalent (Welté, 2000b). These lateral decorations compare to Courbet cave, notably including zigzags, double arcs, and chevrons (Darasse, 1955, p. 223), as well as an engraving of biserial barbed point (Darasse and Guffroy, 1960, p. 24), and an original representation regarded as possibly human (*ibid.*, p. 28) or amphibian (Welté, 2000b, p. 396). Overall, the figurative art from Fontalès mainly depicts horses and cervids (Welté, 2001), and nine profile female figures of Gönnersdorf type have been identified on stone slabs (Darasse and Guffroy, 1960, p. 31; Welté, 2001). Three AMS radiocarbon dates are known from Fontalès: a direct date on a barbed point (GifA-96327, 13140 ± 120 BP, Tisnerat-Laborde et al., 1997), one on a reindeer metatarsal (Poz-138702, 12900 ± 70 BP) and one on a reindeer antler base core (Poz-138701, 12970 ± 70 BP, Pétillon et al., in press). Once calibrated, one of these dates overlap with those from Courbet cave, with the other two appearing slightly younger (table 2).

Southward connections with the Pyrenean area are indicated by the half-round rods with arcs and trefoils, for which Courbet cave gives the northernmost examples known so far (Lucas, 2021). There are further similarities with La Vache cave, where the half-round rods with notched grooves, ovate reliefs and braided patterns are particularly numerous (Lucas, 2021), and a couple of points with lateral ovate reliefs and curves are also documented (Clottes and Delporte, 2003, cat. 98 and 309). In particular, an indubitable representation of a saiga antelope engraved on a rib bone from Courbet cave in the collection of Musée Toulouse-Lautrec, Albi ([CREAP website](#);

here fig. 10A) shows striking similarities with the central and eastern Pyrenean examples from La Vache (fig. 10B) and Bize in the rendering of the convex muzzle, ringed horns, and eyes with underlying hatch marks (Cook and Lucas, 2018). Such distinctive features on a species rarely depicted support close connections.

To the north, a perforated baton from Rochereil cave, Dordogne has a rare depiction of an arm holding a triangular implement with a hatched end (Man-Estier and Paillet, 2013; here fig. 10C) such as also occurs on a piece in the second de Lastic collection from Courbet cave (Cartailhac, 1903; here fig. 10D). Rochereil is also well known for a great variety of portable imagery including relatively numerous indeterminate depictions and vegetal patterns (Man-Estier and Paillet, 2013; Man-Estier et al., 2016). Studies of lithic raw materials in the Aveyron valley support connections with the north of the Aquitaine Basin. While the Verdier flint, located ~20 kilometres southeast of Courbet cave, provides the main raw material, artefacts made of high-quality flint imported from the north are documented at several Magdalenian sites of the Aveyron valley. In particular, Fontalès rock-shelter yielded Senonian and Bergeracois flints from Dordogne, as well as Grain de Mil flint originating in Saintonge (Grubert, 2014). Senonian and Bergeracois flints are also found alongside Fumélois flint and Infralias jasper in the layer 2 of Montastruc rock-shelter (Grubert, 2015). The two AMS radiocarbon dates obtained on reindeer remains from Montastruc layer 2 (Lyon-15076, 13470 ± 70 BP; and Lyon-15075, 13540 ± 60 BP) are comparable to dates of Courbet cave (Grubert, 2021; here table 2).

The two artefacts made of whale bone imported from the seaside to Courbet cave bear witness to wide networks. One hundred and ten objects made of whale bone are known from 11 Magdalenian sites on the northern slope of the western and central Pyrenees (Pétillon, 2013; Poplin, 2020), and a further 54 from 12 Magdalenian sites on the Cantabrian coast (Lefebvre et al., 2021). Outside these regions, only one object is currently documented from Dordogne (Pétillon et al., 2019) and a further one from the Rhineland (Langley and Street, 2013). The two objects from Courbet cave are the first evidence for the use of this raw material in sites from the Aveyron valley. They add to the short list of whale bone objects documented outside the Pyreneo-Cantabrian area, and attest to the integration of Courbet in long-distance distribution networks, in this case originating on the Atlantic coast. Among the Magdalenian objects made of whale bone, foreshafts are the most frequent type after projectile points (Pétillon, 2013; Lefebvre et al., 2021; Langley and Street, 2013). The identification of BM 1864,1226.375 as a fragment of foreshaft fits well within this pattern. Almost all the 165 whale bone objects from the Pyrenees, Cantabria, Périgord and Rhineland are finished objects. Only three possible blanks and no debitage waste have been identified, leading to the hypothesis that whale bone circulated inland only in the form of end products. In this perspective, the discovery of a whale bone debitage piece at Courbet cave (BM 1864,1226.896) is a novelty. It provides the first evidence for blank extraction techniques on this material by bifacial grooving and shows that blocks of whale bone could also, occasionally, be transported far from the seashore.

Of the two whale species identified at Courbet, one, the sperm whale, was already documented in the Magdalenian record from the outskirts of the Bay of Biscay, through the presence of two carved teeth from Las Caldas and Mas d'Azil, and several depictions on portable objects (see review in Pétillon, 2018). The analysis of the Courbet foreshaft confirms that the bones of this species were also used to manufacture weapon elements. Although the debitage piece could only be identified as from a right whale or bowhead whale, this case is the first formal identification of either of these two species in a Magdalenian context. The imprecision of the ZooMS ID prevents further discussion regarding the environmental significance of the species identified,

however, in addition to the gray whale (Pétilion et al., 2019), the artefacts from Courbet cave bring the total of whale species exploited in the Magdalenian to at least three different taxa. Wide networks have been discussed for the Magdalenian period considering the circulation of lithic raw materials, shells, and marine evidence, as well as shared artistic features supporting complex mobility patterns (e.g. Bahn, 1982; Taborin, 1993; Langley and Street, 2013). Different objects and raw materials may point out to different directions depending on the location of best quality sources and their accessibility as well as people moves and exchanges. While the osseous industry and portable art from Courbet cave mainly emphasize southward connections with the Pyrenean area, where whale bone artefacts circulated regularly, the clues for contacts with Dordogne require further investigation adding other lines of evidence in the picture.

Conclusion

Our review of the osseous industry from Courbet cave at the British Museum reinforces some core features of the assemblage, providing quantitative data to further assert them. Largely dominated by double bevel base points primarily decorated on the lateral faces, the assemblage is characterised by a large quantity of barbed implements, amongst which uniserial barbed points are prevalent and *foënes* relatively numerous, alongside half-round rods decorated with a new variety of depictions. These data corroborate the attribution of most of the assemblage to the Upper Magdalenian while an earlier component is attested by single bevel base points, spearthrowers sculpted with horses and half-round rods with arcs and trefoils, and no artefact predating the Middle Magdalenian was identified.

Beyond the main objects already noted, some rarer elements highlighted in this paper provide a glimpse to how far some of the osseous equipment might have circulated. While some unusual representations are indicative of close connections to the Pyrenean and North Aquitaine areas, the actual movement of some objects over long distances is confirmed by the unexpected identification of two whale bone artefacts imported from the Atlantic coast. This finding clearly shows the Magdalenian inhabitants of the Aveyron valley were part of wider networks often discussed for this period. More detailed studies of the outstanding collections from Courbet cave might bring further information regarding the role of this site within such networks in the future.

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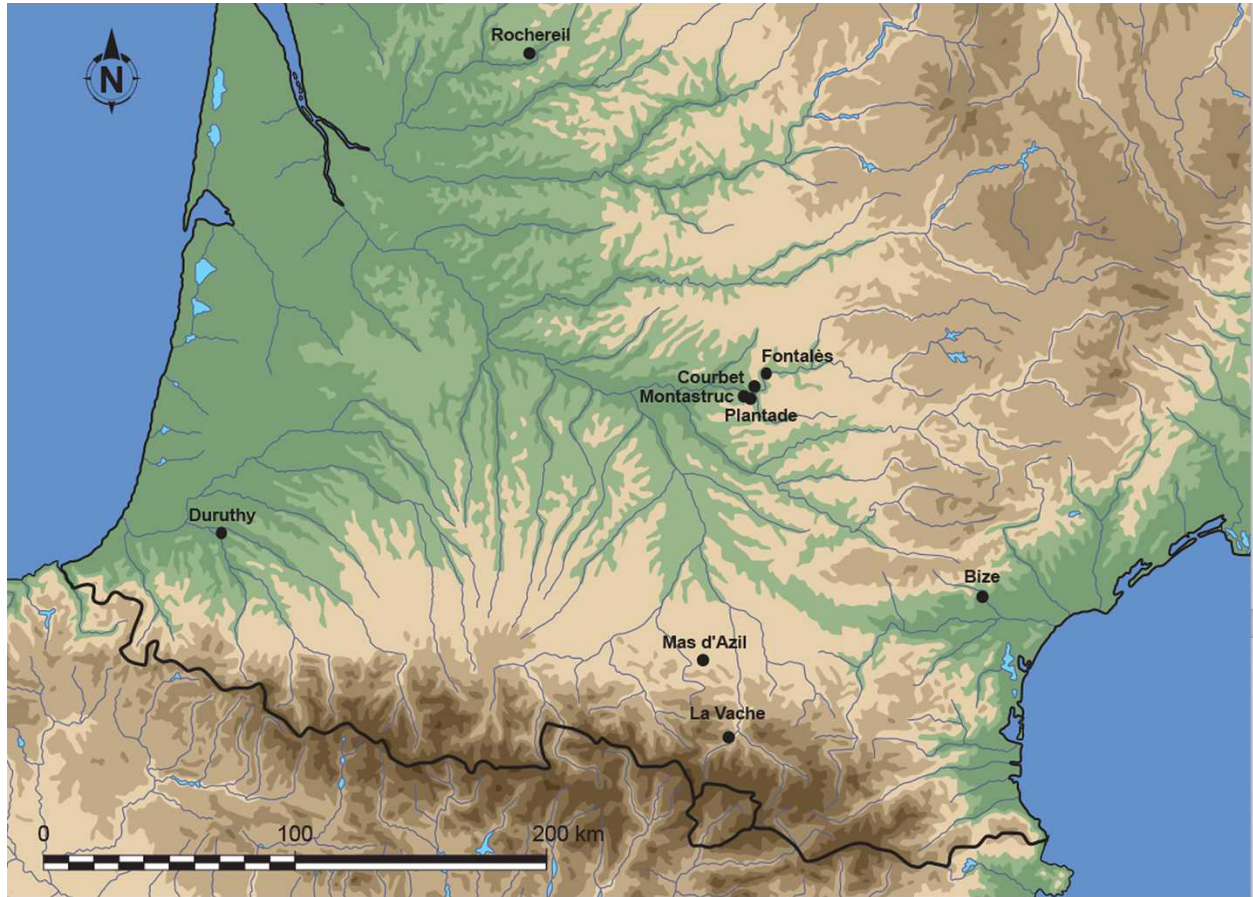


Figure 1: Map showing the location of Courbet cave and other Magdalenian sites mentioned in the text.
Figure 1 : Carte de localisation de la grotte du Courbet et des autres sites magdaléniens mentionnés dans le texte.

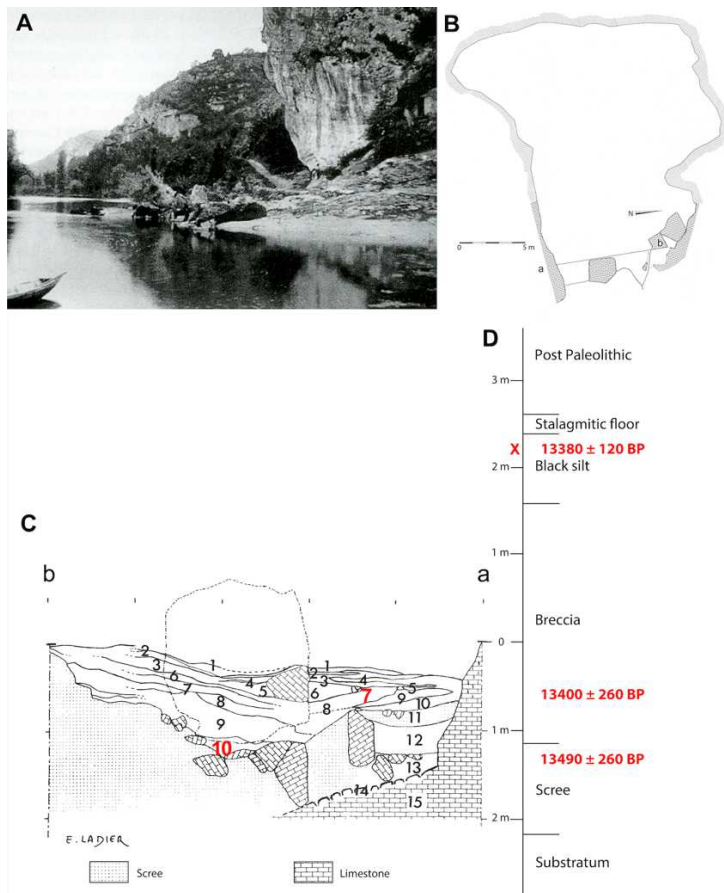


Figure 2: Courbet cave. A) Photography showing the cave entrance and the landscape along the river in the nineteenth century (Ladier and Welté, 1994). B) Cave plan with location of the stratigraphic section (A-B) recorded in 1986 (E. Ladier). C) Stratigraphic section showing the layers identified in 1985-86 (E. Ladier). 1: backfill; 2: gravel; 3: occupation layer in compacted breccia; 4: gravel; 5: occupation layer in gravel; 6: gravel; 7: occupation layer in breccia; 8: gravel; 9: occupation layer in compacted breccia; 10: earliest occupation layer in gravel; 11: coarse gravel; 12: yellow clay; 13: clay with stone blocks; 14: clay with stone slabs and blocks; 15: substratum. D) Comprehensive stratigraphy based on data from earlier excavations and remnants observed in the cave in 1985-86 (E. Ladier). The comprehensive stratigraphy is aligned in height with the section drawing. Occupation layers with radiocarbon dated bones are shown in red.

Figure 2 : Grotte du Courbet. A) Photographie de l'entrée de la grotte et du paysage au bord de l'Aveyron au xix^e siècle (Ladier et Welté, 1994). B) Plan de la grotte avec emplacement de la coupe stratigraphique (A-B) relevée en 1986 (E. Ladier). C) Relevé de coupe montrant les niveaux identifiés en 1985-86 (E. Ladier). 1 : remblai de surface ; 2 : cailloutis stérile ; 3 : brèche compacte, niveau d'occupation ; 4 : cailloutis stérile ; 5 : cailloutis, niveau d'occupation ; 6 : cailloutis stérile ; 7 : brèche, niveau d'occupation ; 8 : cailloutis stérile ; 9 : brèche très compacte, niveau d'occupation ; 10 : cailloutis, niveau d'occupation le plus ancien ; 11 : gros cailloutis stérile ; 12 : argile jaune stérile ; 13 : blocs dans argile stérile ; 14 : blocs et plaquettes dans argile ; 15 : substratum. D) Stratigraphie synthétique d'après les données des fouilles anciennes et les observations réalisées en 1985-86. Le relevé de coupe et la stratigraphie synthétique sont présentés à la même altitude, par rapport au point zéro des fouilles 1985-86. Les niveaux d'occupation datés et les âges radiocarbones correspondants sont indiqués en rouge.

| Stratigraphic Notes | BM registration numbers | Objects | Comments | |
|---------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|-------------------------------|
| Cendres ou limon noir | 1864,1226.5-6 | 2 biserial barbed points | | |
| | 1864,1226.18 | 1 uniserial barbed point | Missing | |
| | 1864,1226.20-21 | 2 uniserial barbed points | | |
| | 1864,1226.27 | 1 uniserial barbed point | | |
| | 1864,1226.37 | 1 uniserial barbed point | | |
| | 1864,1226.45 | 1 barbed point (proximal fragment) | | |
| | 1864,1226.87 | 1 barbed point preform | | |
| | 1864,1226.150 | 1 double bevel base point | | |
| | 1864,1226.160-162 | 3 double bevel base points | | |
| | 1864,1226.545 (Palart.455) | 1 spearthrower sculpted with musk ox | | |
| | 1864,1226.569-577 | 9 barbed implements (foënes) | « Chiefly from Limon noir » | |
| | 1864,1226.584 | 1 uniserial barbed point | | |
| | 1864,1226.588 | 1 point (distal fragment) | | |
| | 1864,1226.594 | 1 chisel | | |
| | 1864,1226.606 | 1 chisel | | |
| | 1864,1226.751 (Palart.509) | 1 elongated pendant | « Près de la stalagmite » | |
| | 1864,1226.797-799 | 3 half-round rods (mesial fragments) | | |
| | 1864,1226.1118 | 1 concave stone implement | | |
| | 1864,1226.1120 | 1 concave stone implement | | |
| | 1864,1226.1125 | 1 concave stone implement | | |
| | Deuxième gisement, couches diverses | 1864,1226.1 | 1 biserial barbed point | « Dans le roc stalagm. » |
| | | 1864,1226.2 | 1 biserial barbed point | « Près d'une corne de renne » |
| | | 1864,1226.4 | 1 biserial barbed point | |
| 1864,1226.7 | | 1 biserial barbed point | | |
| 1864,1226.15 | | 1 uniserial barbed point | Missing | |
| 1864,1226.16 | | 1 uniserial barbed point | | |
| 1864,1226.26 | | 1 uniserial barbed point | | |
| 1864,1226.28 | | 1 uniserial barbed point | | |
| 1864,1226.31 | | 1 uniserial barbed point | | |
| 1864,1226.33 | | 1 uniserial barbed point | | |
| 1864,1226.53 | | 1 barbed point | Missing | |
| 1864,1226.113 (Palart.492) | | 1 foreshaft with single bevel end | Engraved with lateral arcs | |
| 1864,1226.115 | | 1 point (distal fragment) | Missing | |
| 1864,1226.147 | | 1 double bevel base point | | |
| 1864,1226.554 | | 1 biserial barbed point | | |
| 1864,1226.596 | | 1 chisel | | |
| 1864,1226.647-648 | | 2 chisels | | |
| 1864,1226.701 | | 1 antler rod | | |
| 1864,1226.753 (Palart.510) | | 1 elongated pendant | | |
| 1864,1226.767 (Palart.486) | | 1 half-round rod (mesial fragment) | Engraved with cordage? | |
| 1864,1226.777 (Palart.478) | | 1 half-round rod (mesial fragment) | Engraved with arcs | |
| 1864,1226.778 (Palart.482) | | 1 half-round rod (mesial fragment) | Engraved with rows of dashes | |
| 1864,1226.789 (Palart.484) | | 1 half-round rod (pointed base) | | |
| 1864,1226.809 | | 1 thin implement | | |
| 1864,1226.895 (Palart.519) | | 1 'feminine-shaped' bead | | |
| 1864,1226.928 | | 1 antler base core | | |
| 1864,1226.933 (Palart.502) | | 1 perforated antler tine | | |
| Limon rouge à roches concassées | | 1864,1226.530 | 1 shouldered piece | |
| | | 1864,1226.543 (Palart.453) | 1 spearthrower sculpted with horse | |
| | | 1864,1226.748 (Palart.506) | 1 bird bone engraved with reindeer | |
| | 1864,1226.766 (Palart.481) | 1 half-round rod (mesial fragment) | Engraved with arcs and quadrilateral | |
| | 1864,1226.1052 (Palart.503) | 1 perforated scapula | | |

Table 1: Stratigraphic notes for de Lastic collection in the British Museum Antiquities Register.
 Tableau 1 : Indications stratigraphiques enregistrées dans the Antiquities Register du British Museum.

| Site | Layer or collection | Lab code | Method | Material | Description | Date BP | Date cal BP | Other information | Reference |
|------------|---------------------|-------------------------|---------|----------|--------------------------------|-------------|-------------|---|---------------------------------------|
| Courbet | Lastic collection | BM-302 | classic | antler | fragments of barbed points | 11750 ± 300 | 14821-13084 | protein fraction | Barker <i>et al.</i> , 1969 |
| Courbet | Lastic collection | BM-303 | classic | antler | reindeer antler debitage piece | 11110 ± 160 | 13299-12752 | protein fraction | Barker <i>et al.</i> , 1969 |
| Courbet | top of black layer | GifA-97311 | AMS | bone | NA | 13380 ± 120 | 16467-15744 | NA | Ladier and Welté, 1999 |
| Courbet | c7 | GifA-90169 | AMS | bone | NA | 13400 ± 260 | 16975-15426 | sample weight ca. 1g | Tisnerat-Laborde <i>et al.</i> , 1997 |
| Courbet | c10 | GifA-90170 | AMS | bone | NA | 13490 ± 260 | 17055-15566 | sample weight ca. 1g | Tisnerat-Laborde <i>et al.</i> , 1997 |
| Courbet | Lastic collection | OxA-6667 | AMS | teeth | lower P3 of horse | 13230 ± 90 | 16180-15630 | NA | Kaagan <i>et al.</i> , 2011 |
| Fontalès | NA | GifA-96327 | AMS | antler | biserial barbed point | 13140 ± 120 | 16130-15368 | sample weight ca. 1g | Tisnerat-Laborde <i>et al.</i> , 1997 |
| Fontalès | Darasse collection | Poz-138702 | AMS | bone | reindeer metatarsal | 12900 ± 70 | 15646-15208 | sample weight 1790 mg, 1.1%N, 5.2%C, 1.4% coll. | Pétillon <i>et al.</i> , in press |
| Fontalès | Darasse collection | Poz-138701 | AMS | antler | reindeer antler base core | 12970 ± 70 | 15734-15284 | sample weight 790 mg, 1.7%N, 6.7%C, 3.5% coll. | Pétillon <i>et al.</i> , in press |
| Montastruc | layer 2 | Lyon-15076 (SacA-52892) | AMS | bone | reindeer metacarpal | 13470 ± 70 | 16469-16000 | sample weight 700 mg, 14C activity 18.69%±0.15 | Grubert, 2021 |
| Montastruc | layer 2 | Lyon-15075 (SacA-52891) | AMS | bone | reindeer mandible | 13540 ± 60 | 16555-16139 | sample weight 1090 mg, 14C activity 18.53%±0.14 | Grubert, 2021 |

Table 2: Radiocarbon dates mentioned in the text. Calibration with OxCal 4.4, two sigma range, IntCal20 curve. The date GifA-90169 was mentioned in Ladier and Welté, 1999, and Welté, 2000, with partly erroneous values. The values in this table correspond to the ones published in Tisnerat-Laborde *et al.*, 1997, and are the exact ones.

Tableau 2 : Datations radiocarbones mentionnées dans le texte. Calibration avec OxCal 4.4, à deux sigmas, courbe IntCal20. La date GifA-90169 a été mentionnée dans Ladier et Welté, 1999 et Welté, 2000 avec des valeurs partiellement erronées. Les chiffres reportés dans ce tableau sont les valeurs exactes publiées dans Tisnerat-Laborde *et al.*, 1997.

| Category | Object type | Antler | Bone (terrestrial) | Ivory | Bird bone | Whale bone | Osseous indet. | Total | |
|-----------------------|--------------------------|------------------|--------------------|-------|-----------|------------|----------------|-------|---|
| Weapon | Double bevel base point | 203 | 2 | 0 | 0 | 0 | 59 | 264 | |
| | Barbed point | 90 | 0 | 0 | 0 | 0 | 10 | 100 | |
| | Half-round rod | 52 | 0 | 0 | 0 | 0 | 1 | 53 | |
| | Single bevel base point | 34 | 0 | 0 | 0 | 0 | 4 | 38 | |
| | Pyramidal base point | 10 | 0 | 0 | 0 | 0 | 1 | 11 | |
| | Barbed implement (foène) | 10 | 0 | 0 | 0 | 0 | 1 | 11 | |
| | Pointed base point | 3 | 0 | 0 | 0 | 0 | 2 | 5 | |
| | Spearthrower | 5 | 0 | 0 | 0 | 0 | 0 | 5 | |
| | Foreshaft | 2 | 0 | 1 | 0 | 1 | 0 | 4 | |
| | Forked base point | 1 | 0 | 0 | 0 | 0 | 0 | 1 | |
| Tool | Point (mesio-distal) | 170 | 3 | 1 | 0 | 0 | 74 | 248 | |
| | Needle | 0 | 3 | 0 | 0 | 0 | 48 | 51 | |
| | Chisel | 33 | 0 | 0 | 0 | 0 | 0 | 33 | |
| | Awl | 0 | 11 | 0 | 0 | 0 | 7 | 18 | |
| | Smoother | 0 | 2 | 0 | 0 | 0 | 0 | 2 | |
| | Large bevelled rod | 23 | 0 | 0 | 0 | 0 | 1 | 24 | |
| | Personal ornamentation | Pendant | 0 | 3 | 2 | 0 | 0 | 0 | 5 |
| | | Bead | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| | | Perforated tooth | - | - | 1 | - | - | - | 1 |
| | Other finished objects | Perforated baton | 7 | 0 | 0 | 0 | 0 | 0 | 7 |
| Engraved bone/antler | | 3 | 2 | 0 | 1 | 0 | 0 | 6 | |
| Bipoint | | 1 | 1 | 0 | 0 | 0 | 1 | 3 | |
| Tube | | 0 | 0 | 0 | 1 | 0 | 0 | 1 | |
| Miscellaneous objects | | 7 | 0 | 0 | 0 | 0 | 4 | 11 | |
| Indeterminate object | | 34 | 5 | 1 | 0 | 0 | 22 | 62 | |
| Preform | Needle preform | 0 | 1 | 0 | 0 | 0 | 2 | 3 | |
| | Barbed point preform | 2 | 0 | 0 | 0 | 0 | 0 | 2 | |
| | Perforated baton preform | 1 | 0 | 0 | 0 | 0 | 0 | 1 | |
| | Point preform | 1 | 0 | 0 | 0 | 0 | 0 | 1 | |
| | Awl preform | 0 | 1 | 0 | 0 | 0 | 0 | 1 | |
| Debitage | Rod | 83 | 0 | 1 | 0 | 0 | 1 | 85 | |
| | Antler base core | 6 | - | - | - | - | - | 6 | |
| | Other by-products | 183 | 9 | 0 | 0 | 1 | 3 | 196 | |
| Other | Indeterminate piece | 69 | 7 | 0 | 0 | 0 | 7 | 83 | |
| Total | | 1033 | 50 | 9 | 2 | 2 | 248 | 1344 | |

Table 3: Typological composition of the osseous industry from Courbet cave, based on the marked pieces from de Lastic and Wellcome collections housed at the British Museum.

Tableau 3 : Composition typologique de l'industrie osseuse de la grotte du Courbet, d'après les pièces marquées des collections de Lastic et Wellcome au British Museum.

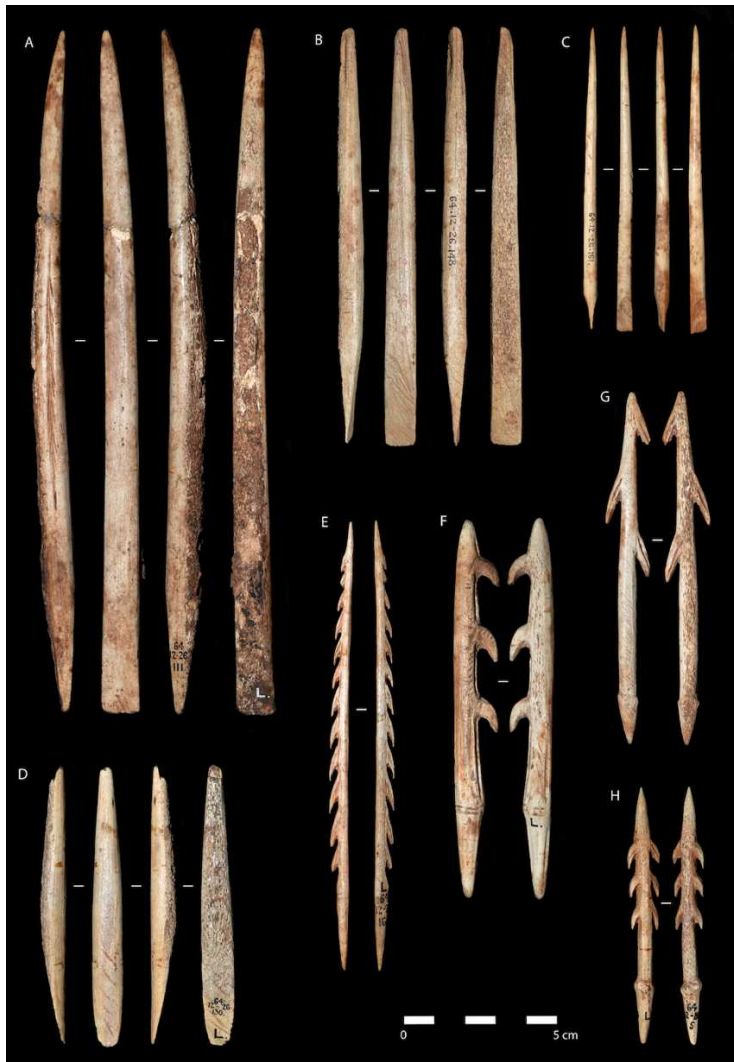


Figure 3: Main types of projectiles from Courbet cave. A) Double bevel base point BM 1864,1226.111 with a longitudinal groove on the left lateral face. B) Double bevel base point BM 1864,1226.148. C) Double bevel base point BM 1864,1226.161, from the black silt, showing oblique dashes on both lateral faces. D) Single bevel base point BM 1864,1226.130. E) Uniserial barbed point BM 1864,1226.16 from the middle layers. F) Uniserial barbed point BM 1864,1226.27 from the black silt. G) Biserial barbed point BM 1864,1226.554 from the middle layers. H) Biserial barbed point BM 1864,1226.5 from the black silt. Photographs C. Lucas © Trustees of the British Museum.

Figure 3 : Principaux types de projectiles de la grotte du Courbet. A) Pointe à biseau double BM 1864,1226.111 présentant une rainure longitudinale sur le bord gauche. B) Pointe à biseau double BM 1864,1226.148. C) Pointe à biseau double BM 1864,1226.161, provenant du limon noir, avec des tirets obliques gravés sur les deux bords. D) Pointe à biseau simple BM 1864,1226.130. E) Pointe à un rang de barbelures BM 1864,1226.16 provenant des niveaux médians. F) Pointe à un rang de barbelures BM 1864,1226.27 provenant du limon noir. G) Pointe à deux rangs de barbelures asymétriques BM 1864,1226.554 provenant des niveaux médians. H) Pointe à deux rangs de barbelures symétriques BM 1864,1226.5 provenant du limon noir. Clichés : C. Lucas © Trustees of the British Museum.



Figure 4: Elements of weaponry from Courbet cave. A) Pointed base point BM 1864,1226.520 with a longitudinal groove on the upper face and a small ovate relief followed by a curve on the left lateral face. B) Pyramidal base point BM Palart.494 (ex 1864,1226.198) with oblique parallel lines. C) Antler foreshaft BM 1864,1226.110 showing a barbed point like end opposite a single bevelled end. D) Forked base point BM 1864,1226.974.39. E) Half-round rod with lateral bevel base BM 1864,1226.886. F) Half-round rod with pointed base BM Palart.484 (ex 1864,1226.789) from the middle layers. G) Half-round rod with pyramidal base BM Palart.489 (ex 1864,1226.763), engraved with lateral arcs and transversal dashes on the upper face. H) Spearthrower BM Palart.451 (ex 1982,1004.4679) sculpted with a horse. I) Short barbed implement (*foëne*) BM 1864,1226.576 from the black silt. J) Short barbed implement (*foëne*) BM 1864,1226.569 from the black silt. Photographs C. Lucas © Trustees of the British Museum.

Figure 4 : Armement de la grotte du Courbet. A) Pointe à base appointée BM 1864,1226.520 présentant une rainure longitudinale sur la face supérieure et un relief ovalaire suivi d'une ligne courbe sur le bord gauche. B) Pointe à base pyramidale BM Palart.494 (ex 1864,1226.198) gravée de lignes parallèles. C) Préhampe en bois de cervidé BM 1864,1226.110 avec une base similaire à celles des pointes barbelées et une extrémité en biseau simple. D) Pointe à base fourchue BM 1864,1226.974.39. E) Baguette demi-ronde à biseau latéral BM 1864,1226.886. F) Baguette demi-ronde à base appointée BM Palart.484 (ex 1864,1226.789) provenant des niveaux médians. G) Baguette demi-ronde à base pyramidale BM Palart.489 (ex 1864,1226.763) gravée d'arcs latéraux et de tirets transversaux intermédiaires sur la face supérieure. H) Crochet de propulseur BM Palart.451 (ex 1982,1004.4679) sculpté en forme de cheval. I) Foëne BM 1864,1226.576 provenant du limon noir. J) Foëne BM 1864,1226.569 provenant du limon noir. Clichés : C. Lucas © Trustees of the British Museum.



Figure 5: Tools and personal ornaments from Courbet cave. A) Stocky chisel BM 1864,1226.649 made of red deer antler. B) Large bevelled rod BM 1864,1226.546 engraved with a sinuous line and oblique dash on the right lateral face. C) Chisel BM 1864,1226.597. D) Thick smoother BM 1864,1226.633. E) Thin smoother BM 1864,1226.752. F) Needle BM 1864,1226.823. G) Needle BM 1864,1226.829. H) Awl BM 1864,1226.878. I) Perforated bovid incisor BM 1864,1226.897 with bilaterally thinned root. J) 'Feminine-shaped' bead BM Palart.519 (ex 1864,1226.895) from the middle layers. K) Elliptical pendant BM Palart.510 (ex 1864,1226.753), from the middle layers, thinning toward a missing perforated annular projection. Photographs C. Lucas © Trustees of the British Museum.

Figure 5 : Outils et éléments de parure de la grotte du Courbet. A) Ciseau épais en bois de cerf BM 1864,1226.649. B) Baguette biseautée épaisse BM 1864,1226.546 gravée d'une ligne sinueuse et d'un tiret oblique sur le bord droit. C) Ciseau BM 1864,1226.597. D) Outil mousse épais BM 1864,1226.633. E) Lissoir BM 1864,1226.752. F) Aiguille BM 1864,1226.823. G) Aiguille BM 1864,1226.829. H) Poinçon BM 1864,1226.878. I) Incisive de bovidé perforée BM 1864,1226.897 présentant une racine amincie. J) Perle en forme de profil féminin BM Palart.519 (ex 1864,1226.895) provenant des niveaux médians. K) Pendeloque elliptique BM Palart.510 (ex 1864,1226.753), provenant des niveaux médians ; l'extrémité proximale est amincie vers un anneau perforé aujourd'hui manquant en raison de la fracture. Clichés : C. Lucas © Trustees of the British Museum.



Figure 6: Miscellaneous artefacts, preforms, and debitage pieces from Courbet cave. A) Thin implement with triangular ends BM 1864,1226.809 from the middle layers. B) Perforated baton preform BM 1864,1226.542 with unfinished perforation. C) Barbed point preform BM 1864,1226.87 showing the manufacture of two uniserial barbed points on an antler segment. D) Barbed point preform BM 1864,1226.872 showing the thinning of an antler rod and engraving of oblique lines in preparation for a row of barbs. E) Needle preform BM 1864,1226.858 with unfinished perforation. F) Shouldered antler piece BM 1864,1226.530 from the red silt. G) Antler rod BM 1864,1226.947 with chisel insertion marks. H) Antler base core BM 1864,1226.900 showing multiple grooving on shed reindeer antler. Photographs C. Lucas © Trustees of the British Museum.

Figure 6 : Objets divers, ébauches, baguette et déchets de débitage de la grotte du Courbet. A) Instrument fin à extrémités triangulaires BM 1864,1226.809 provenant des niveaux médians. B) Ébauche de bâton percé BM 1864,1226.542 dont la perforation est inachevée. C) Ébauche de pointes barbelées BM 1864,1226.87 indiquant la production de deux pointes à un rang de barbelures sur un tronçon de bois de renne. D) Ébauche de pointe barbelée BM 1864,1226.872 montrant l'amincissement du bord de la baguette et la gravure de lignes obliques en préparation d'une rangée de barbelures. E) Ébauche d'aiguille BM 1864,1226.858 dont la perforation est inachevée. F) Pièce à épaulement en bois de cervidé BM 1864,1226.530 provenant du limon rouge. G) Baguette en bois de renne BM 1864,1226.947 avec des traces d'insertion de ciseau. H) Matrice sur base de bois de renne BM 1864,1226.900 montrant un rainurage multiple sur bois de chute. Clichés : C. Lucas © Trustees of the British Museum.

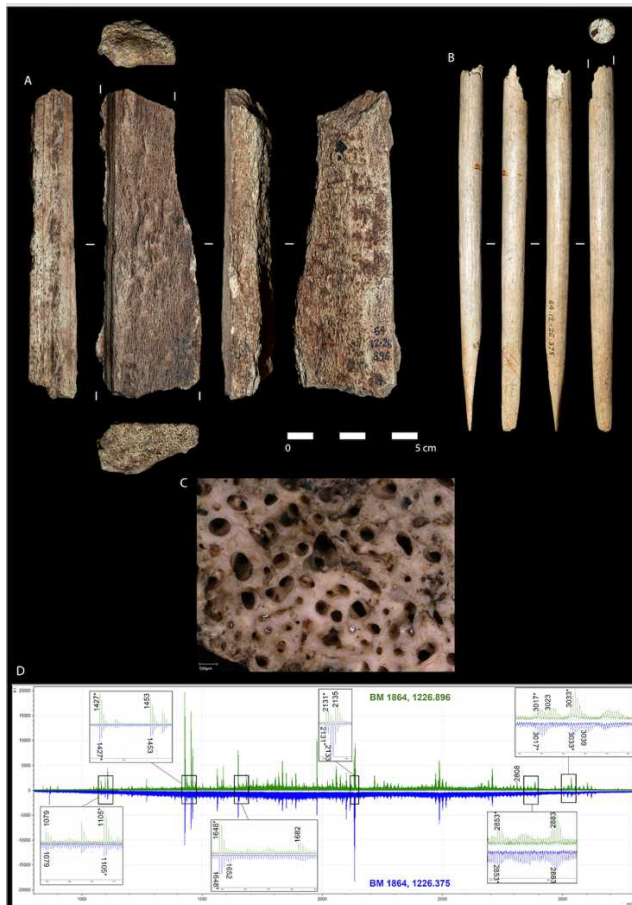


Figure 7: Whale bone artefacts from Courbet cave. A) Tabular debitage piece showing bifacial grooving BM 1864,1226.896. Photographs C. Lucas © Trustees of the British Museum. B) Probable foreshaft with single bevelled end BM 1864,1226.375. Photographs C. Lucas © Trustees of the British Museum. C) Close up showing the alveoles of varied sizes and shiny patches at the end of the debitage piece BM 1864,1226.896. Micro-imagery C. R. Cartwright © Trustees of the British Museum. D) ZooMS spectra for the two whale bone artefacts showing peptide markers used for taxonomic identification of the artefacts and the animal-based glue consolidant. BM 1864,1226.896 has been identified as right or bowhead whale (top spectrum), and BM 1864,1226.375 as sperm whale (bottom spectrum). Inset images show close ups of key peptide markers. Cow markers are identified with an *.

Figure 7 : Objets en os de baleine de la grotte du Courbet. A) Déchet de débitage en forme de tablette BM 1864,1226.896 montrant un rainurage bifacial. Clichés : C. Lucas © Trustees of the British Museum. B) Probable préhampe à biseau simple BM 1864,1226.375. Clichés : C. Lucas © Trustees of the British Museum. C) Vue rapprochée montrant les alvéoles de dimensions variées et les bulles brillantes à l'extrémité du déchet de débitage BM 1864,1226.896. Micro-imagerie : C. R. Cartwright © Trustees of the British Museum. D) Spectres ZooMS des deux objets en os de baleine montrant les peptides marqueurs utilisés pour l'identification taxinomique des objets et du produit consolidant. BM 1864,1226.896 a été identifié comme un os de baleine franche ou de baleine boréale (spectre du haut) et BM 1864,1226.375 comme un os de cachalot (spectre du bas). Les vues rapprochées insérées montrent les peptides marqueurs caractéristiques. Les marqueurs de boviné sont indiqués avec une *.

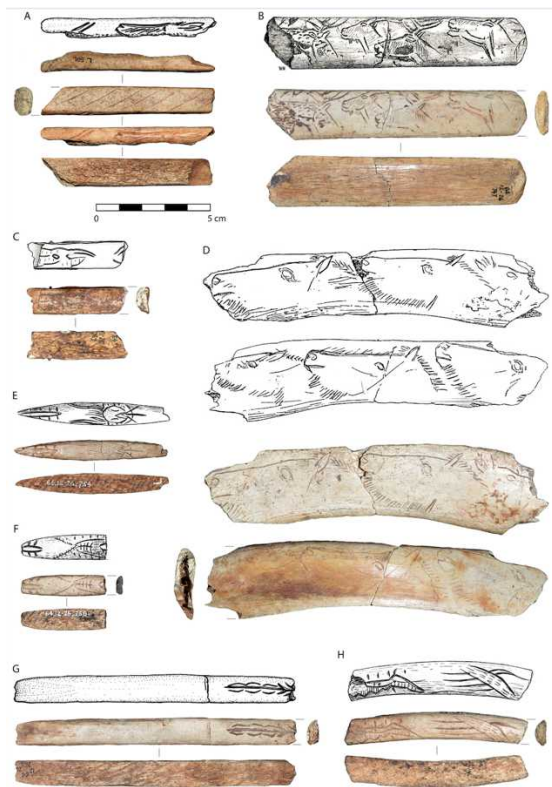


Figure 8: Figurative art from Courbet cave. A) Point with lateral hind head and parallel lines BM Palart.528 (ex 1864,1226.501). B) Carved rib with reindeers and ibex heads BM Palart.505 (ex 1864,1226.747/1866,0303.1). C) Half-round rod with caprid head (saiga?) BM Palart.483 (ex 1864,1226.769). D) Rib with horses and deer heads BM Palart.508. E) Bi-pointed half-round rod with a fish on lines being pulled out of the water BM Palart.471 (ex 1864,1226.754). F) Half-round rod with a fish on lines being BM Palart.472 (ex 1864,1226.758). G) Bevelled half-round rod with a vegetal pattern BM Palart.485 (ex 1864,1226.765). H) Half-round rod with indeterminate figures (possibly insect and whale?) BM Palart.474 (ex 1864,1226.764). Drawings from Owen, 1870 (B); Cartailhac, 1903 (D); Breuil, 1912 (E-F and H); and C. Lucas (A, C, and G). Photographs C. Lucas © Trustees of the British Museum.

Figure 8 : Art figuratif de la grotte du Courbet. A) Pointe gravée d'une tête de biche et de lignes parallèles BM Palart.528 (ex 1864,1226.501). B) Côte façonnée et gravée de têtes de rennes et de bouquetin BM Palart.505 (ex 1864,1226.747/1866,0303.1). C) Baguette demi-ronde gravée d'une tête de capridé (saïga ?) BM Palart.483 (ex 1864,1226.769). D) Côte gravée de têtes de chevaux et de cervidé BM Palart.508. E) Baguette demi-ronde bipointe gravée d'un poisson en lignes étant sorti de l'eau BM Palart.471 (ex 1864,1226.754). F) Baguette demi-ronde gravée d'un poisson en lignes BM Palart.472 (ex 1864,1226.758). G) Baguette demi-ronde biseautée gravée d'un motif végétal BM Palart.485 (ex 1864,1226.765). H) Baguette demi-ronde à figures indéterminées (possible insecte et baleine ?) BM Palart.474 (ex 1864,1226.764). Relevés d'après Owen, 1870 (B); Cartailhac, 1903 (D); Breuil, 1912 (E-F et H); et C. Lucas (A, C et G). Clichés : C. Lucas © Trustees of the British Museum.

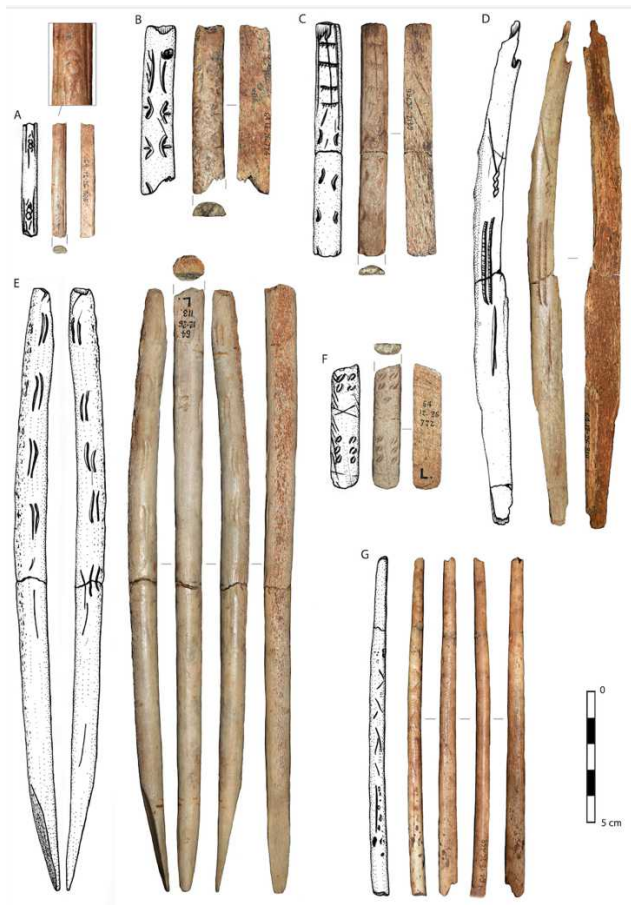


Figure 9: Geometric art from Courbet cave. A) Half-round rod with complex diamond signs BM Palart.521 (ex 1864,1226.805). B) Half-round rod with arcs and 'trefoils' BM Palart.476 (ex 1864,1226.774). C) Half-round rod with short arcs refitted to partitioned quadrilateral pattern BM Palart.481 (ex 1864,1226.766) from the red silt. D) Rib with pair of notched grooves and braided pattern BM Palart.511 refitted to 1864,1226.810. E) Probable foreshaft with lateral double arcs; the single bevelled end has been refitted to BM Palart.492 (ex 1864,1226.113) from the middle layers. F) Half-round rod with small ovate reliefs BM Palart.480 (ex 1864,1226.772). G) Point with lateral zigzag BM 1864,1226.458. Drawings and photographs C. Lucas © Trustees of the British Museum.

Figure 9 : Art géométrique de la grotte du Courbet. A) Baguette demi-ronde gravée de signes losangiques complexes BM Palart.521 (ex 1864,1226.805). B) Baguette demi-ronde à parenthèses et trèfles BM Palart.476 (ex 1864,1226.774). C) Baguette demi-ronde à courts arcs de cercle raccordée au fragment à quadrilatère cloisonné BM Palart.481 (ex 1864,1226.766) provenant du limon rouge. D) Côte gravée d'une paire de rainures crantées et d'un motif tressé BM Palart.511 raccordé au fragment BM 1864,1226.810. E) Probable préhampe gravée d'arcs de cercle doubles sur les deux bords ; l'extrémité en biseau simple a été raccordée au fragment BM Palart.492 (ex 1864,1226.113) provenant des niveaux médians. F) Baguette demi-ronde à reliefs ovalaires BM Palart.480 (ex 1864,1226.772). G) Pointe à zigzag latéral BM 1864,1226.458. Relevés et clichés : C. Lucas © Trustees of the British Museum.

| | Horse | Cervid | Bovid | Caprid | Human | Fish | Barbed point | Vegetal | Cordage? | Indeterminate | Total |
|-------------------------------|-----------|-----------|----------|----------|----------|-----------|--------------|----------|----------|---------------|-----------|
| Half-round rod | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 1 | 1 | 3 | 9 |
| Spearthrower | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| Point | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 3 |
| Engraved bone/antler | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| Bead | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| Chisel | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Debitage piece | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| Indeterminate object | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| Total number of pieces | 8 | 8 | 2 | 2 | 2 | 2* | 2 | 1 | 1 | 5 | 28 |
| Number of depictions | 13 | 13 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 6 | 44 |

Table 4: Figurative depictions on osseous materials from Courbet cave at the British Museum.
 *The two half-round rods engraved with fish being pulled out of the water may be parts of the same object.

Tableau 4 : Représentations figuratives sur matières osseuses de la grotte du Courbet au British Museum. *Les deux baguettes demi-rondes gravées de poissons étant sortis de l'eau font probablement partie du même objet.

| | Parallel lines | Arc | Zigzag / Sinuous line | Chevron | Dot | Ovate relief | 'Complex diamond sign' | Criss-cross pattern | Cross | 'Trefoil' | Notched groove | Braided pattern | Quadri-lateral pattern | Other and indet. | Total |
|------------------------|----------------|-----|-----------------------|---------|-----|--------------|------------------------|---------------------|-------|-----------|----------------|-----------------|------------------------|------------------|-------|
| Point | 7 | 4 | 6 | 5 | 1 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 2 | 24 |
| Half-round rod | 1 | 7 | 0 | 2 | 1 | 1 | 3 | 0 | 0 | 1 | 0 | 0 | 1 | 7 | 18 |
| Large bevelled rod | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 |
| Chisel | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| Engraved bone/ antler | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 3 |
| Debitage piece | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| Foreshaft | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Barbed point | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Pendant | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Perforated baton | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Tube | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Indeterminate object | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Total number of pieces | 16* | 13* | 8 | 7 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 14 | 60 |

Table 5: Geometric patterns on osseous materials from Courbet cave at the British Museum. *Excluding potential technical adjustments such as sets of parallel lines possibly fitting with adherence striations, longitudinal grooves on projectiles, and arcs on barbs.

Tableau 5 : Motifs géométriques sur matières osseuses de la grotte du Courbet au British Museum. *Excluant les aménagements potentiellement techniques tels que les ensembles de lignes parallèles qui pourraient concorder avec des stries d'adhérence, les rainures longitudinales sur projectiles et les arcs de cercles sur barbelures.

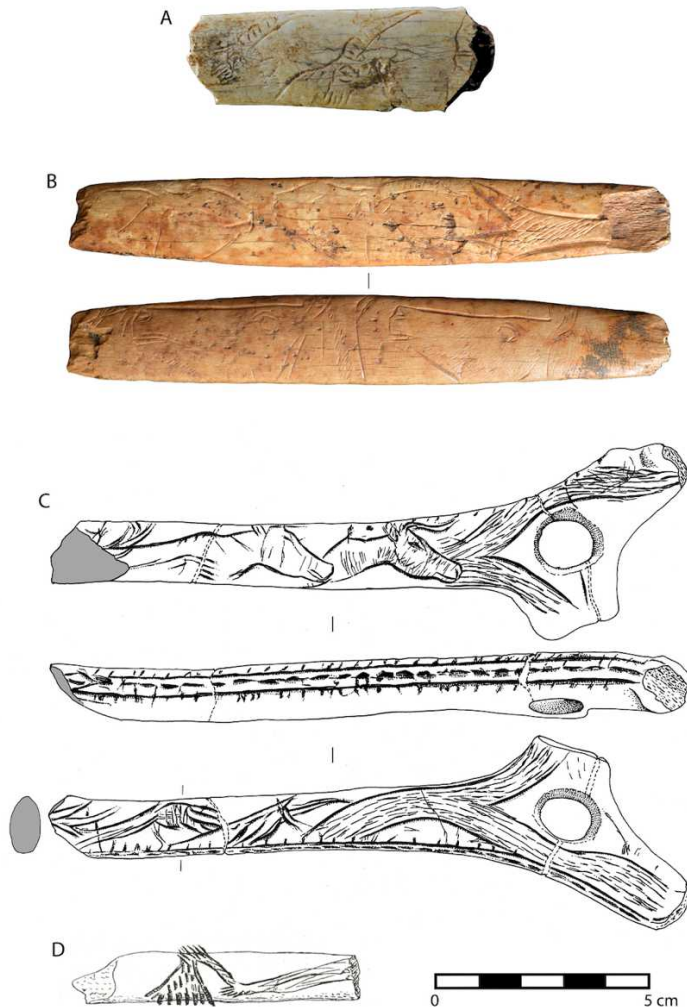


Figure 10: Rare figurative depictions showing striking similarities. A) Rib with saigas and probable horse heads from Courbet cave, Musée Toulouse-Lautrec, Albi, France, unnumbered. Photographs: Carole Fritz, courtesy of the author. B) Probable smoother with saigas and horses heads from La Vache cave, Musée d'Archéologie Nationale, Saint-Germain-en-Laye, France, MAN 83348. Photographs: C. Lucas. C) Perforated baton with aurochs, human arm, and geometric patterns from Rochereil cave, Musée National de Préhistoire, Les Eyzies, France, M2-13-11-38. Drawing: Patrick Paillet. D) Osseous artefact with a human arm holding a triangular implement from Courbet cave, lost de Lastic collection. Drawing: from Cartailhac, 1903.

Figure 10 : Représentations figuratives rares présentant des similitudes frappantes. A) Côte gravée de têtes de saïgas et probable cheval de la grotte du Courbet, Musée Toulouse-Lautrec, Albi, France. Cliché : Carole Fritz. B) Probable lisseur gravé de têtes de saïgas et chevaux de la grotte de La Vache, Musée d'Archéologie Nationale, Saint-Germain-en-Laye, France, MAN 83348. Clichés : C. Lucas. C) Bâton percé gravé d'aurochs, d'un bras humain et de motifs géométriques de la grotte de Rochereil, Musée National de Préhistoire, Les Eyzies, France, M2-13-11-38. Relevé : Patrick Paillet. D) Objet en matière osseuse gravé d'un bras humain tenant un instrument triangulaire de la grotte du Courbet, collection de Lastic perdue. Relevé : d'après Cartailhac, 1903.

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