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## 1 - Presentation of the site

- 1 Rochefort cave, in the village of Saint-Pierre-sur-Erve, is part of the group called “les grottes de Saulges” (Saulges’ caves), which are all found along a ca. 1.5 km stretch of the Erve River (fig. 1). The cave, visited since Palaeolithic times, has long been known: it is presently one of two caves in the valley open for guided tours. It is one of the largest caves of the group with a total length of 250 m, divided into an upper and a lower karst. The upper level was the only one accessible in prehistoric times: it is made of a 24 m long access corridor that opens up into a large chamber. In spite of several excavations at the end of the 19<sup>th</sup> century and in the 1930s that identified a Palaeolithic presence in the cave, the surfaces available for modern archaeological research remain significant. Since 2011, a multi-year excavation has been carried out in part of the large chamber which led to the identification of a remarkable Solutrean level (fig. 1). Indeed the Solutrean layer of Rochefort cave, with its lithic and faunal assemblages and the presence of art on plaquettes and bone has all the characteristics of a real habitation site (Hinguant and Colleter dir. 2010; Hinguant and Biard in press; Pigeaud in press).
- 2 For practical reasons, the excavated area presently covers only half of the chamber. The excavations clearly show that we are at the periphery of the occupation, in an area in which refuse seems important and where spatial organisation is hardly perceptible. Even so, refuse from a hearth and a structure constructed with limestone blocks, at the

edge of the excavation, underscore the existence of an occupation floor. Furthermore, the connections and re-fitting between the lithic or bone pieces show that preferential activities areas do exist. In spite of obvious post-depositional issues, notably connected to cryoturbation and run-offs, the spatial data do bring real information, opportunely reinforced by the good conservation of the portable objects.

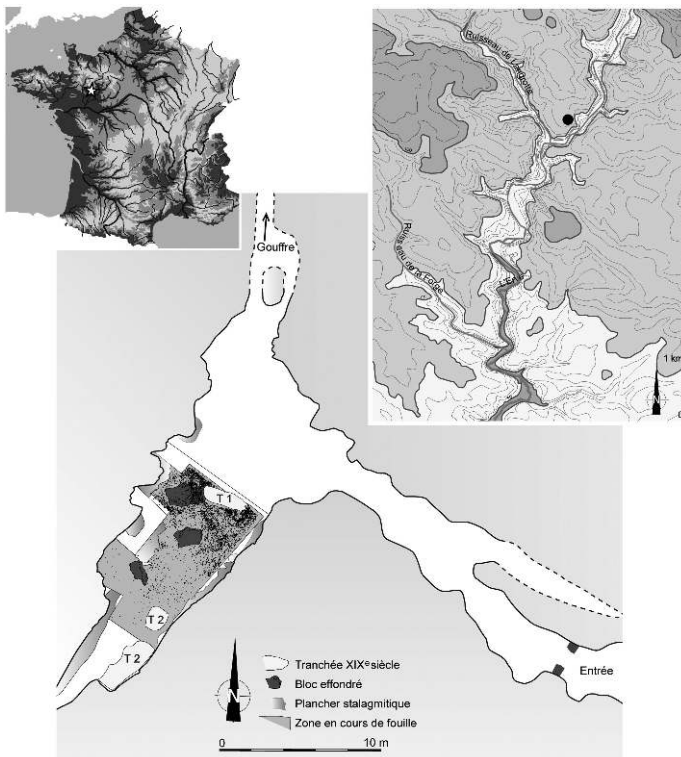
- 3 Stratigraphy and radiocarbon dating give an age at the heart of the Solutrean, between 19,000 and 20,000 BP, a chronology confirmed by the material culture that does not include flat-face points nor shouldered points but in which laurel leaves dominate (fig. 2). The remarkable homogeneity of this Solutrean unit must be underscored: it excludes any possible mix-up with previous or later chronocultures. As for fauna and palaeoenvironmental data, they certify a cold and dry environment that corresponds to the Last Glacial Maximum (OIS 2), in which some protected areas favourable to more temperate species still remained. Thus in the faunal corpus, if reindeer and horses dominate, alpine ibexes, bison, woolly rhinoceroses, mammoths, arctic foxes, wolves, brown bear, lynxes, European wild cats and wild boars are also found (Hinguant and Colleter dir. 2010; Hinguant *et al.* in press). The Solutrean unit in the cave is currently 50 to 60 cm thick at the most; it is made of limestone clasts resulting from the erosion of the walls of the cave and of sandy-clayey fine sediment that seal off the interstices. Six subdivisions have been recorded (4.1 to 4.6) that correspond to changes in structures, textures and colour in the stratigraphy, and also to different densities of objects. While some vertical mix-ups have been noted, the homogeneity of each stratum seems preserved, especially for subdivisions 4.2 and 4.3, but we do not know if they correspond to the superimposition of successive occupations (seasonal or otherwise).
- 4 It is within a corpus of about 8,000 portable objects, among which nearly 5,500 bone remains, 2,000 knapped lithics and 300 engraved plaquettes were excavated, that the objects considered in the present article were found.

## 2 - Corpus

- 5 The items come indistinctly from the sub-layers of unit 4, with a concentration in 4.2 and 4.3. Some have been collected by sieving and/or were simply positioned by square (NR for not recorded). The spatial repartition of the recorded objects within the excavated area does not give any specific information except for an important concentration of objects in the northern half of the excavation, where most of the Solutrean artefacts are found (fig. 3).
- 6 These engraved bones, which are remarkable in their quality of conservation in spite of being frequently fragmented, are presented below in a descriptive inventory according to the nature and the organisation of the incisions. Bones with incontestable graphic expression are put forward first. Ten objects are inventoried in this category. There are secondly other bones with incisions whose aspect and regular organisation make their nature equivocal: are they graphic elements or simply de-fleshing traces? This is the case, for example, with some objects that could have been used as chopping blocks, but they also bear regularly-placed traces that could be seen as intentional: this why they are presented within the corpus. We note numerous bone objects from the Solutrean layer in Rochefort Cave that have traces associated with butchery activities (cutting striations, scraping, etc.). If several such items have been isolated here, it is due to

identified marks denoted in the usual inventory of traces, especially in relation to indicated blanks, which are mostly ribs. We have not forgotten to consider that rodents may leave marks on bones, although in the present inventory confusion of these marks with those left by humans is impossible. Finally, the combination of several of these marks on the same object is sometimes possible.

Figure 1 – General location map and topographical environment of the Erve valley. Plan of Rochefort cave showing the distribution of the Solutrean artefacts. (computer graphics by R.Colleter).



## 2.1 - Bones with graphic expression

Figure 2 – Synthetic stratigraphic section for the upper filling of Rochefort cave and radiocarbon datings of the Solutrean levels. (drawing by S. Hinguant, photography and computer graphics by R. Colleter).

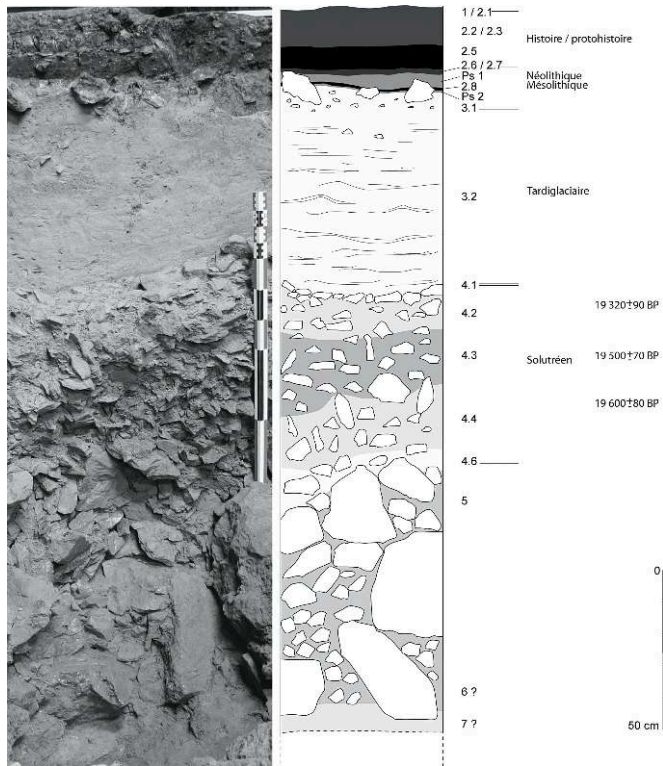
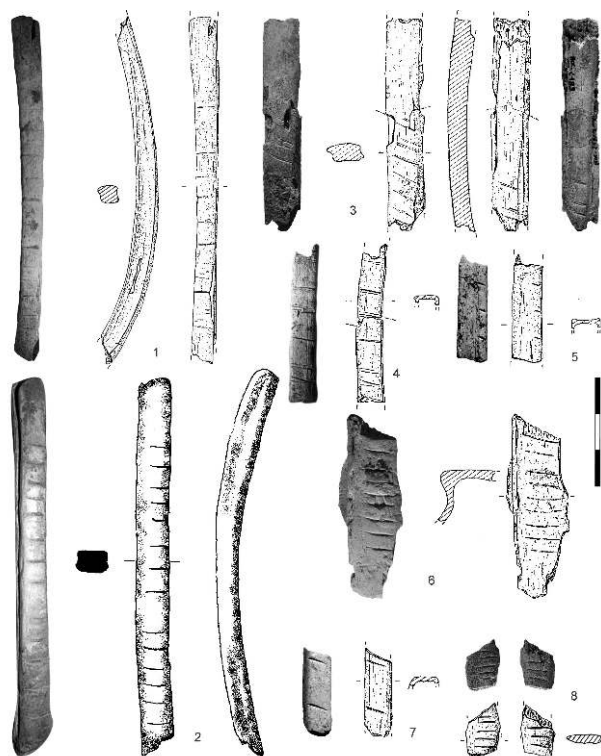


Figure 3 – Distribution of the Solutrean engraved ribs, bones and tusk from Rochefort cave. (computer graphics by R. Colleter).



Figure 4 – Engraved diaphysis or fragments of herbivores ribs. (drawings by S. Hinguant, photography by P.-E.Moullé and R. Colleter, computer graphics by R. Colleter).



- **n° 2951 (4.3)**: rib fragment of a small herbivore (ibex?) that could be a tenth left rib. The dorsal and ventral extremities are missing. At least 12 incisions, perpendicular to the long axis, are present. They are very regular, and remind us of the composition that decorates bear rib n° 984 (see below). A thirteenth incision is nearly fully hidden by concretion and a fourteenth, shorter and closer to the edge of the rib, is also visible. The caudal edge of the dorsal extremity bears a deep line that marked both protruding sides of the bone without reaching the concavity. The symbolic or decorative origin of these marks seems obvious (fig. 4, n° 1).
- **n° 242**: (Dresden Museum, Germany, De Boxberg collection): object from the old De Boxberg excavations, of which a cast also exists at the Crozatier Museum at Puy-en-Velay (fig. 4, n° 2). Its exact origin is unknown but there is little doubt it belongs to the Solutrean unit (Monnier *et al.* 2005). It is a long rib fragment from a small herbivore that bears on its external surface a series of 14 regularly spaced parallel incisions, a composition that is similar to several examples discovered in situ at the Rochefort Cave, including the object described above.
- **n° 2189 (4.3)**: fragment of small herbivore rib (ibex?). On its internal surface, long longitudinal lines were done by scraping. Slightly oblique perpendicular lines cross over them according to a rhythm that makes three sets. Each set is made of at least two fine lines, very close to each other, that indicate the use of a flint tool with a double active part rather than several repetitions of the same tracing in order to accentuate the lines. On the external surface, two groups of perpendicular lines can be seen. These are slightly oblique, done in the same manner as above. Simple butchery does not explain these compositions (fig. 4, n° 3).

- **n° 1837 (4.2):** rib fragment from a small herbivore with only its superior side preserved. It shows at least six lines or groups of transverse lines, regularly spaced, that cannot be interpreted as simple butchery traces (fig. 4, n° 4).
- **NR east front n° 3 (4.3):** rib fragment (between the 7th and the 10th) of a small herbivore (ibex?). It is a cranial or caudal rib fragment from an area close to its dorsal end. Three short incisions, regularly spaced, with a V-shaped cross-section, can be seen on the fragment. Two of them mark the protruding sides of the edge without reaching the concavity between these edges while the third one only marks one protruding side. Their disposition cannot be explained by butchery work (fig. 4, n° 5).
- **n° 3167 (4.3):** indeterminate bone fragment showing a register of nine evenly spaced parallel lines. At one end of the fragment, the break happened along one of the incisions, suggesting that the decoration continued on the object (fig. 4, n° 6).
- **NR east front n° 5 (4.3):** fragment of small herbivore rib with only the external surface preserved. It shows two transversal lines, slightly oblique, well-marked, V-shaped in cross-section, that cannot be butchery traces (fig. 4, n° 7).
- **n° 4268 (4.4):** small fragment of a rib of an herbivore (?), on which the organisation, the regularity, and the depth of the incisions on both sides of the bone are especially neat (fig. 4, n°8).
- **n° 984 (4.2):** discovered in 2006 in layer 4.2, to date it is the masterpiece of the collection. The object is a nearly complete brown bear (*Ursus arctos*) right rib, (fig. 5). With regard to its dorsal extremity, the tubercle, its articular facet, the neck and the head are missing. There is no ventral extremity; the costochondral articulation is thus missing. At the dorsal extremity of the rib body, on its caudal edge, the tuberosity of the longissimus muscle is well preserved. At the same level but on the internal surface, the tuberosity of the ilio-costal muscle is altered and partially covered by concretion. Distal to these tuberosities, along the body, the junction angle between the caudal edge and the internal side is abraded in such a way that the cancellous bone is visible along the length that corresponds to the area where the perpendicular incisions from anthropic origins are seen. This abrasion may also be anthropic in origin as its polished aspect indicates. The presence of numerous longitudinal and oblique striations on the body evokes a cleaning up, a preparation of the rib. Toward the ventral extremity, the angles between the caudal edge and the external and internal sides also show abraded and polished areas. The angle of the rib (between the dorsal extremity and the body) is rather open, which excludes a position within the first ribs of the ribcage (Brown Bears have 14 pairs). The preserved part of the body indicates a rather long rib that could correspond to a central position (7<sup>th</sup> -9<sup>th</sup> position?). This rib seems to belong to a large-sized individual but it has a more slender aspect than the observed cave bear specimens. We recall here that layers 4.2 and 4.3 in Rochefort cave yielded several remains of a large-sized brown bear, some of them with butchery marks. This rib was used as a substrate for fourteen deep parallel incisions on the internal side of the bone, closer to the vertebral extremity than to the ventral one. These incisions, by their morphology and regularity, as well as by their position on the bone, are obviously not connected to butchery activity, a rare but previously-seen practice on this type of bone (Armand *et al.* 2003; Quilès 2004; Armand 2006; Vercoûtère *et al.* 2006). We are indeed in favor of this representing an intentional action with a decorative or symbolic purpose, or again with a functional aim such as counting, which cannot be excluded even if it is impossible to demonstrate (Pernat 2001). The observation of the engraved set of marks allows identifying three potential registers that could indicate a chronology in the making of the incisions without giving more details. The two incisions closest to the dorsal extremity are very deep and larger than

the others, and the space between them is small (3 mm). The following six incisions, still deep, are systematically accompanied by finer parallel lines. These could indicate corrections or the insistence of the artisan's gestures before finding the right position for each notch. Also, the main lines are regularly spaced at a distance of about 8 mm. A last register of six incisions, less visible as shorter and less deep than the previous one, ends (or begins?) the set. The equidistance is also very even (6 mm). A close observation of the object allows one to see that the rib was finely scraped, even polished, on a large part of its surface, especially toward the ventral extremity. Cut marks are also still visible on the middle of the object: they are much finer and thus distinct from the ones making the "decoration" itself. Furthermore, the sporadic presence of red ochre traces is noted.

- **n°8810 (4.3):** fragment of mammoth tusk (*Mammuthus primigenius*). The object, weakened by the very nature of ivory that flakes off as an "onion skin", could be consolidated. After restoration, it measures 17 cm long by 3.5 cm average width and 5 mm average thickness (fig. 6). This last measurement corresponds to the regular thickness of the ivory cones that slot inside each other in a tusk. Closely linked to each other when the animal is alive or in a "fresh" tusk, these different elements crumble over time, which suggests that the ivory was probably collected in a fossilized state (Poplin 1995). The original average diameter of the tusk can be reconstituted as 7 cm and its morphology as well as its curve, with all the necessary caution, seems to place the fragment in the rather distal part of the tusk. As on the herbivore ribs presented above, the external surface bears a series of very fine incisions, parallel and equidistant. A total of 11 lines make the pattern but some of them are doubled or even tripled. Indeed microscopic examination allows one to see that the incisions were done with a burin, with the curve of the surface inducing a change of axis several times at the moment of accomplishing the gesture. Two or even three fine incisions then make the same line (fig. 7b and c). It seems that the composition is complete, as the preserved proximal portion bears no incisions in spite of its relative alteration. In the distal part, as on one of the edges of the tusk, the numerous striations and gnawing left by rodents disturb the reading of the object, but here too the few visible traces seem to stop before the edge (fig. 7a). Striations of limited length are also seen on the decorated surface following the long axis of the tusk, or punctually, in a disordered manner. But they are very different from the incisions making the pattern and are probably not part of it.



Figure 5 – Engraved brown bear (*Ursus arctos*) rib n° 984. (drawings by S. Hinguant, photography by H. Paitier, computer graphics by R. Colleter).

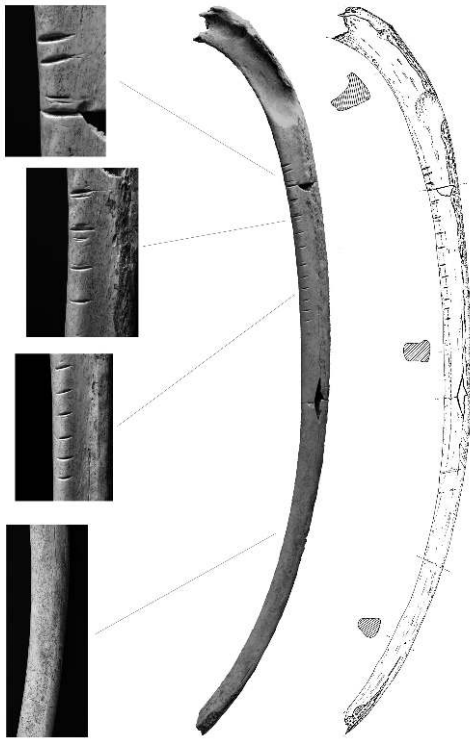


Figure 6 – Engraved fragment of mammoth (*Mammuthus primigenius*) tusk n° 8110. (drawings by S. Hinguant, photography and computer graphics by R. Colleter).

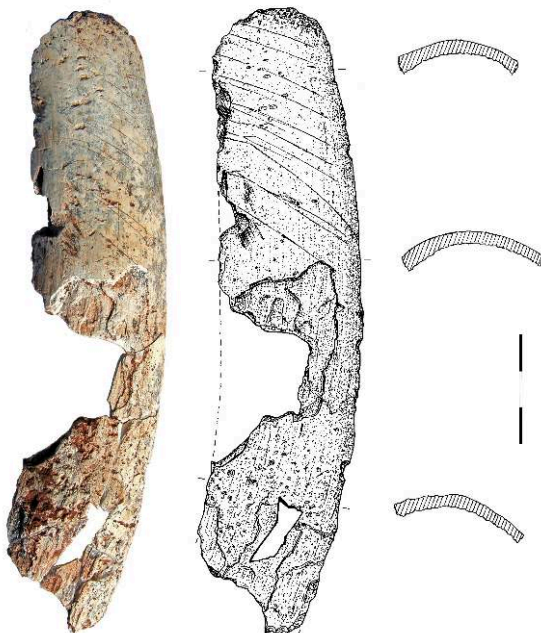


Figure 7 – Detail of the engraved fragment of mammoth tusk n° 8110. a, b and c: external views; d: internal view. Various sizes. (photography and computer graphics by R. Colleter).



## 2.2 - Bones with possible graphic expression

- **n° 1870 (4.2):** long rib fragment of a small herbivore (ibex?). There are three very neat oblique lines on the internal surface, one of them at the origin of the breakage. Because of their regular spacing they do not correspond to butchery work (fig. 8, n° 1). However, their function as adhesion striations cannot be excluded.
- **n° 1817 (4.2):** fragment of herbivore rib (reindeer or equine?). At least five oblique lines, sometimes doubled, are present; they could correspond to butchery work (cutting up) but regular spacing of the incisions is noted (fig. 8, n° 2).
- **NR east front n° 1 (4.3):** fragment of a small herbivore rib. On its internal surface, three perpendicular lines with V-shaped cross-sections are 1 cm distant from each other. The middle line is accompanied by two other finer incisions that could be an aborted attempt at engraving or corrections in positioning. These lines do not seem to be the result of butchery work (fig. 8, n° 3). A coupling of this object with the element NR east front n° 5, from the same layer (fig. 4, n° 7), is possible. This would place the item among the undoubtedly engraved objects.
- **NR east front n° 2 (4.3):** rib fragment from a small herbivore with on its internal side two large and deep lines with a V-shaped profile accompanied by finer striations. They are probably not butchery traces (fig. 8, n° 4).
- **n° 6935 (4.3):** rib or flat bone fragment showing on its external surface a series of at minimum 13 lines, roughly parallel and evenly spaced. In spite of the fragility of the object and of the squamous state of the bone cortex, the incisions are still clear and deep. A practice connected to butchery cannot be excluded in this case (fig. 8, n° 5).

- **NR west back n° 1 (4.2):** small rib fragment with only one preserved side showing abrasion that reveals the spongy tissue. This side shows a group of large lines with a V-shaped profiles, criss-crossing, that could belong to a figurative pattern (fig. 8, n° 6).

### 2.3 - Bones with de-fleshing traces or used as blocks

- **n° 991/1087/1703 NR (4.2):** rib of an average-sized herbivore, probably the left tenth rib of an ibex, discovered in four separate fragments (fig. 9, n° 1a-c). The fragments n° 1703 NR (1b) and 991 (1c) are close to the dorsal extremity (accentuated curve). The first one presents on its external surface about twenty fine and densely packed lines, oblique with regard to the long axis of the bone. The fragment n° 991 follows the previous but without direct connection. It bears on its external layer two series of fine lines, straight (perpendicular to the long axis of the bone) or parallel oblique. The fragment n° 1087 (1a) does not connect directly with the n° 1703 NR. It corresponds to the ventral side of the rib and its extremity is close to the costochondral articulation. This fragment shows on its internal and external sides long striations parallel to the long axis of the object. Short oblique lines are also present on the external side toward the dorsal extremity of the fragment. Some of these lines can only be explained by butchery work (fine, short, oblique lines or lines perpendicular to the long axis of the bone) but their large number, together with the traces of voluntary scraping on the external and internal sides could also allow evoking the preparation of the bone for a completely different use.
- **n° 1757 (4.2):** fragment of reindeer metatarsal diaphysis (*Rangifer tarandus*) with a smooth fracture edge and burning traces. Discreet lines are seen on the object with a marked spacing regularity (fig. 9, n° 2). However, these marks could also be natural.
- **- n° 2304 (4.3):** diaphyseal fragment (reindeer or ibex femur?) with transversal marks. At first glance, these marks remind one of a series of parallel lines intentionally and regularly placed. Binocular magnifier observation shows that they are not deep striations with a V-shaped profile, but that the marks are shallow and rather large with a U-shaped profile. They could therefore be teeth or claw marks. In addition to these parallel marks, other incisions of a similar aspect can be seen but with a less organised positioning (fig. 9, n° 3).
- **n° 5203a (4.4):** fragment of indeterminate rib that shows at least six sub-parallel marks on one side. These could have been made in butchery activity (fig. 9, n° 4).
- **NR n° 1 (4.2):** rib fragment with at least seven fine short oblique lines that could be butchering traces (fig. 9, n° 5).
- **NR west front n° 1 (4.3):** indeterminate bone fragment showing a group of three fine lines (butchery work or use of the bone?) (fig. 9, n° 6).
- **NR east front n° 4 (4.3):** fragment of flat bone with sub-parallel oblique lines along the long axis of the fragment, that could possibly be butchering traces (fig. 9, n° 7).

Figure 8 - Incised fragments of herbivores ribs or bones. (drawings by S. Hinguant, photography and computer graphics by R. Colleter).

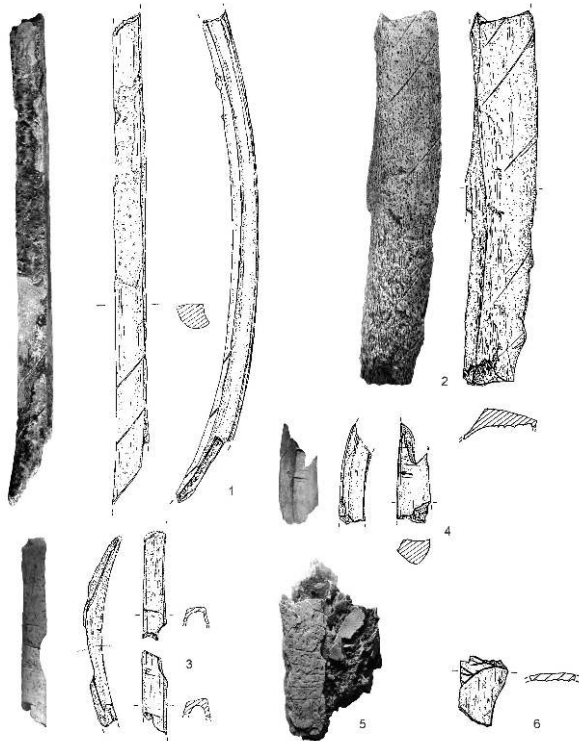
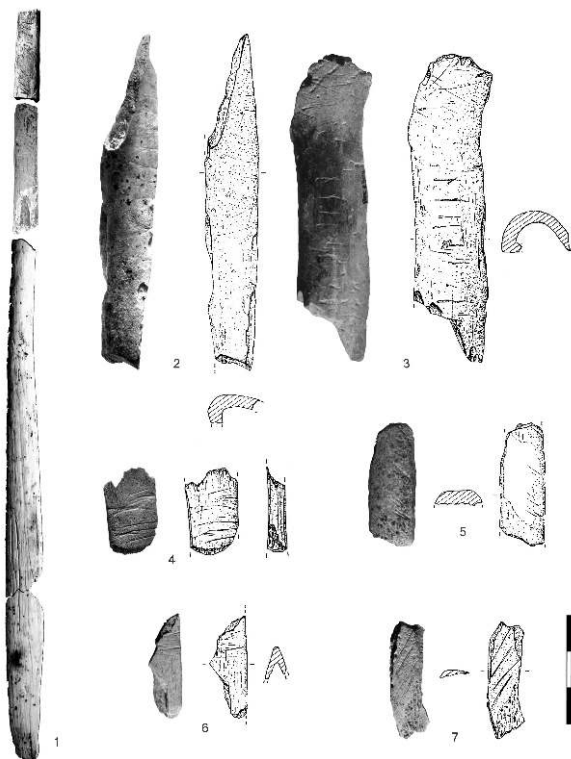


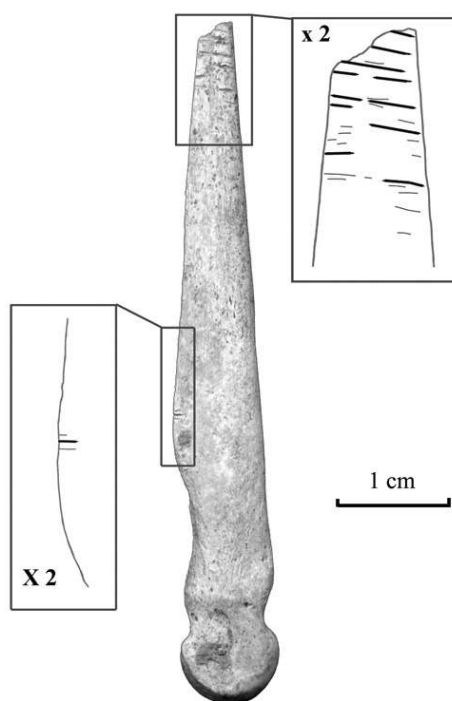
Figure 9 – Herbivorous diaphysis or ribs fragments showing traces of defleshing or having served as a block. (drawings by S. Hinguant except for n°2 N. Mélard, photography by R. Colleter except for casting n°2 by P.-E. Moullé, computer graphics by R. Colleter).



## 2.4 - A particular object

- n° 6175 (4.4): a vestigial incised reindeer metacarpus (fig. 10). On each of the front limbs, the second and fifth metacarpi are vestigial metacarpus. It could be a fifth metacarpus (lateral edge) of the left limb, or a second metacarpus (medial edge) of the right limb. It measures 60.7 mm long, 8.9 mm wide and 5.7 mm thick. The apical extremity of the metacarpus shows a recent fracture.
- 7 Anthropotic traces have been noted at two places on the object. The first worked area is 7.4 mm long and is found, according to its anatomical position, on the apical extremity of the right edge. It is comprised of 11 grooves and 17 lines for the preserved part. The grooves were formed by incising repeatedly with a sharp-edged tool thus creating a deep mark. The lines are more superficial and have been produced by a single cutting gesture. Their distribution with regard to the grooves indicates they could result from the cutting edge sliding out of its axis during the incision. The second worked zone is located, according to its anatomical position, on the upper side, in the mesial part of the metacarpus, 26.2 mm from the trochlea. It is made of three transversal lines parallel between them and to the plan of the object. No trace of macroscopic or microscopic use was identified.

Figure 10 – Detail of grooves (black) and line (grey) of the reindeer (*Rangifer tarandus*) metacarpal fragment n° 6175. (photography and computer graphics by C. Peschaux).



## 3 - Elements for comparisons

Table 1 - Summary inventory of the Solutrean engraved ribs and bones from Rochefort cave. The position of the lines is indicated in relation to the longer axis of the pieces. The number of lines is a minimum as further small incisions, double lines and other inconspicuous or doubtful lines are not taken into account. Highlighted: items indisputably bearing a graphic expression.

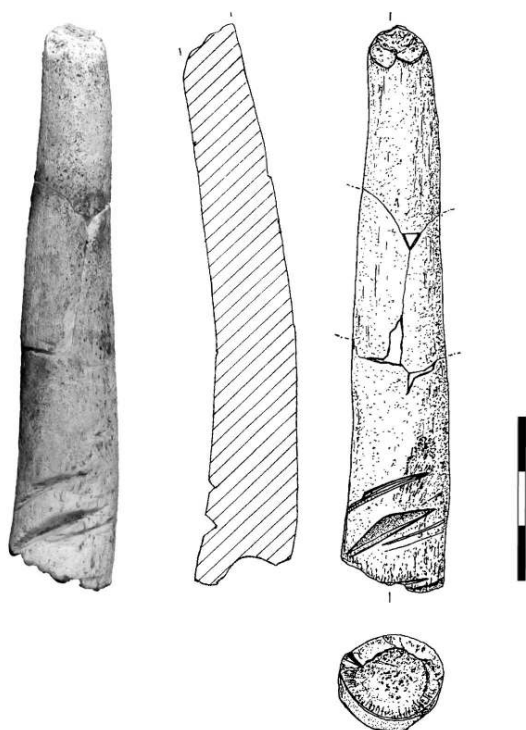
	Type	Espèce	Dimensions mm	Face gravée	Position stries / oblique   orthogonale / mixte	Nombre de stries
<b>Couche 4.2</b>						
984	côte	Ours brun	400x75x20	interne		14
991 et rac.	côte	Bouquetin ?	185x36x7	int./ext.	/	27
1757	métatarsien	Renne	92x15x7	dorsale		-
1817	côte	Renne/Équid ?	103x20x5			5
1837	côte	petit herb.	43x8x4	externe		6
1870	côte	Bouquetin ?	136x20x12	interne		3
NC 1	côte	ind.				7
NC fo 1	côte	ind.			/	ind.
<b>Couche 4.3</b>						
2189	côte	Bouquetin ?	58x11x5	int./ext.	/	8 / 3
2304	fémur	Renne/Bouq. ?	83x23x13	dorsale	/	ind.
2951	côte	Bouquetin	111x16x10			14 (15)
3167	ind.	ind.	50x20x10			9
6935	côte ?	ind.	50x12x5	externe		11
8110	défense	Mammoth	170x35	externe		11
NC do 1	ind.	ind.				3
NC de 1	côte	petit herb.		interne		3
NC de 2	côte	petit herb.		interne		2
NC de 3	côte	Bouquetin ?		externe		3
NC de 4	ind.	ind.				4
NC de 5	côte	petit herb.		externe		2
<b>Couche 4.4</b>						
4268	côte	herbivore ?	14x9x3	int./ext.		5 / 3
5203a	côte	ind.	24x15x4,5	ind.		6
6175	métacarpien	Renne	60,7x9x5,7	extr. ap.		11
<b>Provenance inconnue</b>						
Dr. 242	côte	petit herb.		externe		14

- 8 At the conclusion of this inventory, we note that most of the objects described come from layers 4.3 (12) and 4.2 (10), which shows the validity and the relative homogeneity of the recorded stratigraphy (tabl. 1). The inventory, with the remarkable exception of the mammoth tusk fragment and the vestigial reindeer bone, is mostly comprised of ribs or rib fragments and none of the objects fits into the usual corpus of tools or ornamentation elements. They are mostly small- or medium-sized herbivore ribs, especially reindeer or ibex, which right away questions the choice of the blanks once the objects clearly connected to butchery activity are excluded. Large-sized ribs, such as the brown bear one, were available, but except for this one piece, none bears intentional marks. Horses are never mentioned (except possibly for the n° 1870 item) although they make the larger part of the faunal spectrum. This species was nonetheless used in other sites, for example in the lower Magdalenian of Taillis-des-Coteaux (Primault *et al.* 2010, fig.17). One also notes that only one antler bears incisions, which are in that particular case connected to the cutting up of the object (n° 3237-4.4, fig. 11), when numerous tip fragments or antler segments are indeed found in the Solutrean layer.
- 9 Most of the objects do not seem to have been given a preliminary treatment to the making of the incisions, but some scraping traces, even polishing traces, are nonetheless visible on some objects, notably on the bear rib. However, taphonomic polishing is often seen on the objects and it is sometimes difficult to distinguish between natural and anthropic actions. In terms of dimensions, no visible mark could be considered blank preparation. Most of the objects are fragments and it is difficult to know if the ribs were intentionally cut up in segments to give them the required

dimensions. This does not seem to be the case with regard to the nearly whole objects of the collection (n° 984 or n° 1870) and we assume that originally the decorations were done on whole ribs, with the fragmentation resulting from later voluntary action or from post-depositional phenomena after the desertion of the site.

- 10 The decorations are redundant and made of more or less regular series of lines on one or, more rarely, two sides of the bones. These incisions are parallel, equidistant, orthogonal or oblique with regard to the long axis of the objects and they are, in most cases, unlikely to be simple cut marks even if one needs to remain cautious in certain cases in which butchery actions can result in this type of organisation (Giacobini and Patou-Mathis 2002 - p. 24, fig. 3). However, the frequent position of the incisions on the external side of the ribs is not compatible with this type of activity. Sometimes fine and discreet, the incisions can also be more deeply marked, turning into real grooves like on the bear rib. This reinforces the intentional character of the gestures.
- 11 This type of decoration is frequent in Upper Palaeolithic art, notably among the Gravettian groups (Lucas 2011) but the assemblage of Rochefort Cave constitutes a rich and original series for the Solutrean. If similar or close objects are noticed in contemporaneous sites, unfortunately often resulting from old excavations (for example in Solutrée, Roc-de-Sers... see Combier 2002; Tymula 2002), these series rather tend to show functional objects. In the Solutrean of Rochefort, we have not found any spear head, needle, awl, punch, smoother or again pendant, notched functional or ornamental object (Le Placard, Le Fourneau-du-Diable, Pech de la Boissière... cf. Smith 1966; Chollot-Varagnac 1980). In numerous sites in which examples have been indicated, the engraved ribs are rare and never make the majority of the decorated bone objects as they do in Rochefort Cave.

Figure 11 - Reindeer crown tine marked in its basal part by three deep parallel incisions. (n° 3237-4.4). (drawing by S. Hinguant, photography by P.-E. Moullé).



- 12 Thus comparisons can be made between objects rather than between series. We can already note that the two most remarkable objects from Rochefort cave, the bear rib and the mammoth tusk fragment, do not have an equivalent in the collections. Therefore the question of the blanks chosen by the artisans to do the decorations can be raised. In the case of the bear rib, if a functional goal was sought, we can possibly evoke miniature bows or rather the fire bows or the drills made from large herbivore ribs, mentioned in the Danish Mesolithic or in ethnography. *“The morphology of the object is [thus] strongly connected to the one of the original support, as it happens a large rib..., a long straight bole with a rather curved profile”* (David 2001). But in the present case, we cannot confirm this use because the extremities are lacking and thus the potential perforations or notches to hold a rope. Could the locally polished aspect of the object, such as the fine longitudinal striations, however be the witness of a prolonged use? The use of bear bones remains in Palaeolithic art is not unknown but concerns more often cave bears, notably perforated teeth and claws, and much more rarely brown bears which are more often mentioned in Eastern European sites (Kozłowski 1992; Abramova 1995).
- 13 To our knowledge, the fragment of mammoth ivory is at this writing unique in the Franco-Cantabrian Solutrean. The use of mammoth ivory is widely known during the Upper Palaeolithic, including in the Solutrean (Castel and Madelaine 2006), whether for the making of tools, ornamentation elements, art (the well-known Aurignacian and Gravettian statuettes...) or even in the Central European Palaeolithic, in the building of shelters. But no known item compares with the one from Rochefort cave, except perhaps for the decorated fragment of mammoth ivory discovered at Pech de La Boissière (Dordogne), called a “ritual spade” by Elie Peyrony (Peyrony 1934; see also Smith 1966 - p. 192, for more detailed description and drawing). The object is larger in size than the example from Rochefort as the blank was probably taken on a more proximal segment of a tusk. It does not show equivalent incisions but a series of notches and parallel striations on both edges as well as punctuations on the distal part. The marked rounded aspect of the distal part and the traces of wear and polish evoke for the authors the use of this object as a spade; it does seem to come from the Solutrean level of the shelter.
- 14 If no Solutrean element is yet known, the use of a vestigial reindeer metacarpus as an ornament blank is well known in the Upper Palaeolithic. It has been noted especially in Badegoulian sites where sawed and/ or pierced examples are found at the sites of Fritsch (Peschaux 2008) and Cassegros (Le Tensorer 1981) rock shelters. Two examples are also found in the Lower Magdalenian of Saint-Germain-la-Rivière (Vanhaeren 2002). They are also found in larger numbers in the Placard collections but their stratigraphic origin is unspecified. If the intentional character of the incisions seems certain, the function of the example from Rochefort Cave remains open to discussion. The localization of the incisions on the right edge, an unexposed internal side, excludes their interpretation as butchery marks. Considered initially as a possible ornamental element, this object does not show any significant clue (suspension element, trace of use) that would justify such a use. It is therefore more cautious to see it as a decorated object, which is why it has been presented here among the engraved bones corpus.
- 15 The corpus includes ten items, to which we could add the vestigial reindeer metacarpus, on which the incisions are clearly not connected to cut marks. Six others are more doubtful as to the intentionality of the lines, but the engraving of these



objects does not strictly correspond to simple butchery activity. In general, the composition of the decorations is redundant, with simple incisions, more or less deep, regular, equidistant and organised in an oblique or orthogonal manner with regard to the long axis of the bones. Rhythms can sometimes be noted (n° 991), or both faces can be engraved (n° 2189 and 4268), but the organisation of the decoration seems random. It is mostly the general impression of regularity and the geometrical character of the decorations that remain, making this type of composition a ubiquitous model, difficult to detect at a chronocultural level from the whole of the recorded pieces for the Upper Palaeolithic. By way of example, the frequent decorations with notches or tightly packed holes are not indicated in the series; they are deeply marked, often in a lateral position on the blanks and they characterise the Solutrean objects.

## 4 - Conclusion

- 16 The mains types of inventoried marks on bone in the literature and the doubts that remain on the intentionality of some of them imply cautiousness. M. Lorblanchet (1999) has offered a series of diagnostic criteria to distinguish anthropic marks from non-anthropic, and intentional from non-intentional. According to these criteria, through the rhythm and the position of the incisions, and especially with regard to the types of blank support used (essentially small herbivore ribs), most of the objects from Rochefort cave do bear an intentionally traced decoration. We are excluding straight away any functional aspect. Indeed they cannot be tools or tool fragments on which adhesion striations, known elsewhere, could have been designed for fitting in a handle or for fixing connected elements (Allain and Rigaud 1986). Similarly, it is not possible that the taphonomic actions or rodent activity are the only intervening agents, even if some traces belong without a doubt to these categories of marks. Finally, de-fleshing or the use as a block, already mentioned, are not sufficient for interpreting the whole of the collection.
- 17 This type of incision is essentially characterised by their rhythm and their repetition (Leroi-Gourhan 1965). Indeed, the spaces between the incisions are not random occurrences; they show some regularity and comprise identifiable graphic units. The issue here is not underscoring the emergence of symbolic or aesthetic behaviour which is already an ancient phenomenon for the period we are considering. We can evoke as a reminder the very ancient remains from Blombos cave (South Africa) between 100,000 and 70,000 years ago (D’Errico 2003; D’Errico *et al.* 2001; Henshilwood *et al.* 2011) and numerous sites of the European (Lorblanchet 1999; Kozłowski *et al.* 1995) or Middle Eastern Upper Palaeolithic (Belfer-Cohen and Bar Yosef 2009). Cave art also contains such repetitive marks. We can mention for example the lines engraved on the horn of the Laussel Venus (Dordogne) or the wall “combing” recently identified by M. Lorblanchet on the walls of the Quercy caves (Lorblanchet 2009).
- 18 It was once assumed that such marks could imply a real system for counting in the Palaeolithic (hunted prey, moon phases, menstrual cycles, see for example Pernat 2001 p. 49-59). Alexander Marshack (1972) went further in these propositions. These hypotheses are of course impossible to verify and possibly overly simplistic (d’Errico 1996). On a rhinoceros rib from the site of Solutré, Francesco D’Errico has attempted to determine the existence of a notation system from the 47 notches done on the object (Lagardère 2006 - p. 44). If the organisation of the incisions is doubtless and the

technique of incising with a raw flint cutting edge identified, the author cannot be sure of the chronology of the execution, which excludes any hope of determining counting.

- 19 Obviously, some of these objects do belong to the symbolic sphere of the Solutrean people, which still does not mean that we can see in it an aesthetic preoccupation, as others, for example ritual (Pigeaud 2007), remains possible. Therefore, we will mostly insist here on a type of behaviour recognised for the first time in the Erve Valley and in general rarely mentioned for the Solutrean. Too few elements for comparison and unknown or unreliable origins of the ancient collections from major sites, Solutrean or other, prevent us from deepening the analysis (San Juan-Foucher and Vercoutère, forthcoming). This new dot on the map and in the inventories is thus an important marker for a better comprehension of the cultural space of the Solutrean, which is still poorly known.
- 20 The preliminary data presented in this article are thus encouraging. The excavated part of the Rochefort cave is only limited, *a fortiori* in the periphery of the supposed habitation area. Excavations to come should concern the second half of the chamber for which we know that no ancient excavation was done, and thus no disturbance to the Solutrean spatial occupation. The inventory of engraved bone objects should therefore expand and permit refining research in this field.

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## ABSTRACTS

Within the Solutrean portable corpus gathered from Rochefort cave, a series of twenty-five items was isolated. It is mainly made up of herbivore ribs but also of fragments of long bones and ivory that are showing different types of incisions. Their lay out does not indicate simple grooves related to butchering activities. Remarkable items such as an entire brown bear rib or a fragment of mammoth tusk are part of this series of incised pieces. These symbolic engraved decorations are known for the Solutrean period but the imprecise chronostratigraphic contexts of most of the older collections make them unreliable items of reference. As the search for comparisons has not really been fruitful, the Rochefort cave corpus singles out by the quantity and quality of the objects that have been inventoried.

## INDEX

**Keywords:** Solutrean, Engraved Bones, Mammoth, Brown Bear, Rochefort Cave, Mayenne

## AUTHORS

### STÉPHAN HINGUANT

INRAP-Bretagne, 37 rue du Bignon, 35577 Cesson-Sévigné, France et UMR 6566 CNRS CREAAH « Centre de Recherche en Archéologie Archéosciences Histoire », CNRS, Université de Rennes 1, Rennes 2, Nantes et Ministère de la Culture ; Bâtiment 24-25, Université Rennes 1 - Campus de Beaulieu 74205CS, 35042 Rennes Cx, France - stephan.hinguant@inrap.fr

**PIERRE-ELIE MOULLÉ**

Musée de Préhistoire régionale de Menton, rue Lorédan Larchey, 06500 Menton et Département de Préhistoire du Muséum National d'Histoire Naturelle, Institut de Paléontologie Humaine, Paris, France - pierre-elie.moulle@ville-menton.fr

**ALMUDENA ARELLANO**

Musée de Préhistoire régionale de Menton, rue Lorédan Larchey, 06500 Menton, France - almudena.arellanoalonso@ville-menton.fr

**ROMAIN PIGEAUD**

UMR 7194 CNRS, Département de Préhistoire du Muséum national d'Histoire naturelle, Institut de Paléontologie Humaine, Paris, France - romain.pigeaud@wanadoo.fr