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NEANDERTHAL CUTMARKS: COMBE-GRENAL AND MARILLAC (FRANCE). A SEM ANALYSIS

ABSTRACT: This paper deals with the analysis of several human remains found in two French Middle Paleolithic sites with Mousterian culture and assigned to Homo sapiens neanderthalensis. Chronostratigraphic data for both of them document very cold climatic conditions corresponding to OIS 4.

One of these sites is Combe-Grenal Cave, where F. Bordes found several human remains in Mousterian level 25 (around 75/65 ky). The considered fossils are the fragment of a child's mandible, an incomplete juvenile mandible and a humeral fragment from an adult. Numerous intentional cutmarks on the second mandible and on the humerus are described, while scratches found on the first mandible are interpreted as toothmarks produced by small carnivores.

The second site is Marillac ("Les Pradelles"), where B. Vandermeersch discovered several human remains (levels 9 and 10), one of which, the posterior part of an adult neurocranium, also has several cutmarks.

At both sites the fossils were found on living floors, randomly mixed with abundant faunal remains and tools. Macro and microscopic examination, including observation at the SEM, permitted clear identification of traces of flint tools used during the manipulation of the cadavers, peri- or post-mortem. The possible interpretations of these striations are discussed.

KEY WORDS: Combe-Grenal – Marillac – Southwest France – Mousterian – Neanderthal – Cutmarks – Cannibalism – Mortuary practices

INTRODUCTION

Identification of linear striations and fractures on Neanderthal remains has often been interpreted as possible evidence of post-mortem processing of human corpses, related either to cannibalism or to secondary burial. However, it was repeatedly demonstrated that several non-human taphonomic agents might mimic traces of human intervention on bones. Scanning electron microscope (SEM) analysis is necessary in order to distinguish true cutmarks from scratches having a different origin, such as toothmarks or trampling marks.

One of the cases of supposed ritual cannibalism by Paleolithic humans, the Neanderthal skull from Guattari Cave (Italy) was reconsidered in recent years by several scholars (Borgognini-Tarli 1991, White, Toth 1991). No evidence of human intervention was identified on the human remains

and associated faunal bones lying on the paleosurface of the site. Carnivore toothmarks were frequent on animal remains, and they are present even on the human skull; the analysis of the bone assemblage demonstrated close affinities to those identified in hyena dens (Piperno, Giacobini 1991, Stiner 1991). The conclusion was that hyenas and not humans were responsible for the accumulation of faunal and human remains in the upper levels of Guattari Cave, where the Neanderthal skull was found.

Reconsideration by Trinkaus (1985) and Russell (1987a, b) of the purported evidence for cannibalism at the famous site of Krapina (Croatia) suggested that some of the striations present on the Neanderthal remains could indeed be cutmarks. Unfortunately scanning electron microscope inspection on the surface alterations of the Krapina remains is precluded by sellac which was used as hardener and cannot be removed.

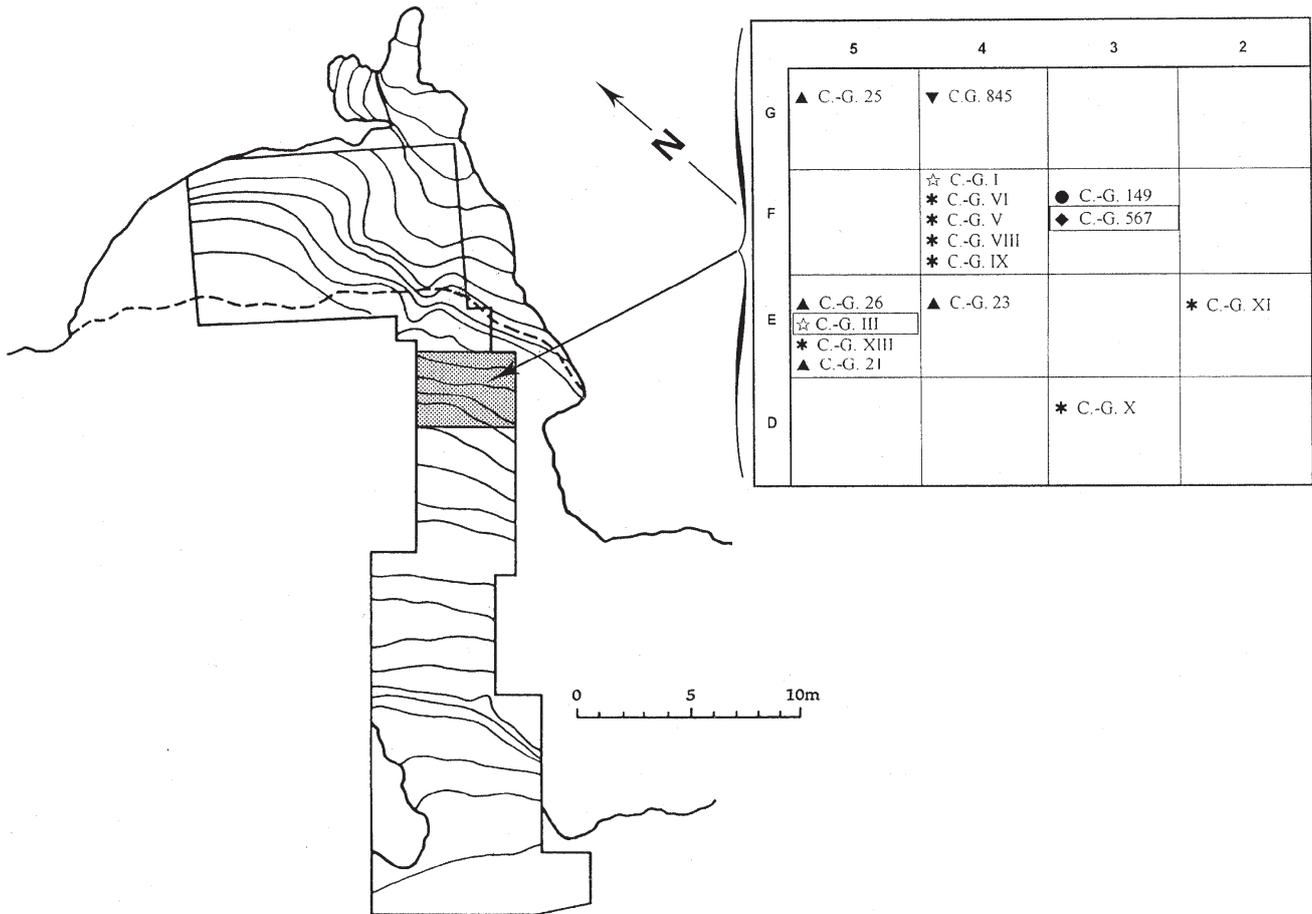


FIGURE 1. Plan of Combe-Grenal Cave (Bordes, 1972). Level 25: Distribution of the human remains (n=16) with square references from F. Bordes documents. ● = cranial fragment, ☆ = mandibular fragment, * = isolated teeth, ◆ = incomplete humerus, ▲ = hand bones, ▼ = left hallux phalanx, □ = fossils with cutmarks.

Evidence of post-mortem processing was also suggested by observation of linear striations on the cranial vault of the Neanderthal juvenile specimen from Engis (Belgium), but SEM analysis showed characteristics typical of marks produced by sandpaper and metal instruments, probably during preparation of a cast at the end of the 19th century (White, Toth 1989).

Other Neanderthal sites, as Vindija (Malez, Ullrich 1982), Zafarraya (Barroso 2003) and, especially, Moula-Guercy (Defleur *et al.* 1993, Defleur *et al.* 1999) have provided important information about these possible human actions, and their results will also be discussed later.

The aim of this paper is to analyse the evidence for manipulations by Neanderthals of parts of the human body immediately following death or at least when tissue still adhered, based on reanalysis of remains from the French sites of Combe-Grenal and Marillac. Hominid fossils from both sites were not treated with sellac or other preservatives, allowing SEM inspection of the bone surface. The presence of linear striations on some of these remains was already stressed and their preliminary interpretation as cutmarks suggested (Vandermeersch 1976a, Genet-Varcin 1982, Le Mort 1987, 1989, Garralda, Vandermeersch 2000a). But we

were interested in a more detailed analysis of those striations in order to show and to discuss diagnostic characteristics of cutmarks. Consequently, observations were carried out on replicas produced with Provil-L silicon rubber (Bayer, Leverkusen, Germany) and RBS polyurethane resin (T2L Chimie, Chalabre, France); a Cambridge Stereoscan 120 SEM was used.

THE CASE FROM COMBE-GRENAL

The Mousterian deposit of the Combe-Grenal rock-shelter (Dordogne) was first excavated by D. and E. Peyrony, although the most important programme of research was done by F. Bordes, between 1953 and 1965 (Bordes 1955, 1972, Bordes, Prat 1965, Bordes *et al.* 1966, 1972).

Several human remains were found in Mousterian levels 25, 35 and 39. Geological and faunal studies, done by Guadelli and Laville (1990), permit the attribution of level 39 to the 5a OIS, while levels 25 and 35 correspond to stage 4. Consequently the Combe-Grenal fossils should be placed chronologically at the beginning of the early Würm (ca 85/75 ky), and most of them (those from layers

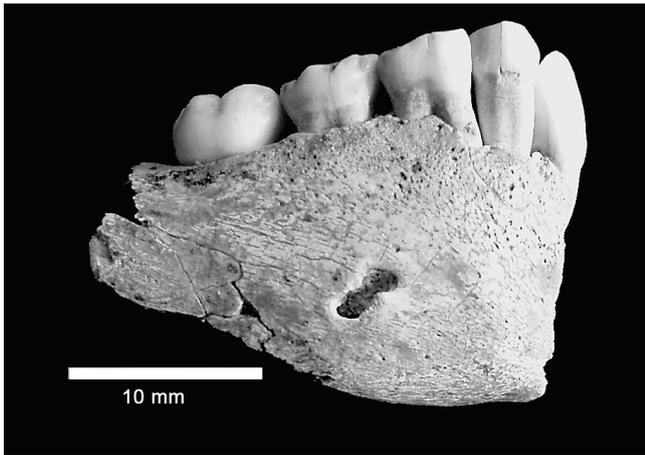


FIGURE 2. The mandibular fragment Combe-Grenal I, external side.

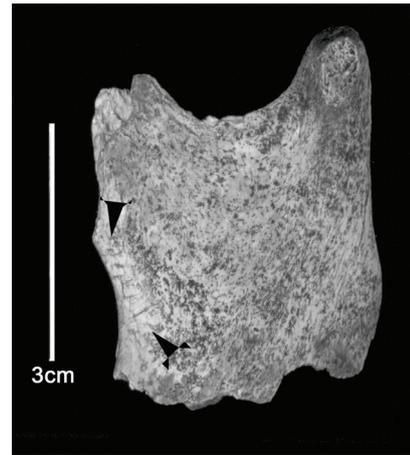


FIGURE 4. Combe-Grenal IV. Mandibular ramus, external side.

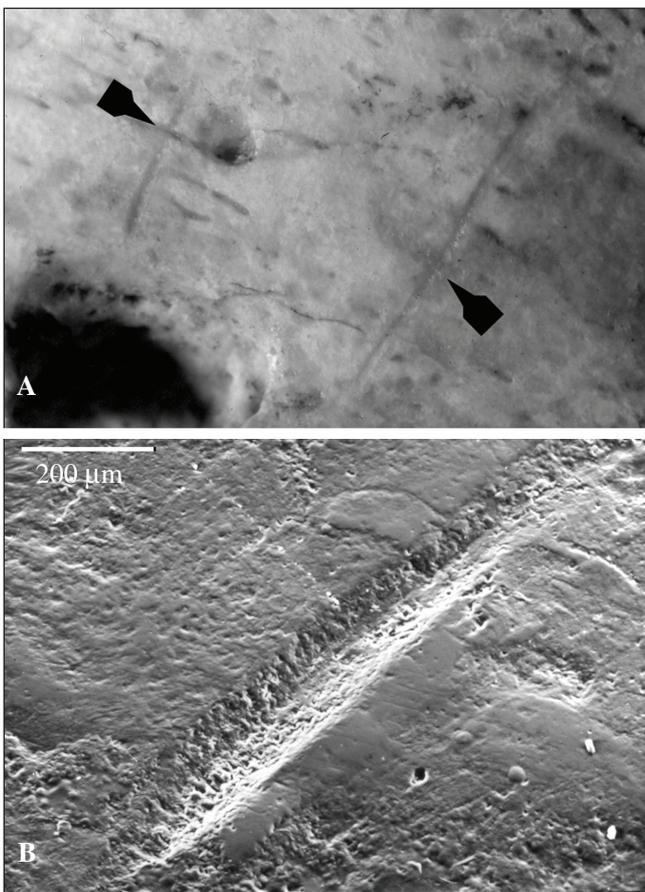


FIGURE 3. Combe-Grenal I. A. Marks close to the mental foramen. B. SEM micrograph of one of the striations.

35 and, especially, 25) are dated as belonging to its coldest period (ca 75/65 ky).

Combe-Grenal anthropological remains, presently preserved at the Musée National de Préhistoire de Les Eyzies (France), were the object of a detailed morpho-anatomical description and analysis by two of the authors (Garralda, Vandermeersch 1997, 2000a, b).

The major part of the remains was found in level 25, where several young and adult males and females (MNI

ca 8) of different ages were identified. Cranial, dental and post-cranial remains represented the fossil hominids, and the only intact bones are those of the hand and foot. Bordes' unpublished data, which two of us had the opportunity to analyse (M. D. G. and B. V.), indicated that most of the individuals were dispersed in several grid squares, very close to one another, located at the centre of the back part of the Cave (Figure 1). There were no traces of deliberate burials. Morphological and anatomical analyses of the Combe-Grenal series have led to their assignment to *Homo sapiens neanderthalensis* (Garralda, Vandermeersch 2000a).

Three of the fossils found in level 25, Combe-Grenal I, Combe-Grenal III-IV, and Combe-Grenal 567 are the object of the present study.

Combe-Grenal I. It is the right mandibular fragment (Figure 2) of a child (ca 7 years old), bearing a set of four oblique subparallel marks on its external surface, close to the mental foramen (Figure 3a).

SEM observation (Figure 3b) showed characteristics that are not consistent with cutmarks, such as the rounded U-shaped cross-section of the grooves and the absence of secondary striae within them. We consider that these scratches should be interpreted as scoring produced by the teeth of a small carnivore.

Combe-Grenal III-IV. This specimen consists of an incomplete mandible assigned to an adolescent (around 15 years) and represented by a small fragment of the left mandibular corpus (Combe-Grenal IV), with two teeth (P4 and M1), and the *ramus mandibularis* (Combe-Grenal III) from the same side (Figure 4), which, having two sets of striations, is the object of research.

On Combe-Grenal III the most important set of marks is located on the external side, near and on the anterior border of the ramus (Figures 5a and 5b). At least fifteen subparallel (1 to 4 mm long) striae are present, separated one from the other by around 1 mm. They are slightly curved, deeply incised and V-shaped, having also different depths. Evident indentations were formed along the walls of some grooves, where bone was removed, and parallel

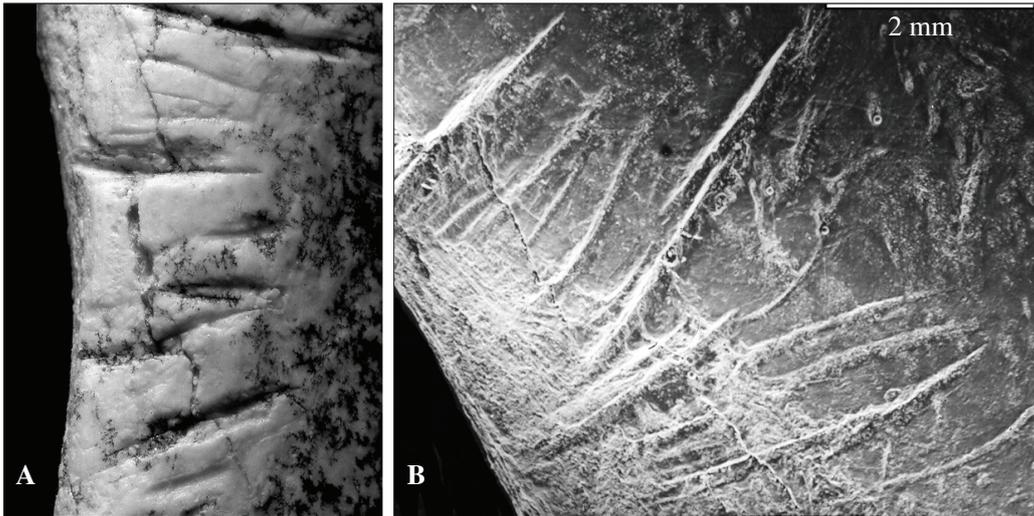


FIGURE 5. Combe-Grenal IV. A. Cutmarks on the anterior border. B. SEM micrographs of the striations.

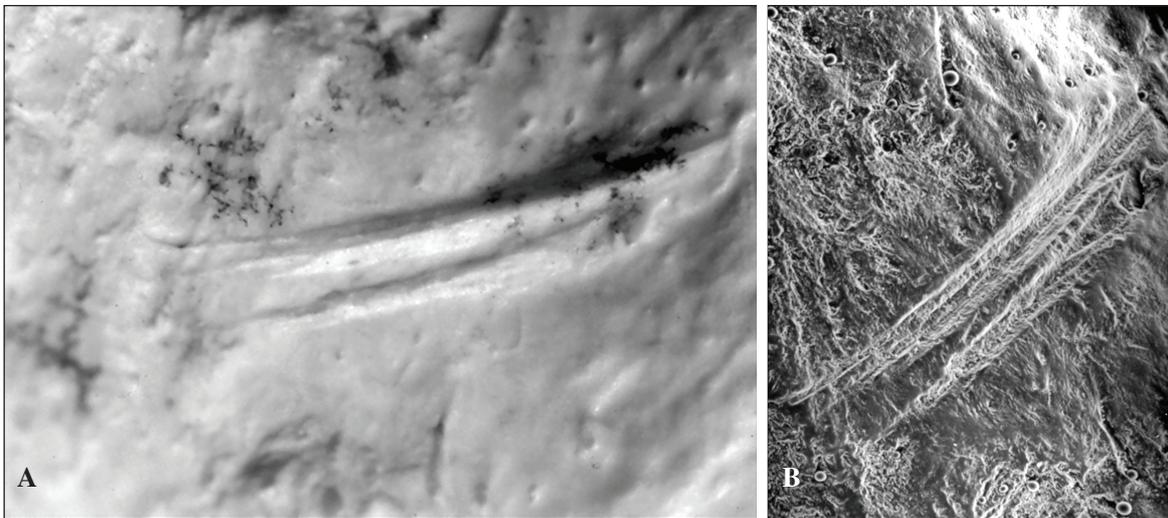


FIGURE 6. Combe-Grenal IV, internal side, condylar neck region. A. Cutmarks, the two main grooves. B. SEM micrographs of the striations.

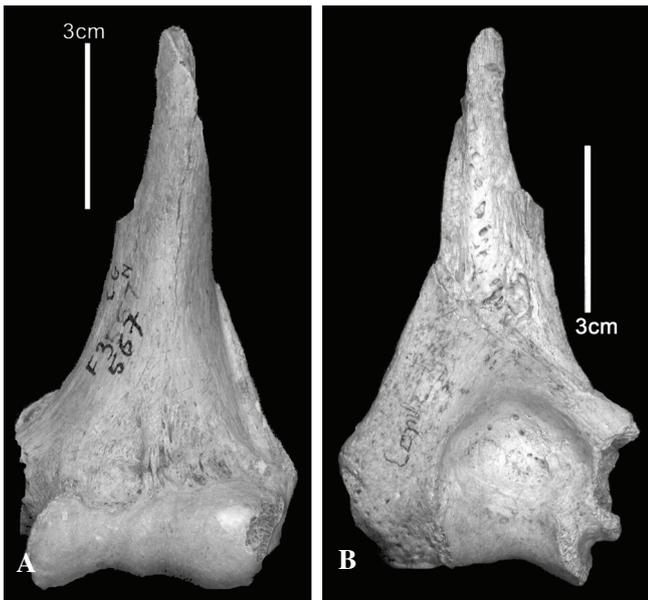


FIGURE 7. Combe-Grenal 567. A. Anterior side. B. Posterior side.

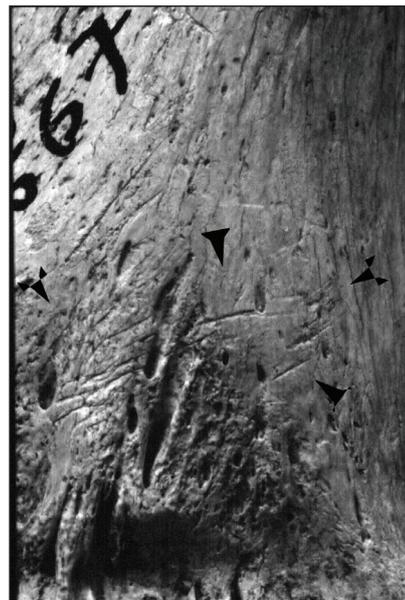


Figure 8. Combe-Grenal 567. Cutmarks on the anterior surface, near the *fossa coronoidea* and the *f. radialis*.

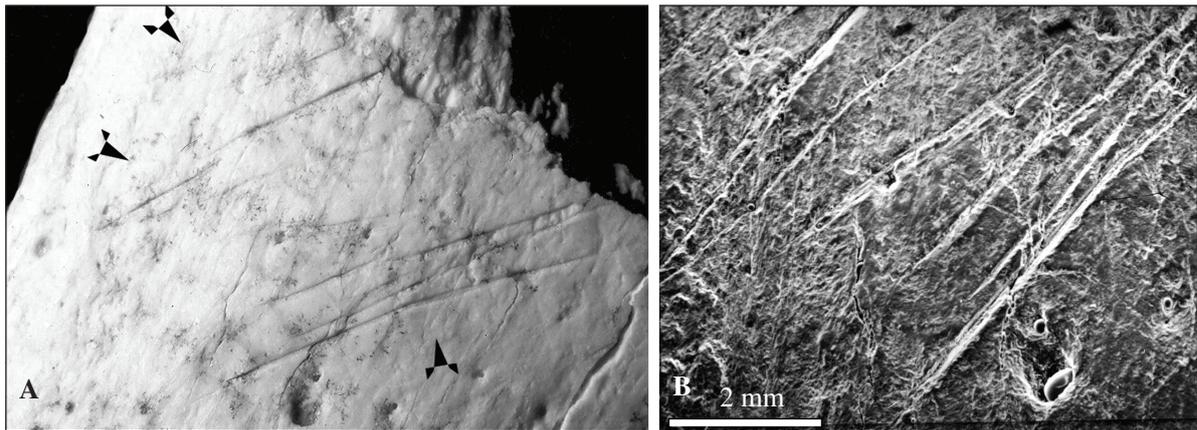


FIGURE 9. Combe-Grenal 567. A. Posterior shaft marks. B. SEM micrographs of the striations.

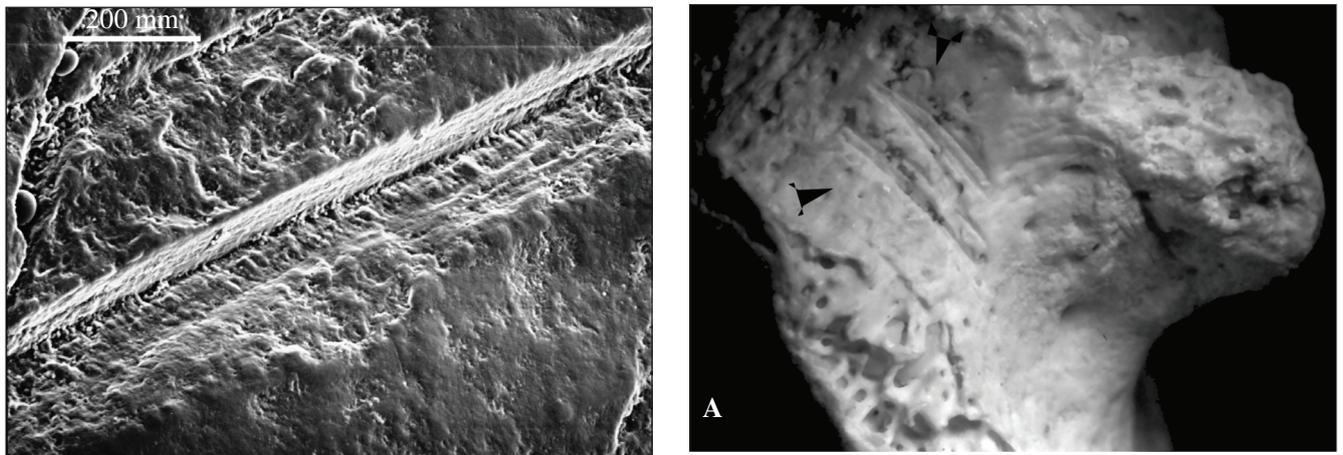


FIGURE 10. Combe-Grenal 567. SEM micrograph of one of the posterior cutmarks.

striations can be observed within the main grooves (Figure 5b). In our opinion these marks can be related to cutting the *m. temporalis*.

On the internal side, near the posterior border, marks are present on the condylar neck, showing two main grooves oblique and slightly curved (Figure 6a). They are deep, V-shaped, approximately 3 mm long. Each of them has a set of fine striations, probably caused by bi-directional motions (Figure 6b). Those cutmarks can be related to the severing of the joint capsule, of the spheno-mandibular ligament and of the tendon of the *m. pterigoideus lateralis*.

Combe-Grenal 567. It consists of the left distal humeral fragment of an adult individual (probably male) with advanced arthrosic lesions specially accentuated on the *capitulum* polished surface (Garralda, Vandermeersch 2000a). This humerus (Figures 7a and 7b) shows a spiral and V-shaped fracture of the diaphysis, similar to those produced on fresh bone, but no evidence of percussion blow is present.

Several marks appear on the ventral shaft and on the distal epiphysis. On the anterior surface different sets of long, oblique and sub-parallel striations (of different lengths: 2 to 8 mm) are present, especially near the *fossa coronoidea* and the *fossa radialis* (Figure 8). They probably

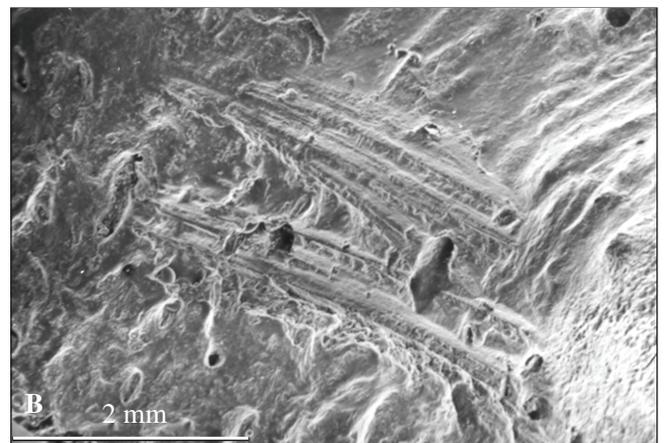


FIGURE 11. Combe-Grenal 567. A. Marks between the trochlea and the medial epicondyle. B. SEM micrographs of the striations.

correspond to cutting of the *m. brachialis* and of the joint capsule.

Another set of similar marks, oblique and sub-parallel (3 to 9 mm long), were also observed on the posterior diaphyseal surface, close to the *olecranon fossa* (Figures 9a and 9b).

They correspond to cutting the *m. triceps brachii* and joint capsule. All these marks are elongated, deep and V-shaped. At the SEM, diagnostic features of cutmarks are evident, such as steep sides with fine parallel striations



FIGURE 12. Marillac H2. *Norma lateralis dextra*.

running along walls, caused by the imperfections of the stone tool edge (Figure 10).

Two other sets of striations are also located on the posterior shaft side, between the trochlea and the medial epicondyle (Figures 11a and 11b), probably corresponding to severing of the ulnar collateral ligament of the elbow joint and of the tendons of forearm muscles. They are short, V-shaped deep marks, where fine parallel striations are also visible within main grooves.

THE CASE FROM MARILLAC

Near the village of Marillac there exists the site of "Les Pradelles", an ancient sinkhole where B. Vandermeersch conducted archaeological excavations from 1964 to 1980. Several human remains were found in the Mousterian deposits, mostly in levels 9 and 10 (Mousterian Quina), assigned to OIS 4. As was the case in Combe-Grenal, the fossils appeared dispersed in several grid squares, very close to one another, randomly mixed with stone tools and faunal remains. The detailed anthropological study is under preparation by two of the authors (M. D. G. and B. V.), but preliminary analysis allows the assignation of these fossils to *H. sapiens neanderthalensis*.

Marillac H2. The fossil consists of the posterior part of an adult cranium, comprising parts of the occipital and of the two parietals (Figure 12). Linear striations are present on the right parietal and on the occipital.

On the parietal, marks are sub-parallel (10 to 30 mm long), deep and V-shaped. SEM observation shows fine parallel striations on the walls of the grooves. Their morphology is consistent with their interpretation as cutmarks, which probably indicate cutting of the *m. temporalis*.

On the occipital, incised striations are organized in six sets located close to the *fossa supratoralis*, on the external

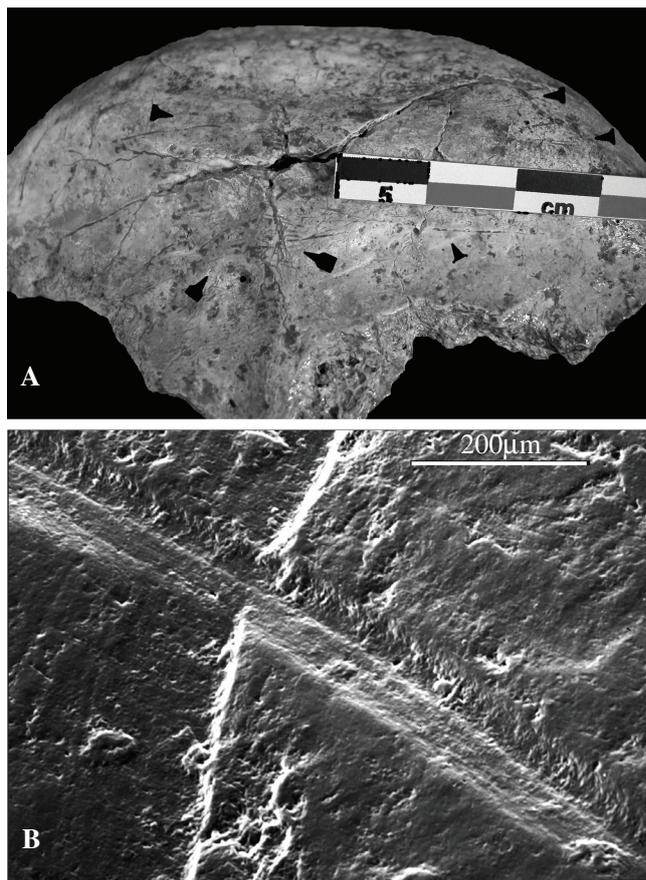


FIGURE 13. Marillac H2. A. Cutmarks on the occipital. B. SEM micrograph of one striation.

occipital crest, and on the occipital *torus transversalis* (Figure 13a). These marks are shorter than those on the parietal (2 to 15 mm long), and microscopic observation of some of them demonstrated typical features of cutmarks. They probably correspond to severing of the nuchal muscles and ligaments (*m. trapezius*, *splenius capitis*, *semiespinalis capitis*, and *suboccipitalis*), as well as the *aponeurosis epicranealis* (Figure 13b). Some of the scratches on the occipital cannot however be interpreted, either because they are covered with concretion, or because of post-depositional deterioration of the groove walls which preclude reliable SEM inspection of their morphology. Moreover, several marks, which can be seen with the naked eye, correspond to deep vascular grooves. Marks by sedimentary abrasion represented by short bands of fine shallow striations can be also observed on the bone surface.

DISCUSSION AND INTERPRETATION

The detailed observations of the striations on the Combe-Grenal IV and 567 and Marillac H2 specimens document, in our opinion, marks caused by direct action, or intervention, of humans. These manipulations seem to have been made on the cadavers; that is, they were produced peri- or post-

mortem, with flint implements. The Mousterian type Quina, present at both sites at the levels where the fossils were found, has several tools or flakes that are suitable for such purposes.

Interpretations of these cutmarks as made on the cadavers, raises numerous difficult questions. For example, *when* people work on the cadaver? According to White (1990), the lack of well defined differential criteria means it is nearly impossible to deduce if such striations were made immediately after death, or at some later time.

It should be kept in mind that the two fossils from Combe-Grenal were found on a living floor, in grid squares near each other, at the centre of the posterior part of the cave. They were intermixed with other human remains (without identified traces of manipulation), stone tools and fauna, meaning that these fragments were not located in a special part of the site.

Furthermore, some faunal remains, especially those from reindeer (*Rangifer tarandus*), also display striae that have been interpreted as butchery marks (Bordes 1972, Bindford 1981, Chase 1986).

Marillac H2 was also found mixed with stone tools and faunal remains as well as some other human fragments; archaeology reveals short occupational periods of the site, which is considered more as a hunting camp than as a living place.

The fossils from Marillac appear to have been slightly altered by taphonomic processes (erosion, type of breakage); those from Combe-Grenal, however, despite their antiquity, have, as previously described, well-preserved external surfaces. But the three considered fossils from Marillac and Combe-Grenal (Marillac H2 partial cranium, the juvenile mandible C-G III-V and the humeral fragment C-G 567) do not show traces of rodent gnawing, carnivore biting, neither of erosion of the bone surface caused by plant roots, or human/animal trampling. The originality of the analysed cutmarks is demonstrated by their coloration and their well-defined walls (and sometimes by thin lime partially covering them). The V-shaped (spiral) form of the broken humeral diaphysis (Combe-Grenal 567) is typical of fresh bone breakage (see Villa, Mahieu 1991), and the patina on the borders documents its antiquity. Most probably, the cold climatic conditions and the particularities of soil formation favoured good preservation of the fossils, especially in Combe-Grenal Cave.

The two fragments of the juvenile mandible, Combe-Grenal III-IV, have spots of manganese oxide on both external and internal surfaces, but none of the three described fossils show evidence of direct or indirect involvement with fire. Burnt human (and animal) bones have been identified at Zafarraya (Barroso 2003) and at Krapina, but problems involved in the archaeological interpretation of the evidence from the former site have not been resolved. The taphonomy of the beautiful Krapina series has been discussed by a number of authors (e.g. Ullrich 1978, Trinkaus 1985, Russell 1987a), and it seems that the most plausible explanation for the few charred

human fragments may be their proximity to the hearths, and not deliberate burning.

On the basis of such fragmentary data, it is extremely difficult to reconstruct any ethological patterns affecting the two human groups living at the sites of Combe-Grenal and Marillac, regarding these kinds of manipulations. It is unknown if these processes were limited to certain individuals (on the basis of age or sex?) and if there were specific social rules observed by certain groups. Further, it is impossible to estimate either the possible relationship between the cadavers and their manipulators.

A number of different interpretations have been considered when analysing similar activities at other sites. One of the most frequent interpretations is the practice of cannibalism, habitual, occasional (gastronomic?) or ritual (Defleur *et al.* 1993, 1999). If this was indeed the case at Marillac and Combe-Grenal, the abundance of faunal remains in the levels from which the three individuals come from seems to indicate that such practices may reasonably be attributed to "social/ritual purposes" and not to periods of starvation. It should be noted that paleoisotopic analysis of two of the Marillac individuals (Bocherens *et al.* 1991) suggest that the Neanderthals' diet consisted of great quantities of meat; this has been confirmed by results obtained from several other European fossil specimens (Bocherens *et al.* 2005).

Other interpretations have focussed on specific processing of the cadavers, or possible funerary rituals twice performed, implying the defleshment and dismemberment of the bodies (Russell 1987b, Le Mort 1989). The excellent state of preservation of teeth and external bony surfaces at both sites, especially at Combe-Grenal, could suggest that the cadavers may have been buried shortly after death by natural causes (cave-in, collapses documented for the two caves), or perhaps intentionally. In the second possibility, the burial may have taken place after a partial or total dismemberment of the cadavers, documented by the cutmarks described earlier. These eventual tombs may later have been destroyed, by Neanderthals or by animals, causing the dispersal of the human remains; the identified traces of a small carnivore teeth on the child's mandible (Combe-Grenal I) documents a possible interaction of this kind. Nevertheless, although this interpretation seems very attractive, the reality is that we lack solid evidence to demonstrate this hypothesis. Furthermore, Neanderthal burials from Western Europe are primary sepultures, as for example those from La Chapelle aux Saints or La Ferrassie, where skeletons are almost complete and the bones in anatomical connection (Vandermeersch 1976b).

However, another possible interpretation exists: that the cutmarks observed in the two Combe-Grenal and the Marillac individuals could have been the result of some manipulations on the three isolated fragments without any precise intentionality, or perhaps from unknown reasons. Of course, this is the least attractive interpretation and it has been usually ignored in published discussions on this topic.

CONCLUSIONS

Many human societies have behaviours which emphasize "special relationships" with different groups of living individuals or with cadavers. Some of these involve different kinds of cannibalism, ranging from the hunting of living individuals (from groups usually considered "enemies") to the sacrifice of persons from the same society, or the eating of the cadavers of people who died from natural causes. Very often, the identification of the necessary "manipulations" on the living individuals and on the cadavers is well documented by archaeological, anthropological and historical testimonies. Numerous studies, for instance those of White (1990) and Turner (1993) on the Anasazi, DeGusta (1999) on pre-colonial Fiji, and of Turner and Turner (1999) or Botella *et al.* (2000) on several populations, demonstrate the presence of cutmarks for body dismemberment, of percussion impact scars, or bone alterations caused by cooking processes. But the last authors also describe the complex rituals of the killing and careful flaying of victims as part of some ceremonies in Pre-Spanish Mexico; their skins were used "as a mask" by priests or warriors until putrefaction. Botella *et al.* (2000) also document "cutmarks" on Mexican skulls resulting from such ceremonies, but that did not appear on the post-cranial skeleton, and are completely similar to the traces caused by cannibalism, etc.

Furthermore, funerary rituals, or burial customs, are very varied throughout time and space, and different societies have manipulated the cadavers in order to deflesh and disarticulate them, sometimes later reconstructing the bodies (as in the case of the Chinchorro mummies from Chile), or totally or partially burying the skeletons of sacrificed people, as was demonstrated by Jelínek (1993) and Dočkalová (2001) for the Moravian Bronze Age. These actions very often involved hard manipulations and bone modifications, but their intentionality was very different from those described in the previous paragraph.

So, if only two possibilities are considered, cannibalism and funerary customs, the first seems to be demonstrated for the Abri Moula by Defleur *et al.* (1999), where a human femoral diaphysis fragment can be refitted and shows a percussion impact scar. But many other sites do not reflect marrow processing, and this is the case for the largest collection of Neanderthals, Krapina, or for the Combe-Grenal and Marillac individuals. At the latter sites, definite cutmarks have been found on two cranial fragments (one *ramus mandibulae* and one occipital), as well as on one humerus, whose V fracture demonstrates that it was broken probably at "fresh", but without percussion impact traces. Could the similar spatial distribution of the human and animal remains at both sites be directly interpreted as the reflection of some kind of cannibalism involving, at least, some individuals, or can we conclude that the "causality" of the identified cutmarks has not as yet been explained? The available evidence for the Middle Paleolithic is often not conclusive, so it should be considered with objectivity and prudence.

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REFERENCES

- BARROSO C. (Ed.) 2003: *El Pleistoceno superior de la Cueva del Boquete de Zafarraya*. Monografía de Arqueología, Junta de Andalucía. 520 pp.
- BINDFORD L. R., 1981: *Bones. Ancient Men and Modern Myths*. Academic Press, New York. 336 pp.
- BOCHERENS H., FIZET M., MARIOTTI A., LANGE-BADRE B., VANDERMEERSCH B., BOREL J.-P., BELLON G., 1991: Isotopic biogeochemistry (13C, 15N) of fossil vertebrate collagen: implications for the study of fossil food web including Neandertal Man. *J. of Hum. Evol.* 20: 481–492.
- BOCHERENS H., DRUCKER D. G., BILLIOU D., PATOU-MATHIS M., VANDERMEERSCH B., 2005: Isotopic evidence for diet and subsistence pattern of the Saint-Césaire I Neandertal: review and use of a multi-source mixing model. *J. of Hum. Evol.* 49, 1: 71–87.
- BORDES F., 1955: La stratigraphie de la Grotte de Combe-Grenal (Dordogne). Note préliminaire. *Bull de la Soc. Préhistorique Française* 52 : 426–429.
- BORDES F., 1972: *A Tale of Two Caves*. Harper and Row, New York. 169 pp.
- BORDES F., PRAT F., 1965: Observations sur les faunes du Riss et du Würm en Dordogne. *L'Anthropologie* 69: 31–46.
- BORDES F., LAVILLE H., PAQUEREAU M. M. 1966: Observations sur le Pléistocène supérieur du gisement de Combe-Grenal (Dordogne). *Actes de la Soc. Linnéenne de Bordeaux (série B)*: 3–19.
- BORDES F., LAVILLE H., DE LUMLEY H., MISKOWSKY J. C., PAQUEREAU M. M., PILLARD B., PRAT F., RENAULT-MISKOWSKY J., 1972: Le Würmien II. Tentative de corrélations entre le Languedoc méditerranéen (l'Hortus) et le Périgord (Combe-Grenal). *Etudes Quaternaires* 1: 353–336.
- BORGOGNINI-TARLI S., 1991: The hollowed-out skull base of the calvarium Circeo I. Review and discussion of an intriguing finding. In: M. Piperno, G. Scichilone (Eds.): *Il cranio neandertaliano Circeo I. Studi e documenti*. Pp. 423–455. Libreria dello Stato, Roma.
- BOTELLA M. C., ALEMÁN I., JIMÉNEZ S., 2000: *Los huesos humanos. Manipulación y alteraciones*. Ed. Bellaterra, Barcelona. 229 pp.

- CHASE P. G., 1986: *The Hunters of Combe-Grenal. Approaches to Middle Palaeolithic Subsistence in Europe*. BAR International Series 286. 224 pp.
- DEFLEUR A., DUTOUR O., VALLADAS H., VANDERMEERSCH B., 1993: Découverte de restes humains moustériens dans l'Abri Moula (Soyons, Ardèche). *C. R. Acad. Sci. Paris* 316, série II: 1005–1010.
- DEFLEUR A., WHITE T., VALENSKI P., SLIMAK L., CREGUT-BONNOURE E., 1999: Neanderthal cannibalism at Moula-Guercy, Ardèche, France. *Science* 286: 128–131.
- DEGUSTA D., 1999: Fijian cannibalism: Osteological evidence from Navatu. *Amer. J. of Phys. Anthrop.* 110, 2: 215–241.
- DOČKALOVÁ, M., 2001: Ritual or ordinary burial rites in the Bronze Age? *Anthropologie* XXXIX, 2–3: 153–172.
- GARRALDA M. D., VANDERMEERSCH B., 1997: Los Neandertales de Combe-Grenal (Dordogne, Francia). Aspectos de su biología y cultura. In: C. J. Cela, R. Gutiérrez, J. Martínez (Eds.): *Senderos de la evolución humana. Estudios en homenaje a P. V. Tobias*: 129–144. Ludus Vitalis, nº1, México.
- GARRALDA M. D., VANDERMEERSCH B., 2000a: Les Néandertaliens de la Grotte de Combe-Grenal (Domme, France). *PALEO*, Musée National de Préhistoire (Les Eyzies, France) 12: 213–259.
- GARRALDA M. D., VANDERMEERSCH B., 2000b: Los Neandertales de Combe-Grenal (Domme, Francia). Aspectos bio-culturales de su dentición. In: T. A. Varela (Ed.): *Investigaciones en biodiversidad humana*. Universidades de Santiago de Compostela: 231–237.
- GENET-VARCIN E., 1982: Vestiges humains du Würmien inférieur de Combe-Grenal, commune de Domme (Dordogne). *Annales de Paléontologie* 68, 2: 133–169.
- GUADELLI J. L., LAVILLE H., 1990: L'environnement climatique de la fin du Moustérien à Combe-Grenal et à Camiac. Confrontation des données naturalistes et implications. In: C. Farizy (Ed.): *Paléolithique moyen récent et Paléolithique supérieur ancien en Europe*. Mém. du Musée de Préhistoire d'Ile de France: 43–48.
- JELÍNEK J., 1993: Dismembering, fileting and evisceration of human bodies in a Bronze Age site in Moravia, Czech Republic. *Anthropologie* XXXI, 3: 99–114.
- LE MORT F., 1987: Incisions volontaires sur un arrière-crâne de Néandertalien de Marillac (Charente). *Préhistoire de Poitou-Charentes. Problèmes actuels*. Ed. du C.T.H.S.: 151–156.
- LE MORT F., 1989: Traces de décharnement sur les ossements néandertaliens de Combe-Grenal (Dordogne). *Bull. de la Soc. Préhistorique Française* 86, 3: 79–87.
- MALEZ M., ULLRICH H. 1982: Neure paläanthropologische Untersuchungen am material aus der Höhle Vindija (Kroatien, Jugoslawien). *Palaeontologia Jugoslavica*, 29: 1–44.
- PIPERNO M., GIACOBINI G., 1991: A taphonomic study of the paleosurface of Guattari Cave (Monte Circeo, Latina, Italy). *Quaternaria Nova* 1: 143–161.
- RUSSELL, M. D., 1987a: Bone breakage in the Krapina hominid collection. *Amer. J. of Phys. Anthrop.* 72, 23: 373–380.
- RUSSELL M. D., 1987b: Mortuary practices at the Krapina Neanderthal site. *Amer. J. of Phys. Anthrop.* 72, 23: 381–397.
- STINER M. C., 1991: The faunal remains from Grotta Guattari: a taphonomic perspective. *Curr. Anthrop.* 32: 103–117.
- TRINKAUS E., 1985: Cannibalism and burial at Krapina. *J. of Hum. Evol.* 14: 203–216.
- TURNER II C. G., 1993: Cannibalism in Chaco Canyon: The charnel pit excavated in 1926 at Small House Ruin by F. H. H. Roberts, Jr. *Amer. J. of Phys. Anthrop.* 91: 421–439.
- TURNER II C. G., TURNER J. A., 1999: *Man Corn: Cannibalism and Violence in the Prehistoric American Southwest*. University of Utah Press, Salt Lake City. 550 pp.
- ULLRICH H., 1978: Kannibalismus und Leichenzerstückelung beim Neandertaler von Krapina. In: M. Malez (Ed.): *Krapinski Pračovjek I Evolucija Hominida*. Pp. 293–318. Jugoslavenska Akademija Znanosti i Umjetnosti, Zagreb.
- VANDERMEERSCH B., 1976a: Les Néandertaliens en Charente. *La Préhistoire Française. L'Homme et ses activités* 2. Ed. du CNRS, Paris: 584–587.
- VANDERMEERSCH B., 1976b: Les sépultures néandertaliennes. *La Préhistoire Française. L'Homme et ses activités* 1. Ed. du CNRS, Paris: 725–728.
- VILLA P., MAHIEU E., 1991: Breakage patterns of human long bones. *J. of Hum. Evol.* 21: 27–48.
- WHITE T. D., TOTH N., 1989: Engis: preparation damage, not ancient cutmarks. *Amer. J. of Phys. Anthrop.* 78: 361–367.
- WHITE T. D., 1990: *Prehistoric Cannibalism at Mancos 5MTUMR-2346*. Princeton, NJ: Princeton Univ. Press. 458 pp.
- WHITE T. D., TOTH N., 1991: The question of ritual cannibalism at Grotta Guattari. *Curr. Anthrop.* 32: 118–138.

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