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Rabbits in the grave! Consequences of bioturbation on the Neandertal "burial" at Regourdou (Montignac-sur-Vézère, Dordogne)

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ABSTRACT

The understanding of Neanderthal societies, both with regard to their funerary behaviors and their subsistence activities, is hotly debated. Old excavations and a lack of taphonomic context are often factors that limit our ability to address these questions. To better appreciate the exact nature of what is potentially the oldest burial in Western Europe, Regourdou (Montignac-sur-Vézère, Dordogne), and to better understand the taphonomy of this site excavated more than 50 years ago, we report in this contribution a study of the most abundant animals throughout its stratigraphy: the European rabbit (*Oryctolagus cuniculus*). In addition to questions surrounding the potential bioturbation of the site's stratigraphy, analysis of the Regourdou rabbits could provide new information on Neandertal subsistence behavior. The mortality profile, skeletal-part representation, breakage patterns, surface modification, and comparison with modern reference collections supports the hypothesis that the Regourdou rabbit remains were primarily accumulated due to natural (attritional) mortality. Radiocarbon dates performed directly on the rabbit remains give ages ranging within the second half of Marine Isotope Stage 3, notably younger than the regional Mousterian period. We posit that rabbits dug their burrows within Regourdou's sedimentological filling, likely inhabiting the site after it was filled. The impact of rabbit activity now brings into question both the reliability of the archaeostratigraphy of the site and the paleoenvironmental reconstructions previously proposed for it, and suggests rabbits may have played a role in the distribution of the Neandertal skeletal remains.

1. Introduction

The reconstruction of prehistoric human societies' behavior toward their dead has for a long time attracted the attention of paleoanthropologists and prehistorians (e.g., de Nadaillacde, 1886; Bouyssonie et al., 1908; Breuil, 1921, 1951; Peyrony, 1921; Bouyssonie, 1954; Arensburg et al., 1985; Defleur, 1993; Vandermeersch, 2006; Maureille and Vandermeersch, 2007; Pettitt, 2011; Maureille et al., 2016a). In particular, the question of whether Neandertals intentionally buried their dead has attracted great attention and is an issue still hotly debated today (Sandgathe et al., 2011; Rendu et al., 2014, 2016; Dibble et al., 2015). This ongoing debate is so heated most likely because this funeral gesture is thought to represent one of the most complex human symbolic behaviors, and as such many find it difficult to believe it was practiced by non-anatomically modern hominins.

In several sites across the paleospecies' range, the discovery of nearly complete Neandertal skeletons has been interpreted as evidence of intentional primary burials (e.g., Vandermeersch, 1995; Maureille and Tillier, 2008; Pettitt, 2011). Such cases are considered by some to reveal a funerary behavior shared between Neandertals and modern humans that appeared near the end of the Middle Paleolithic (ca. 100 kyr for anatomically modern humans

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and not before 65 kyr for Neandertals; Valladas et al., 1987; Schwarcz et al., 1988; Mercier et al., 1993; Skinner et al., 2005; Guérin et al., 2015). However, many of these discoveries were made before archaeologists and paleoanthropologists fully appreciated taphonomic processes, and the "exceptional" nature of these discoveries tends to lend itself to lower levels of caution. As a consequence, several scholars have argued that the evidence for Neandertal burials is scarce if not non-existent, as it notably relies on old and inadequate observations from antiquated excavations (Gargett, 1999; Sandgathe et al., 2011; Goldberg et al., 2013; Dibble et al., 2015). In an attempt to confirm whether some Neandertals intentionally interred their dead, and to clarify the taphonomic contexts in which the skeletons in question were found, several archaeological sites discovered in the early twentieth century have recently been re-excavated using modern analytical techniques (e.g., Le Roc-de-Marsal: Sandgathe et al., 2011; La Chapelle-aux-Saints: Rendu et al., 2014; Le Moustier: Gravina and Discamps, 2015; La Ferrassie: Turq et al., 2016).

Among those sites with a supposed (albeit much debated) "burial" is Regourdou Cave, having in 1957 yielded the partial skeleton of a young Neandertal individual (Regourdou 1) as well as Mousterian lithics (Piveteau, 1959, 1963, 1966; Bonifay, 1964, 1965; Bonifay et al., 2007). Many authors recognize Regourdou 1 as an intentional burial (Bonifay and Vandermeersch, 1962; Bonifay, 1964; Otte, 1993; Maureille and Vandermeersch, 2007; Bonifay et al., 2007; Pettitt, 2011), one which could, in fact, be the oldest Mousterian funerary deposit in Europe (Bonifay, 1964; Bonifay et al., 2007; Maureille et al., 2016b). Due to its complex excavation history, the issue of these human bones' origin in this deposit is still relevant. Furthermore, the stratigraphic integrity of the hominin-bearing layer (layer 4) has recently been questioned (Madelaine et al., 2008; Cavanhié, 2009–2010), and debate regarding the original position of the Regourdou 1 corpse has recently been revived (Maureille et al., 2015, 2016b).

As is generally known, multiple kinds of (often complex) post-depositional processes can greatly impact a site's stratigraphy (e.g., Wood and Johnson, 1978; Texier, 2000) and, therefore, scientific interpretations as well. In order to more fully appreciate the exact nature of the potential Regourdou burial, we need a more accurate understanding of the taphonomy of the site, especially considering that the excavations at Regourdou were done over 50 years ago under less than ideal circumstances (cf. *Research history of Regourdou*). Importantly for the question at hand, the burrowing mammal *Oryctolagus cuniculus* (European rabbit) is one of the most abundant animals throughout the stratigraphy at Regourdou (Pelletier et al., 2015a). Such abundance is frequently found in archaeological and paleontological sites, and this leporid may, in certain cases, even dominate faunal spectra in deposits (Bournery et al., 2004; Jones, 2006; Sanchis Serra and Fernández Peris, 2008; Rosell et al., 2010; Lloveras et al., 2011; Rillardon, 2011; Brugal et al., 2012; Cochard et al., 2012; Rodríguez-Hidalgo et al., 2013; Lloveras et al., 2016). Determining the nature of their accumulation is often problematic. Usually, the presence of burrowing animal bones in archaeological or paleontological assemblages poses questions regarding their role in site formation processes and post-depositional disturbances, including the contemporaneousness of these remains with other assemblage components. Indeed, digging by rabbits can strongly rework a site's stratigraphy, moving archaeological artifacts and skewing the spatial data, thus bringing into question the integrity of the archaeostratigraphy and the reliability of the studied material (Bocek, 1986; Balek, 2002; Mallye, 2007, 2011). Assessing if rabbits might have affected/altered the stratigraphy and spatial organization of any human remains thus seems essential prior to discussing the origin of the Neandertal skeleton at Regourdou.

Apart from an intrusive presence referred to as "attritional mortality" (i.e., infant mortality, senility), the origin of rabbit remains in a site could also be due to accidental mortality, such as falling into natural pitfall traps (Cochard, 2004a; Pelletier et al., 2015a). Additionally, the small body size of rabbits makes them ideal prey for over 40 predators (Delibes and Hiraldo, 1981), including small- to medium-sized terrestrial carnivores, birds of prey, and humans (Pillard, 1972; Desclaux, 1992; Fernández-Jalvo and Andrews, 2000; El Guennouni, 2001; Cochard, 2004a, 2007; Sanchis Serra and Fernández Peris, 2008; Lloveras et al., 2010, 2011; Rosado-Méndez et al., 2015; Arriaza et al., 2017). While multiple scholars argue for the systematic hunting and/or trapping and consumption of rabbits by anatomically modern humans (Stiner, 1994; Villaverde et al., 1996; Stiner et al., 1999, 2000; Aura-Tortosa et al., 2002; Hockett and Haws, 2002; Cochard and Brugal, 2004; Pérez Ripoll, 2004; Lloveras et al., 2011; Fa et al., 2013), the regular consumption of rabbits by Neandertals is also posited by some researchers (Gerber, 1973; Defleur et al., 1994; Huguet, 2007; Sanchis Serra and Fernández Peris, 2008; Blasco and Fernández Peris, 2012; Cochard et al., 2012). Nonetheless, this concept is criticized by other scholars who argue that Neandertals had an inferior cognitive capacity and therefore lacked the modern human adaptation for regularly hunting small game (Fa et al., 2013). Understanding the agent(s) that accumulated the rabbits in Regourdou is thus essential, either to investigate the potential bioturbation of the Neandertal skeleton or to provide key information on Neandertal behavior.

The present work develops an approach combining taphonomic analyses and direct AMS radiocarbon dates taken directly on rabbit bones from different layers of the Regourdou site. The goals are to evaluate: 1) the exact role played by Neandertals in the rabbit accumulation at Regourdou and, 2) if the rabbits' origin is natural, to discuss the impact of this burrowing species on the Regourdou deposits in order to provide key contextual information essential for interpreting the nature of the deposition of the Neandertal skeleton.

2. Material and methods

2.1. Research history of Regourdou

The site of Regourdou is located in the municipality of Montignac-sur-Vézère (Dordogne, France; Fig. 1), on the east bank of the Vézère river, on top of the hill near Lascaux Cave. It is a karst cavity opening in Santonian (Late Cretaceous) limestone, with a rock ceiling (which was present throughout the Palaeolithic) that collapsed onto the underlying sedimentary fill, likely in the terminal Pleistocene. In 1954, the owner of the property (Roger Constant) initiated underground work near the entrance of his house, digging into a rock-fall and sediments obstructing a part of the karstic collapsed cave. It was during the course of this activity that Mousterian lithics and Upper Pleistocene faunal remains were first discovered. During the night of September 22–23, 1957, under destructive and unscientific circumstances, Neandertal human remains (Regourdou 1) were found (Piveteau, 1959; Bonifay, 1964). On October 4–5, 1957, despite very dangerous and difficult conditions, a salvage operation to remove the skeleton was conducted by E. Bonifay and G. Laplace-Jauretche, under the administrative authority of F. Bordes. Subsequent scientific excavations at Regourdou were assigned to Bonifay in 1961, who led them through 1964. During the excavations from 1961 to 1964, archaeological remains (i.e., mainly Mousterian lithic artifacts and macrofaunal bones) and a few additional Regourdou 1 remains were plotted and recorded following the lithological layers defined by Bonifay (1964). At this point, it is difficult to precisely estimate the impact of recovery