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Focus Article

# Substantial biases affecting Combe-Grenal faunal record cast doubts on previous models of Neanderthal subsistence and environmental context

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ABSTRACT:

This short contribution presents faunal data from new fieldwork at the Middle Palaeolithic site of Combe-Grenal (Dordogne, France). This important sequence continues to serve as both a reference sequence to which other Western European Middle Palaeolithic sites are often compared and the basis of several models of Neanderthal subsistence and environmental context. However, several researchers have highlighted the likelihood that skeletal part profiles were biased as a consequence of the incomplete recovery methods used during previous excavations at Combe-Grenal. A comparison of faunal remains recovered during new excavations with data from the original collections allows recovery bias induced by previous excavation protocols to be quantified. The unreliability of the original skeletal part profiles is confirmed by our study, while, more importantly and unexpectedly, radical biases in species frequencies were equally identified. These results cast doubts on several interpretive models held to account for variability in Mousterian industries, the evolution of Neanderthal hunting strategies, as well as Pleistocene environmental changes. Furthermore, Combe-Grenal provides an instructive example to archaeologists working on sites with less than ideal recovery methods of faunal material. In such cases, recovery biases may be so substantial than even basic faunal data, such as species lists, prove unreliable.


## 1. Introduction

Over the past five decades, research on Neanderthals has increasingly incorporated analyses of subsistence and foraging behaviour, as these facets represent key elements for interpreting cultural changes and human adaptation to Pleistocene environments. From the onset, the site of Combe-Grenal has figured prominently in these discussions, as it is one of the most important Middle Palaeolithic sequences in Western Europe. Located in the Périgord region of southwestern France, Combe-Grenal's iconic status is due to its unusually long stratigraphy spanning MIS 6 to 3 (65 Middle Palaeolithic layers over a depth of over 13 m) and for its unequalled documentation of the region's rich Mousterian record. Material recovered from Combe-Grenal during excavations by F. Bordes from 1953 to 1965 includes 29 Neanderthal skeletal remains, some bearing cut-marks (Genet-Varcin, 1982; Le Mort, 1988; Garralda and Vandermeersch, 2000; Garralda et al., 2005; Maureille et al., 2009–2010; Gómez-Olivencia et al., 2013), a diverse set of lithic industries that contributed to the original definition of Bordes' Mousterian facies (more than 144,000 lithic artefacts, see Faivre et al., 2014 for a recent review), pigments, incised raptor claws potentially used as ornaments (Morin and Laroulandie, 2012), as well as diverse faunal assemblages representing an exceptional record of the local Pleistocene faunal communities, including more than 12,000 identified specimens of macro-fauna pertaining to 27 different species and representing more than 550 individuals (Laquay, 1981; Guadelli, 1987, 2012).

Given the importance of this sequence, studies of the Combe-Grenal faunal material are numerous (e.g. Bordes and Prat, 1965; Chaline, 1972; Levine, 1979; Laquay, 1981; Binford, 1981, 1984, 1985, 2007; Chase, 1986a, 1986b, 1989, 2001; Guadelli, 1987, 1990, 1996, 2012; Vincent, 1993; Delpech and Prat, 1995; Villa and d'Errico, 2001; Steele, 2004; Fernandez et al., 2006; Sevilla and Chaline, 2011; Morin and Laroulandie, 2012). The relative frequencies of skeletal elements at the site were among the first employed to discuss patterns of Neanderthal carcass utilization

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(Binford, 1981, 1984; Chase, 1986a; Mellars, 1996). Most notably, the abundance of head remains at Combe-Grenal and in other Middle Palaeolithic faunal assemblages was interpreted as evidence for scavenging (Binford, 1981, 1984, 1985, 1991; Stiner, 1994; Mellars, 1996), touching off an intense debate over Neanderthal hunting abilities during the 1980s and 1990s (see Ready, 2010 for a recent review). Furthermore, Combe-Grenal faunal associations have figured prominently in many large-scale syntheses of Neanderthal foraging behaviour and environmental changes in southwestern France and Western Europe (e.g. Delpech et al., 1983; Delpech, 1996; Mellars, 1996; Potts, 1998; Stewart et al., 2003; Gaudzinski, 2006; Grayson and Delpech, 2006; Binford, 2007; Delagnes and Rendu, 2011; Discamps et al., 2011; Gaudzinski-Windheuser and Kindler, 2012; Morin et al., 2014; Discamps and Royer, 2017; Sorensen, in press). In many respects, the Combe-Grenal record continues to serve as a reference sequence to which other Western European Middle Palaeolithic sites are often compared.

Notwithstanding its key importance, many researchers have highlighted that the recovery methods employed during Bordes' excavations at Combe-Grenal may have introduced important biases (Binford, 1981; Chase, 1986a; Marean, 1998; Marean and Kim, 1998; Dibble et al., 2009; Guadelli, 2012; Faivre et al., 2014). Both the extent of these recovery biases and their impact on skeletal part profiles and taxonomic composition, are, however, difficult to evaluate or test given the lack of detailed information concerning Bordes' recovery protocol. Although the impact of incomplete recovery methods on skeletal representation has been described in previous papers (Turner, 1989; Marean, 1998; Marean and Kim, 1998; Mussi, 1999), these analyses are generally limited to qualitative evaluations and do not consider potential biases for taxonomic composition. Data collected during new excavations at Combe-Grenal (resumed in 2014, dir. J.-Ph. Faivre) provide an opportunity to examine this problem. Our new excavations include the piece plotting of all elements greater than 20 mm and systematic wet-sieving of sediments (4 mm and 1.6 mm meshes), ensuring a near-complete recovery of macro-faunal elements. Here we report faunal data for this new material and compare the results with previous analyses based on Bordes' collections.

## 2. Recovery biases at Combe-Grenal

Detailed examination of Bordes' field notes and sedimentological descriptions by H. Laville (1973), as well as a photogrammetric analysis of archival documents (Discamps et al., 2016) allowed us to reliably correlate one of our stratigraphic units, "upper N2", with Bordes' layers 11 or 12, the former being most likely. Recent revision of the lithic assemblages from these layers identified a Denticulate Mousterian dominated by Discoid debitage but with a minor Levallois component (Thiébaut, 2005; Faivre, 2008; Faivre et al., 2014). Newly excavated lithic material indicates similar techno-typological composition, further corroborating the correlation of upper N2 with Bordes' layers 11 and/or 12.

To assess potential differences in terms of skeletal representation, we compared frequencies of reindeer skeletal elements (Fig. 1) from the new excavations with Bordes' collections as reported by Chase (1986a) for layers 11–13. While Bordes' material is overwhelmingly dominated by teeth (82% of the reindeer remains), these elements are poorly represented in the newly excavated assemblage (2%). Consistent with photographs (Fig. 2) and discussions with people who excavated with Bordes, post-cranial remains are far more abundant in the new excavations (98% versus 18%), particularly long bone shaft fragments. Although Chase (1986a) viewed recovery biases as mostly limited to the axial skeleton, Fig. 1 shows that Bordes' recovery protocol not only affected the representation of these bones, but also limbs. Our data confirm that the Combe-Grenal "head- and foot-dominated" pattern, which has been interpreted as evidence for scavenging (Binford, 1991) or the differential post-depositional destruction and/or export of meat-rich bones (Chase, 1986a, 1989), in fact results from recovery biases.

Species frequencies also differ between Bordes' layers 11–12 and the newly excavated faunal assemblage (Fig. 3). All ten species identified in Bordes' collections (*Bovinae*, *Capra ibex*, *Equus caballus*, *Cervus elaphus*, *Rupicapra rupicapra*, *Equus hydruntinus*, *Rangifer tarandus*, *Crocuta crocuta spelaea*, *Vulpinae* and *Canis lupus*) are also present in our faunal assemblage, yet their relative proportions differ substantially. Notably, the percentage of reindeer increases from 18.6% and 9.4%, respectively for layers 11 and 12, in the original Bordes' collections (in %NISP, Guadelli, 1987) to 77% in the new excavations (stratigraphic unit "upper N2"), a statistically significant difference that cannot be attributed to effects of sample size (Fig. 3; chi-square = 165.64, $p < 0.001$ with layer 11; chi-square = 138.29, $p < 0.001$ with layer 12). In this respect, the importance of reindeer as a food source at Combe-Grenal is highly underestimated in Bordes' collections, a point that has also been stressed for other layers at Combe-Grenal based on regional comparisons (Discamps and Royer, 2017).

The importance of recovery bias is even more striking when the quantity of faunal remains retained is compared to the area excavated (i.e. density of faunal remains per square meter). For layer 11, Bordes' collection contains 180 faunal elements for an excavation area of ~12 $m^2$, of which 172 were identified to taxon (Guadelli, 1987; S. Madelaine, pers. comm.). This means that approximately

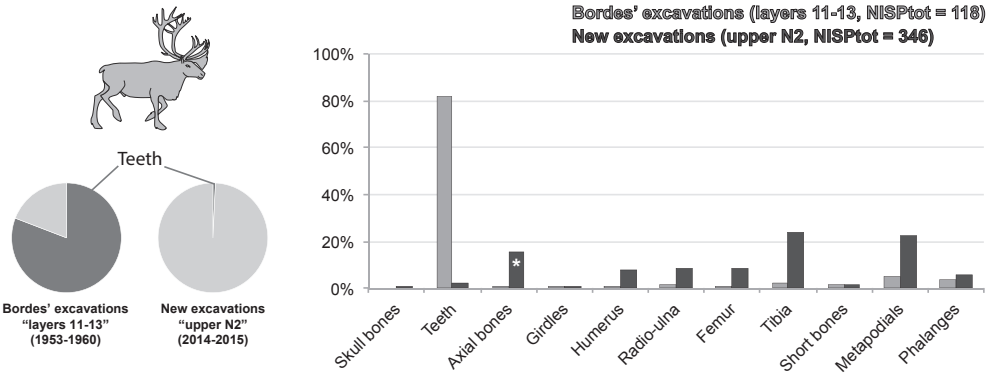


**Fig. 1.** Reindeer skeletal part profiles from Bordes' (estimated after Chase, 1986a) and new excavations (this study), in %NISP. Proportions of teeth (pie charts on the left) and all elements (bar chart on the right, with Bordes' excavation in light grey and new excavations in dark grey). *: for better comparison, axial bones include fragments of ribs and vertebras identified as "reindeer-sized ungulates".

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