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DISCUSSION

Connecting Middle Palaeolithic Datasets: the Interplay of Zooarchaeological and Lithic Data for Unravelling Neanderthal Behaviour

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Abstract

The ongoing refinement of archaeological excavation and recording methods over the last decades has led to a significant increase in quantitative Middle Palaeolithic datasets that provide a record of past Neanderthal behaviour. Stone tools and butchered animal remains are the two main categories of Middle Palaeolithic archaeological remains and both provide distinctive insights into site formation and Neanderthal behaviour. However, the integration of these quantitative lithic and zooarchaeological datasets is key for achieving a full understanding of both site-specific and broader-scale patterns of Middle Palaeolithic subsistence. To explore novel ways to enhance the incorporation of these datasets, we organised a session at the 82nd annual meeting of the Society for American Archaeology in Vancouver. An underlying theme was the problem of linking lithic and faunal variability. Are variations in subsistence strategies reflected by changes in tool-making decisions? This paper will briefly introduce the possible ways these Middle Palaeolithic datasets can be integrated, illustrated with the papers included in this special volume, and discuss its potential for understanding the variability and interconnectedness of Neanderthal technologies and subsistence strategies.

Keywords Middle Palaeolithic · Neanderthal · Subsistence behaviour · Lithic variability

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Introduction

The procurement of animal resources and the production of stone tools are intertwined throughout the narrative of hominin evolution, from studies of early hominin subsistence through to models of Middle Palaeolithic variability. Neanderthal fossils are securely associated with a vast number of Middle Palaeolithic assemblages across Eurasia between ca. 300,000 and 40,000 years ago. This large behavioural repertoire, containing both faunal remains and lithic implements, has the potential to provide unique insights into the interplay between these two categories and the mechanisms underlying their role through human behavioural evolution (Chase 1986; Stiner and Kuhn 1992; Delagnes and Rendu 2011; Discamps et al. 2011; Seetah and Gravina 2012).

The ongoing refinement of archaeological excavation and recording methods over the last decades has led to a significant increase in quantitative Middle Palaeolithic datasets that provide a record of past Neanderthal behaviour. These now commonly comprise detailed geoarchaeological, taphonomic, spatial, lithic and faunal data and are available as part of elaborate site monographs (Boismier et al. 2012; Carbonell 2012; Gaudzinski-Windheuser and Roebroeks 2014; Dibble et al. 2018), as supplementary information in journal articles (Morin 2012; Rendu et al. 2019) or still less frequently as online databases (e.g. http://oldstoneage.com/). Many specialist studies focus on analysing either the recovered stone tools or the butchered animal remains, the two main categories of archaeological remains at Middle Palaeolithic sites. Typically, results from the analyses of these data sets are studied independently and form separate chapters or sections within monographs and papers. While both provide distinctive insights into site formation and Neanderthal behaviour, their integration is key to coming to a full understanding of both site-specific and broader-scale patterns of Middle Palaeolithic subsistence. An underlying theme is the question of linking lithic and faunal variability. Are variations in subsistence strategies linked to changes in toolmaking decisions?

The interpretive potential of this dataset integration, which often still remains underexplored, led us to organize a session at the 82nd annual meeting of the Society for American Archaeology in Vancouver aimed at examining the interplay of these lithic and zooarchaeological datasets; how can they inform on each other and in what ways can they be integrated? This included both a methodological focus, assessing how faunal remains can directly inform on lithic technology and vice versa (e.g. cut mark morphology, damage signatures, use wear), as well as the exploration of new and existing taphonomic and behavioural models that have been based on the integration of faunal and lithic data, including theoretical constructs, archaeological applications and site-based and regional studies. This paper will briefly introduce the possible ways these Middle Palaeolithic datasets can be integrated, illustrated with the papers included in this special volume, and discuss its potential for understanding the variability and interconnectedness of Neanderthal technologies and subsistence strategies.

Direct Inferences from Lithic and Faunal Data

Direct traces of lithic use and faunal exploitation are the foundation for further site based and more regional perspectives on Neanderthal behaviour. Although in some

scenarios, the direct association between lithic and faunal materials at one site can be problematic due to taphonomic processes and/or time-averaging (Chazan and Horwitz 2006; Smith 2012; Bargalló et al. 2016; Real et al. 2020), in many instances direct links can inform on lithic use through faunal analyses and vice versa (Stiner and Kuhn 1992; Stiner 1994; Delagnes and Rendu 2011; see Hovers and Belfer-Cohen 2020 for critique).

Surface modifications on animal bones (such as cut marks) provide direct evidence of the use of stone tools in the butchery of animal carcasses. While studies of these modifications have reignited debates into the earliest stone tool use and meat exploitation (e.g. McPherron et al. 2010; Domínguez-Rodrigo et al. 2011; Sahnouni et al. 2018) within a Middle Palaeolithic context the systematic exploitation of large terrestrial mammals is well established (e.g. Morin 2012; Gaudzinski-Windheuser and Roebroeks 2014; Smith 2015). Zooarchaeological studies at Middle Palaeolithic sites have been focused largely on how Neanderthal groups exploited different animal species at both a site and at a more regional perspective. Some faunal studies have integrated lithic datasets to investigate aspects of butchery practice and social learning (Blasco et al. 2013), stone tool morphology (de Juana et al. 2010; Val et al. 2017; Moclán et al. 2018), stone tool manufacture and shaping (e.g. retouchers (Daujeard et al. 2014; Mallye et al. 2012) and hunting weapons (e.g. puncture holes (Iovita et al. 2014, Gaudzinski-Windheuser 2016; O'Driscoll and Thompson 2018; Gaudzinski-Windheuser et al. 2018, Smith et al. 2020)).

The identification of direct traces of exploited fauna on Middle Palaeolithic stone tools is more problematic, although it has been attempted through both usewear and residue analysis (Hardy 2004; Hardy and Moncel 2011), FTIR spectroscopy (Solodenko et al. 2015; Monnier and May 2019) and new methodologies might be applicable in the future, e.g. zooarchaeology by mass spectrometry (ZooMS) and/or DNA data from residues on stone tools (Welker 2018). Results from these studies can be compounded further because many Middle Palaeolithic tools appear to have been used for multiple tasks (Monnier et al. 2012). The development of more systematic, quantitative experimental approaches and methodologies (Rots et al. 2016; Martisius et al. 2018; Calandra et al. 2019a, 2019b) will help to provide new insights into the formation of such signatures within the archaeological record and their interpretive potential and drawbacks.

Experimental studies are a key component in our understanding of the marks left behind on bones from stones and vice versa. Many experimental studies have a strong focus on recreating very specific marks encountered in the archaeological record (e.g. Churchill et al. 2009; Gaudzinski-Windheuser et al. 2018). However, more and more studies also employ a more systematic approach to create experimental reference databases for comparison with archaeological material (see for example Rots and Plisson 2014; Rots et al. 2016). This is important in understanding the specific formation history of both bone surface modifications and lithic surface and edge damage and in assessing how these types of data can inform on site formation and taphonomic history as a whole (McPherron et al. 2014; Thompson et al. 2017).

In this volume, Smith et al. discuss current experimental frameworks, especially for the use of projectiles in the Middle Palaeolithic. These authors emphasise the importance of integrating both lithic and faunal data sets in the creation of more quantitative experimental protocols producing more standardised data sets that can be more easily

compared. Further, the paper highlights the variation in experimental methodologies and terminology, which could limit the identification and comparison of projectile impact marks. These authors address the issue of an 'absence' of projectile points and diagnostic impact marks on both lithic and bone within the Middle Palaeolithic, suggesting this may result, in part, from difficulties in differentiating these signatures in the often fragmentary archaeological record. Overall, Smith et al. (2020) illustrate that Neanderthal hunting technology appears varied across time and space, which seems characteristic of their behaviour as a whole.

Integrating Lithic and Faunal Data at the Site Level

The extensive integration of lithic and faunal datasets recovered from a specific archaeological context has huge potential to provide additional insights into both site formation (e.g. spatial distributions, fragmentation, weathering and artefact condition) and occupation (e.g. site use, occupation duration and exploitation intensity). Site formation processes can be reconstructed through the integration of taphonomic variables such as damage patterns (including edge damage and weathering), chemical alterations (including patination and surface readability) and fragmentation (including presence/absence of small fraction). In addition, spatial data, including orientation analysis (e.g. García-Moreno et al. 2016; McPherron 2018) and refit studies (Vaquero et al. 2017; Discamps et al. 2019; Romagnoli and Vaquero 2019), can further help to understand the distribution of material across a site. Site use and function, including occupation duration and intensity, can be further explored by looking at patterns of burning (Pop et al. 2016; Leierer et al. 2019), seasonality data (Rendu and Armand 2009; Rendu 2010; Sánchez-Hernández et al. 2019; Britton et al. 2019) and raw material transport distances (Turq et al. 2017; Moncel et al. 2019).

Two site-based contributions to this volume, the Abrigo de la Quebrada (Spain; Real et al. 2020) and Lakonis I (Greece; Starkovich et al. 2020), aptly demonstrate the potential of integrating lithic and faunal datasets to address site use and taphonomy issues. Real et al. (2020) use lithic and faunal data concomitantly to address several aspects of Neanderthal occupation at the site: spatial analysis, the question of palimpsest, the length of occupation of the site, hunting activities and mobility patterns. They further compare these patterns to other sites in the Iberian Mediterranean area stressing the difficulty of relating the density of material to occupation duration, frequency and site function. Starkovich et al. (2020) address the intra-site activity patterns at Lakonis I to understand spatial aspects of Neanderthal behaviour. Using principally three lines of evidence, geoarcheology, faunal, and lithic analyses, they focus on the use of fire and the ways hearth-related features were used and maintained. This approach helped differentiate intentional burning of food remains and the hearth cleaning activity that included dumping the material from the hearth areas.

Building Broader Models of Neanderthal Behaviour

Besides reconstructing site-specific behaviour, the integration of lithic and faunal datasets at a broader geographic and/or temporal scale also has the potential to provide

additional insights, such as region-, time- or environment-specific trends, into Neanderthal behaviour (e.g. Stiner 1994; Kuhn 1995). This includes assessing links between lithic and faunal diversity, mortality and seasonality (including prey choice, hunting technology and carcass processing) and mobility patterns (e.g. isotopes, raw material and sourcing). Recently, this has been done in a comprehensive way for the various Mousterian entities from southwest France (Delagnes and Rendu 2011; Discamps et al. 2011; Morin et al. 2014).

However, it is also important to note that causal links between lithic and faunal variation are not always straightforward, as was pointed out in relation to the production and use of points from the early Middle Palaeolithic and African Middle Stone Age onwards (Hovers and Belfer-Cohen 2020; Smith et al. 2019). Generally, we assume that innovations in technology, specifically in the most visible technology, lithic technology, resulted in more efficient subsistence systems, and therefore we should see changes in lithic technology correlating with changes in faunal assemblages. However, Hovers and Belfer-Cohen's (2020) contribution uses the record of the Levantine Middle Palaeolithic as a case study to argue against a strict functional interpretation of the relationship between lithics and fauna. They find that while we have assumed that the appearance of pointed implements must have been linked to a change in hunting methods, these innovations do not seem to correlate with trends in current faunal data. They argue that we should seek alternate explanations for lithic diversity, and in doing so, they discuss a few options.

Discussion and Conclusion

The papers in this volume illustrate aptly both the potential and pitfalls of reconstructing site formation and Neanderthal behaviour through the integration of Middle Palaeolithic lithic and faunal datasets. The increasing availability of quantitative data, alongside several novel methodologies, allows the establishment of direct links between lithic technology and faunal exploitation at artefact, site and regional levels. An extensive integration of lithic and faunal data results in a more in-depth understanding of the geoarchaeological and taphonomic processes at play at a site and the integrity of the various assemblages (see also Discamps et al. 2019; Reeves et al. 2019). This is key to assessing the interpretive potential of the lithic and faunal datasets in relation to both the units of excavation and analysis and, ultimately, how these are (or are not) related to past Neanderthal behaviour.

In general, the characteristics of a lithic assemblage (such as its overall size, reduction intensity and shape variability) cannot be studied in a vacuum and should, where possible, be linked to the faunal remains recovered. The reflection of subsistence behaviour into the archaeological record is skewed through a range of geoarchaeological and taphonomic processes, making it difficult to untangle the role of site type, antiquity or lithic entity (Vaquero 2008; Smith et al. 2019; Režek et al. 2018, 2020). As a result, the Neanderthal archaeological record can be described both as static and dynamic depending on the scale of analysis. On a macro-regional scale, there is consistency in the recovered faunal remains with a recurring dominance of medium- and large-sized ungulates (such as bison, horse and deer) despite climatic and environmental change (Stewart 2004; Discamps et al. 2011; Stiner 2013; Smith 2015;

Morin et al. 2016). At this scale, Neanderthal lithic technology, characterised by the production of flakes and retouched tools, is also consistent across the Neanderthal range (Režek et al. 2018, 2020).

This contrasts with the behavioural versatility and flexibility that can be recognised in both Middle Palaeolithic faunal remains and stone tools at a site scale; adapting knapping methods to available raw materials and required functionalities and adapting procurement (hunting, scavenging) and exploitation methods to the available faunal spectrum (e.g. occasionally exploiting megafauna (Smith 2015), marine resources (Stringer et al. 2008; Zilhão et al. 2020) or birds (Peresani et al. 2011; Blasco et al. 2014; Gómez-Olivencia et al. 2018)). There seems to be no one-on-one relationship between a lithic type or technology and a specific animal species exploited. At individual sites, all stone tool types and technologies are found in combination with a range of exploited species (e.g. mammoth remains with and without handaxes, pointed implement with and without deer remains). Patterns in relation to site type (cave vs open-air) are also difficult to establish and form an interesting avenue for further research.

Certain spatial-temporal trends in Neanderthal behaviour are difficult to explain merely in terms of this behavioural flexibility. For example, the sparsity of lithic hunting implements in western Europe (Villa et al. 2009; Smith et al. 2020), the re-occurrence of single species hunting (Farizy et al. 1994; Delpech 1996; Gaudzinski and Roebroeks 2000; White et al. 2016) or the presence of region-specific lithic characteristics within a restricted time slice (e.g. expedient Eemian assemblages (Valoch 1984; Pop 2014, 2015), regional bifacial tool variability during MIS-3 (Ruebens 2013; Ruebens and Wragg Sykes 2016)). These trends are usually defined on either lithic or faunal characteristics and ones that incorporate both are few and require further contextualisation, especially also in terms of their chronological resolution (e.g. Quina Mousterian associated with reindeer remains, e.g. Costamagno et al. 2006; Niven et al. 2012; Discamps et al. 2011; Castel et al. 2017).

The question if changes in toolmaking decisions are linked to variations in subsistence strategies is far from being solved, despite some regional studies indicating no causal links (e.g. see Smith et al. 2019 for Middle Pleistocene Africa, and Hovers and Belfer-Cohen 2020 for Middle Palaeolithic Levant). It is clear that no single mechanism underlies all the observed variability in faunal and lithic remains; rather it reflects a dynamic interplay of various taphonomic and behavioural factors. Unravelling their dynamics remains one of the key challenges of Neanderthal archaeology.

As illustrated throughout this volume and discussed throughout our SAA session, the ways lithic and faunal data can be collected, analysed, integrated and presented are numerous. Large sets of quantitative data, new methodologies and novel interpretive frameworks are now available to more extensively develop and test models of Middle Palaeolithic variability at various scales. The key here will also be the further application of a range of new methodologies, including microscopic, experimental, modelling and molecular approaches. For example, a wider application of ZooMS to faunal assemblages will greatly enhance our understanding of the species composition at a site regardless of post-depositional fragmentation (Welker et al. 2015; Sinet-Mathiot et al. 2019). The collection of meta-level data at various geographic and temporal scales can feed into statistical models which can further test causal links between lithic and faunal change (e.g. Smith et al. 2019).

Unravelling the mechanisms underlying Neanderthal behavioural variability through the large Middle Palaeolithic faunal and lithic databases is a crucial step in coming to a better understanding of the interplay between lithic and faunal resources in relation to other hominin species for which the archaeological records are more sparse. With this SAA session and this volume, we hope to put different ways to integrate Middle Palaeolithic datasets further into focus, provide a first platform for showcasing some ideas and help researchers think outside of the classic data frameworks to come up with innovative ways to explore and integrate their various archaeological datasets.

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