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Investigating Neanderthal dispersal above 55°N in Europe during the Last Interglacial Complex

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ABSTRACT

When dealing with the northern boundary of Neanderthals (*Homo neanderthalensis*) and the question of whether or not they dispersed into Southern Scandinavia, two contradictory hypotheses can be identified. The first, and also the most widely endorsed, hereafter, hypothesis A, argues primarily that Neanderthals did not occupy regions above 55°N because of 1) climatic constraints and 2) dispersal barriers. The second, hypothesis B, argues that they possibly occasionally dispersed above 55°N, but that factors such as 1) research- and/or 2) taphonomic bias are responsible for their archaeological invisibility. Here, we report an evaluation of these competing hypotheses. To this end, we reconstruct the environment for the time period and region of interest (the Last Interglacial Complex and Northern Germany and Southern Scandinavia), based on three lines of evidence: palaeoenvironmental reconstruction combined with a novel habitat modelling approach, a review of relevant archaeological localities, and a discussion of the possible impacts of both research biases and the taphonomic effects on the archaeological data. We focus particularly on the climatic and geological explanatory factors relevant to the two hypotheses. Our results are inconsistent with the claim that climatic constraint and/or a lack of suitable habitats can fully explain the absence of Neanderthals in Southern Scandinavia during the Eemian Interglacial and Early Weichselian Glaciation. We do, however, find evidence that a geographic barrier may have impeded northerly migrations during the Eemian. The evidence reviewed here suggests that both research bias and taphonomy – consistent with hypothesis B – could account for the archaeological invisibility of Neanderthals in Southern Scandinavia, highlighting the need for further strategic survey and/or excavation efforts in the region.

1. Introduction and definition of the spatiotemporal frame

Defining and understanding the northern boundary of the Neanderthal range has the potential to provide key information about their adaptive capabilities and environmental constraints. As such, defining this boundary has attracted the attention of several studies (Roebroeks et al., 1992; Holm and Larsson, 1995; Roebroeks and van Kolfschoten, 1998; Larsson, 2000; Hoffecker, 2005). Based on the distribution of Neanderthal sites, the general consensus is that 55°N constitutes their tentative northern boundary, even during times of climatic amelioration. Recent claims of a Mousterian assemblage found as far north as 65°N at Byzovaya in the Ural Mountains (Russia) potentially challenge this assumption (Slimak et al., 2011), but critics argue that the typology of the assemblage does not unequivocally support a Neanderthal affiliation (Zwyns et al., 2012). The North European Plain usually denotes the most northerly region of the Neanderthal's core occupation area, as the Plain is naturally bordered by the North and Baltic Seas. Just north of this however, lies the Jutland Peninsula/Southern Scandinavia,

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with direct terrestrial access through Schleswig–Holstein in Northern Germany (Fig. 1a). The North European Plain can therefore be considered the most likely geographical source, but although Neanderthals regularly exploited this area during the Last Interglacial Complex (Roebroeks and Speleers, 2002), secure evidence for one or several substantive and demographically viable dispersals into Southern Scandinavia is still lacking. Claims for Middle Palaeolithic finds from Denmark have been made (Møhl-Hansen, 1955; Holm and Larsson, 1995; Johansen and Stapert, 1995; Holm, 2000, 2001) but are all highly contested (see map of sites in Fig. 1b). The focus of this paper is to discuss the two existing and contradictory explanatory models inherent within the debate of a possible hominin presence in Southern Scandinavia and to assess the degree to which they are empirically supported.

The temporal focus of this paper is the Last Interglacial Complex, comprising the warm Eemian Interglacial and the Brørup and Odderade Interstadials of the Early Weichselian Glaciation at the transition from the late Middle-to early Late Pleistocene (Ziegler et al., 2010). This choice of chronological frame is driven by the empirical corpus available for this period (archaeological and ecological), as well as the underlying notion that climatic amelioration (with the accompanied glacial contraction) would have enabled high latitude expansions of hominins. By the time of the Middle Weichselian (~MIS4) Southern Scandinavia is likely to have been too cold for human occupation (to what degree opportunities for occupation arose in the MIS3 warming are outside the scope of this paper). Although the term Eemian is occasionally paired synchronously with Marine Isotope Stage (MIS) 5e, studies have convincingly shown that the climatic amelioration defining the onset of the interglacial across terrestrial Europe is spatio-temporally transgressive and does not coincide fully with MIS 5e (Sier et al., 2011, 2015b). Delayed onsets of the interglacial (compared to the onset in the type area in the Central Netherlands) are observed both in Southern and Northern Europe in the order of 5–10 ky, respectively (Sier et al., 2015b). This difference is important and has implications for the numerical timing of the Last Interglacial Complex and its position within a global chronological frame (Ziegler et al., 2010).

Recent efforts, such as the identification of the paleomagnetic Blake event within the pollen succession of archaeological sites, have shown great potential in providing high resolution chronological control at Interglacial sites like Neumark-Nord 2 and Caours (Sier et al., 2011, 2015a), and provide clear evidence that the onset of the Interglacial warming is spatially variable. According to Sier et al. (2015b), the onset of the Eemian in NW Europe takes place c. 10,000 years after the beginning of MIS 5e and continues into MIS 5d, pointing to an overall correspondence between the onset of the Eemian warming and the Blake event from around 121 ka BP in NW Europe. Defining the timing and duration of the Eemian Interglacial in Europe is, however, not completely straightforward and is still the subject of some debate. Most researchers agree that the onset of the Eemian can be observed locally with the spread of birch in pollen zone (PZ) 1 and that the climatic optimum occurs in PZ IVb and PZ V with the spread of hazel, yew, lime and hornbeam and that the duration of the Interglacial in Northern Europe is in the range 8000 to 11,000 years (Müller, 1974; Kukla et al., 2002; Turner, 2002; Caspers et al., 2002; Tzedakis, 2003; Sier et al., 2015b) compared to the longer duration of 17,700 ± 200 years for southern Italy (Brauer et al., 2007). At the end of the interglacial warming, the climate shifts and the transition to the Early Weichselian Glaciation begins. Although a general decline in temperature and precipitation (Kühl et al., 2007) can be observed for the Early Weichselian, this period in NW Europe is also characterised by two pronounced Interstadials which can be observed in the pollen diagrams obtained from the sediment cores from Gröbern, Oerel in Northern Germany and from the Brørup bog in Denmark (Andersen, 1965, 1966; Averdieck, 1967; Kühl et al., 2007; Helmens, 2014). These Interstadials are here referred to as the Brørup and Odderade Interstadial after the type sites in Denmark and Northern Germany respectively, but have been suggested to correspond to the St. Germain I and St. Germain II temperate Interstadials observed in the Grande Pile core from eastern France and MIS 5c and 5a, respectively (Behre and van der Plicht, 1992). The absolute timing of these Interstadials is difficult to determine but their occurrence can be constrained by a lower ^{14}C-date from the Oerel core, Northern Germany, indicating the end of the Odderade Interstadial by 61 uncal BP (Behre and van der Plicht, 1992; Helmens, 2014). Varve counts from the Rederstall diatomite, Northern Germany, have given an estimated duration of the Brørup Interstadial around 7600 years (minimum 5800 and maximum 10,500 years) and sediment thickness suggests that the Odderade Interstadial can be considered to be of a similar duration (Grüger, 1991; Behre and van der Plicht, 1992; Litt et al., 2007).

1.1. Outlining the contradictory hypotheses

Currently, two contradictory hypotheses concerning dispersals of Neanderthals beyond 55°N can be identified: Hypothesis A argues that Neanderthals did not venture above 55°N, hypothesis B contends that they did. The former is the one most widely accepted by archaeologists because no unambiguous finds have been detected above this latitude. Under this hypothesis, the explanations for this absence are often connected to climatic reasoning, arguing that the north was too cold and that a lack of adaptation, push/pull factors or geographical barriers would have prevented such northern dispersals. Hypothesis (B), in contrast, holds that northern dispersals were ephemeral and short-lived. Short occupations combined with research bias and preservation issues have resulted in very low archaeological visibility, which accounts for the absence of unambiguous archaeological and palaeoanthropological remains. According to supporters of this second hypothesis, evidence that Neanderthals indeed ventured north of 55°N derives from archaeological finds that represent or at least resemble Palaeolithic artefacts from a number of northern localities, including Vejstrup Forest and other sites of surface scatter in Denmark, Susioloula Cave in Finland and Byzovaya in Russia (Holm and Larsson, 1995; Holm, 2000, 2001; Schulz and Rostedt, 2008; Schulz et al., 2010; Slimak et al., 2011).

1.2. Material and methods

Each of these hypotheses offers a set of predicted circumstances that can be tested against the archaeological, ecological and geological records. If, for example, Neanderthals did not venture north of 55°N (hypothesis A) because of paleogeographical, climatic and/or ecological constraints, we would expect this to be identifiable in the environmental signal, showing a marked difference between the area north of 55°N compared to Neanderthal sites below 55°N (synchronically and/or diachronically). In order to address this, we evaluate the ecological and climatic record for the time period and region in focus as well as incorporate a novel methodological approach in the form of a model reconstructing Neanderthal habitat suitability in Northern Europe and Southern Scandinavia. If, however, Neanderthals continuously occupied the immediate source area (the North European Plain), but never expanded north into Southern Scandinavia (sink area) despite suitable environments and accessibility, it suggests that other factors were at play that could be critical for understanding their cultural, behavioural and biological adaptations.

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