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The environment in the Caucasus in the Upper Paleolithic (Late Pleistocene): Evidence from the small mammals from Dzudzuana cave, Georgia

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ABSTRACT

The MIS 3/2 transition (Denekamp interstadial and beginning of the LGM) is a crucial point in time for understanding adaptation of modern humans to climate. The Southern Caucasus is a unique place to study human ecology within this time period because it served as a refugium during the Last Glacial Maximum (LGM) and thus allows us to study how human populations responded to the climatic shifts during the Last Glacial. This study presents the results of the paleoecological analysis of Dzudzuana cave during the MIS 3/2 transition using small mammal community structure as a proxy for paleoenvironment.

Of the four units in Dzudzuana (Units A through D), Unit C, divided into subunits C5 to C1, has been dated to 27–24 ka cal BP and the MIS 3/2 transition. Thus, Unit C allows for a diachronic analysis throughout this important time period. Small mammals were found primarily in subunit C2 and C1.

Analysis of the small mammal assemblages of Dzudzuana subunits C2 and C1 confirm the paleoecological reconstruction obtained from macrobotanical remains, and suggest a refugium habitat during the last phase of MIS 3 and the onset of the LGM. Comparison with a contemporaneous site in the region (Satsurblia) suggests a high spatial-temporal mosaic habitat in the region. Small refugium areas within the Rioni River valley and its tributaries that enjoyed ameliorated climatic conditions and proximity to water resources may have promoted local human habitation.

Furthermore, results suggest that the small mammal assemblages of Dzudzuana are non-analogue communities typical of European Denekamp assemblages, and provide a new datum point for the faunal remains during this time period.

1. Introduction

The southern Caucasus was a major route for early humans as they migrated out of Africa. The earliest evidence for their migration out of Africa is present in the Georgian site of Dmanisi in the southern Caucasus (Gabunia and Vekua, 1995; Ferring et al., 2011). During the Lower to Middle Paleolithic transition, the southern Caucasus served as a core region for the development of a regional transitional culture (Adler et al., 2014) and it has served as a prime location to study Neanderthal and modern human interactions during the Middle to Upper Paleolithic transition (Adler et al., 2006, 2008). The study of the local Upper Paleolithic sequence and human presence in the southern Caucasus during the Last Glacial Maximum (LGM) is important to the understanding of the biogeographic dispersal patterns of modern *Homo sapiens* out of Africa and how human populations responded to the climatic shifts during the Last Glacial (Stewart and Stringer, 2012).

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The MIS 3/2 transition is a crucial point in time for understanding adaptation of modern humans to climate. The period encompassed by the MIS 3 was a warm part of the Last Glaciation (Van Andel and Davies, 2003). The final part of MIS 3 corresponds to the Briansk Interstadial in Eastern Europe and to the Denekamp Interstadial (Netherlands), dated to 33–24 cal ka BP. Gamble et al. (2004) have suggested that this period (LGM to GS 2c) is a period in which the distribution of human populations is dominated by the presence of refugia, identifying Iberia as a major refugium at that time period (Cuenca-Bescós et al., 2010; Rofes et al., 2012; Sauqué and Cuenca-Bescós, 2013; Bañuls-Cardona et al., 2014). However, it has been suggested that other regions such as the Balkans, the Levant and the Southern Caucasus may have also served as refugia throughout the Middle Pleniglacial and even during the Late Pleniglacial (Meshveliani et al., 2004; Bar-Yosef et al., 2006).

There are three archaeological sites in the Southern Caucasus dated to the Denekamp interstadial and the beginning of the LGM: Satsurblia BII dated to 25.22–24.44 ka cal BP (Pinhasi et al., 2014); Dzudzuana C, dated to ca. 27–24 ka cal BP (Bar-Yosef et al., 2011), and Bondi Cave IV-V dated to 31.54–21.2 ka cal BP (Le Bourdonnec et al., 2012). Other Upper Paleolithic archaeological sites in the near vicinity of those caves include the site of Ortvale Klde, dated to 42–39 ka cal BP (Adler et al., 2008) and Sagvardjila V dated to 34–30 ka BP (Meshveliani et al., 2004) (Fig. 1). Radiometric dates of other archaeological sites in the region that had previously been assigned to the Upper Paleolithic, based on lithic typo-technology, have not been substantiated (Meshveliani et al., 2004).

Paleontological studies of small mammals have been used as paleoecological indictors due to their rapid evolution, small home range size, unique niche requirements and their very short life spans (Chaline, 1977; Cuenca-Bescós et al., 2009, 2011). Together with their frequent preservation in the archaeological record, they are excellent indicators of vegetation type and provide a high-resolution proxy for environmental changes. Dzudzuana and Satsurblia are the only two sites in the region that have yielded large enough small mammal assemblages with secure dating in order to allow for robust paleoecological analysis. A smaller assemblage of small mammals is available from Bondi cave (Tushabramishvili et al., 2012), although relative abundance data and temporal distribution of the small mammal specimens are missing.

Here we present the results of the paleoecological analysis of small mammals of Dzudzuana cave during the MIS 3/2 transition. Excavations in the cave were conducted in two campaigns. The first campaign, during 1966–75, was directed by D. Tushabramishvili (Bar-Yosef et al., 2011). The second campaign, during 1996–2008, was directed by a joint team of Georgian, Israeli and American researchers led by T. Meshveliani and O. Bar Yosef (Bar-Yosef et al., 2011). During the first excavation campaign, artefacts were only recovered by hand, without wet sieving (Bar-Yosef et al., 2011). Therefore no microfaunal remains were recovered from this campaign. In the second campaign, two areas were excavated: the first, near the entrance of the cave (squares F–I 9–7 and J–K 12–11), which we call hereafter the 'lower area'; a second area, dubbed the 'upper area', comprised squares G–H 24–21, 19–15 (Fig. 2). All excavated deposits were wet-sieved, dried and later hand sorted (Bar-Yosef et al., 2011). All small mammal remains analyzed in this paper are from the second campaign.

The current study presents an important datum point of the biogeography and paleoecology of this transition period and thus furthers our understanding of the relationship between climate change and human evolution.

2. The regional setting

The Southern Caucasus is located between Europe and Asia. It is bounded in the North by the Caucasus Mountains and by the Caspian and Black seas in the east and west respectively. The region is noted for its mosaic habitat and diverse ecology dating from as early as the Upper Pleistocene. Today, the vegetation at the base of the foothills is characterized by grassland and open steppe habitat. Gallery forest is present along the valleys and gorges that are

Fig. 1. Location of sites mentioned in the text. Dzudzuana is marked with a star. Archaeological sites are marked with an octagon and modern sites are marked with a circle.

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