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Landscapes, depositional environments and human occupation at Middle Paleolithic open-air sites in the southern Levant, with new insights from Nesher Ramla, Israel

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ABSTRACT

Middle Paleolithic human occupation in the Levant (250–50 ka ago) has been recorded in roofed (cave and rockshelter) and open-air sites. Research at these different types of sites yielded different perspectives on the Middle Paleolithic human behavior and evolution. Until recently, open-air Middle Paleolithic sites in the Levant were found in three major sedimentary environments: fluvial, lake-margin and spring. Here we describe a unique depositional environment and formation processes at the recently discovered open-air site of Nesher Ramla (Israel) and discuss their contribution to understanding site formation processes in open-air sites in the Levant. The site is 8-m-thick Middle Paleolithic sequence (OSL dated to 170–80 ka) that is located in a karst sinkhole formed by gravitational deformation and sagging into underground voids. The sedimentary sequence was shaped by gravitational collapse, cyclic colluviation of soil and gravel into the depression, waterlogging, in situ pedogenesis and human occupation. Original bedding and combustion features are well-preserved in the Lower archaeological sequence, a rare occurrence in comparison to other open-air archaeological sites. This phenomenon coincides with episodes of fast sedimentation/burial, which also allowed better preservation of microscopic remains such as ash. The Upper archaeological sequence does not exhibit bedding or preservation of ash, despite presence of heat-affected lithic artifacts, which makes it similar to other open-air sites in the Levant. We suggest that rate of burial is the major factor that caused the difference between the Upper and Lower sequences. The differences in the burial rate may be connected to environmental and vegetation changes at the end of MIS 6. We also identified an interplay between sediment in-wash and density of human activity remains, i.e. during episodes of low natural sediment input the density of artifacts is higher relative to episodes with high rate of sediment in-wash. The detailed analysis of natural and anthropogenic processes at Nesher Ramla suggests a much wider spectrum of processes than previously reported for southern Levantine Paleolithic sites. Nesher Ramla shares certain depositional and post-depositional characteristics with both cave and open-air sites and provides a better insight into processes which control both types of sites.

1. Introduction

Since the early Pleistocene, the southern Levant served the main route for hominin dispersals from Africa into Eurasia. Although prehistoric hominins likely occupied different landscapes, it was only in the second half of the middle Pleistocene that the two distinctive physical types of settlements – roofed (caves and rock

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shelters) and open-air sites – are identified in the Levant (e.g. Sharon et al., 2014). The cave sites are mainly situated in the Mediterranean climate zone, while open-air sites are found on or close to riverbanks, lake margins and springs in both Mediterranean and desert environments.

The roofed vs. open-air site dichotomy provides different perspectives on Middle Paleolithic (250–50 ka ago) human occupation, continuity and intensity. Levantine cave sites usually represent long-term habitation localities with thick sequences that accumulated over tens of thousands of years. These have been interpreted as repeatedly-occupied residential camps to which lithic, faunal and other resources were transported (Bar-Yosef and Meignen, 2007; Garrod and Bate, 1937; Hovers, 2001, 2009; Jelinek, 1977, 1982; Meignen et al., 2006; Speth, 2004, 2006; Speth and Clark, 2006; Stiner, 2005; Yeshurun et al., 2007). The cave deposits contain indications of intensive human activities including clear evidence for habitual use of fire (e.g. Albert et al., 1999; Bar-Yosef and Meignen, 2007; Goldberg and Berna, 2010; Goldberg and Sherwood, 2006; Karkanas et al., 2007; Shahack-Gross et al., 2008; Weinstein-Evron et al., 2012). On the other hand, open-air sites usually represent short-term habitation with often thin occupation level/s, constrained lithic and faunal records and scarce evidence for use of fire. They were therefore interpreted as ephemeral occupations or task-specific localities connected to hunting and butchering activities (Davis et al., 1988; Gilead, 1980; Gilead and Grigson, 1984; Goren-Inbar, 1990; Hovers, 1986; Rabinovich, 1990; Sharon et al., 2010).

A recently discovered Middle Paleolithic site at Nesher Ramla (Israel) is situated in a markedly different geomorphological context. It is an open-air site found in a sinkhole that acted as a closed depositional basin before, during and after the period of human occupation. This specific environmental setting has resulted in a unique archaeological site formation history. The current paper presents a review of extant knowledge on archaeological site diversity in the Levantine Paleolithic in general and Middle Paleolithic in particular, highlighting geomorphological contexts and depositional processes involved in site formation. The regional review provides a basis for understanding the unique archaeological and sedimentary sequence at the site of Nesher Ramla (Zaidner et al., 2014). Our goal is to unify the previous accounts of formation processes at Nesher Ramla, while discussing the role they played in the way humans used the site and in the way the archaeological record was preserved. Finally, we discuss the contribution of Nesher Ramla to understanding site formation processes in open-air sites in the Levant.

2. Paleolithic landscapes in the southern Levant

The Levant is the geographical region between southern Turkey in the north, Egypt in the south, the eastern Mediterranean coast in the west, and the Euphrates in the east (Fig. 1). In modern political borders it includes Turkey (Anatolia only), Syria, Cyprus, Lebanon, Israel, Jordan, and Egypt (Sinai only). The southern Levant, including Israel, Jordan, Sinai and Syria, is often treated as a separate region based on similarity in climatic and topographic characteristics as well as ancient cultures. The climate in the southern Levant is generally arid and semi-arid but includes Mediterranean niches closer to the Mediterranean coast. Lithology is dominated by igneous rocks in the south and marine carbonates in the north. Precipitation is affected by topography as well as proximity to the Mediterranean coast, thus average annual precipitation may range from 100 to 800 mm of rain. Snow is rare and so is frost. Precipitation occurs during the winter months, normally November to April. Temperatures range between −2 (the lowest in winter) and ca. 35 °C (in summer). The combination of precipitation, topography, lithology and temperature affects local vegetation as well as soil types and their degree of development. All these parameters, in turn, are related to processes that are basic to archaeological site formation.

The Southern Levant is further subdivided into four roughly longitudinal strips: 1. The Transjordan, including the Jordanian Plateau and inland basins to the east, the Anti-Lebanon Mountains and the Syrian Desert with mostly harsh arid and semi-arid environment throughout the Pleistocene. Desert springs and rare rockshelters are the only attractive locations for hominin occupation; 2. The Jordan Rift Valley, a narrow and long basin that hosted a number of lakes and water bodies during the Pleistocene. The sediments are mostly of alluvial and lacustrine origin; 3. The Central Mountain Ridge, comprising of the Lebanon Mountains, Galilee, Carmel, Samaria and Judea hills, all located in the Mediterranean climate zone, and the Negev Highlands which are located in an arid environment. Lithology is dominated by carbonate rocks characterized by numerous karst landforms in the Mediterranean zone, where precipitation is relatively high. Many of the karst caves were intensively used by hominins during the Middle and Upper Pleistocene; 4. The Mediterranean Coastal Plain, dominated by Nile sands in the south, and alluvial deposits and sand in the north (from Haifa Bay and along the Lebanese coast). The sands form dune fields and calcareous sandstone ridges that stretch north-south sub-parallel to the coast, creating natural barriers for streams that flow westwards from the Central Mountain Ridge. The swamps and seasonal ponds that were formed at the junctions of sandstone ridges and streams were favorable locations for human occupation on the Coastal Plain during the Pleistocene.

Paleolithic sites in the southern Levant have been identified in all four geographical areas, in a variety of geomorphological settings, such as alluvial plains, ridge tops and slopes, topographic depressions, lake margins, caves and rockshelters (Fig. 1). The earliest Levantine archaeological sites, dated to the Early Pleistocene or beginning of the Middle Pleistocene, are exclusively related to open-air contexts in the Jordan Rift Valley and the Mediterranean Coastal Plain. The hominins inhabited lake margins and ecotones within a mosaic environment of woodlands, open areas and water bodies (Bar-Yosef, 2006; Bar-Yosef and Goren-Inbar, 1993; Bar-Yosef and Tchernov, 1972; Belmaker, 2006, 2009; Clark, 1967, 1969; Feibel, 2001, 2004; Goren-Inbar et al., 2000; Haas, 1966; Horowitz, 1996; Martinez-Navarro, 2004; Mallol, 2006; Tchernov et al., 1994). Some Early Pleistocene sites (e.g. Bizat Ruhama) indicate that hominins were capable of adapting to harsher semi-arid environments with patchy water sources (Zaidner, 2014; Yeshurun et al., 2011; Mallol et al., 2011).

Human use of caves is a relatively late phenomenon in the Levantine record, becoming a part of hominins' habitual behavior only during the second half of the Middle Pleistocene (Sharon et al., 2014). Sheltered sites are always associated with karstic caves or rockshelters (the latter refer to human occupation along shallow rock overhang) formed in carbonate rocks of the Central Mountain Ridge.

3. Paleolithic site formation in the southern Levant

Paleolithic cave and rock shelter sites in the southern Levant in which geoarchaeological and sedimentological studies have been carried out, include (from the oldest to the youngest): Qesem Cave (Frumkin et al., 2009; Karkanas et al., 2007; Shahack-Gross et al., 2014); Tabun Cave (Jelinek, 1977, 1982; Tsatskin, 2000); Misliya Cave (Weinstein-Evron et al., 2012); Hayonim Cave (Weiner et al., 1995, 2002); Amud Cave (Madella et al., 2002; Shahack-Gross et al., 2008); and Kebara Cave (Goldberg and Bar-Yosef, 1998; Goldberg, 2003; Schiegl et al., 1996; Weiner et al., 1993). The