Reconnaissance survey for Paleolithic sites in the Debed River Valley, northern Armenia

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This is an Accepted Manuscript version of the following article, accepted for publication in *Journal of Field Archaeology*.

Egeland, C.P., Gasparian, B., Arakelyan, D., Nicholson, C.M., Petrosyan, A., Ghukasyan, R., Byerly, R.M. 2014. Reconnaissance survey for Paleolithic sites in the Debed River Valley, northern Armenia. Journal of Field Archaeology 39, 370-386. https://doi.org/10.1179/0093469014Z.00000000096

Abstract:

The southern Caucasus is a critical region for those interested in Palaeolithic research because of its varied topography and location at the crossroads of Europe, Africa, and Asia. Modern Armenia sits at the heart of this area, but has until now played a small role in broader debates, largely because of its paucity of well-excavated and well-dated sites. To improve this situation, a survey was conducted for Palaeolithic sites along the valley of the Debed River (Lori Depression, northeastern Armenia). Twenty-three open-air sites, spanning the Lower through the Upper Palaeolithic periods, were identified. Most of the lithic material is of Middle Palaeolithic manufacture. Upper Palaeolithic material is also well represented, but only a handful of Lower Palaeolithic artifacts have been identified. Test excavations at several sites suggest that they preserve in situ deposits that may help us to understand the role of the southern Caucasus in the Palaeolithic occupation of Eurasia.

Keywords: Armenia | Lori Depression | Palaeolithic | survey | southern Caucasus

Article:

Introduction

Nestled between the Black and Caspian Seas and the Greater Caucasus Range, the so-called southern Caucasus (a term that commonly refers to the modern independent republics of Armenia, Azerbaijan, and Georgia) lies within a natural cul-de-sac at the intersection of Africa, Europe, and Asia (fig. 1). This geographic location, when coupled with an amicable climate and rich natural resources, has helped define the pivotal role of the "Trans-Caucasian Corridor" (Fernández-Jalvo *et al.* 2010: 103) as an important destination and thoroughfare for human populations throughout the Palaeolithic and, indeed, into historical times. The region has a rich record of Palaeolithic occupation (Liubin 1977, 1984, 1989; Lordkipanidze 1998) and, in fact, it is thought that the southern Caucasus was one of a handful of important glacial refugia for humans during the Pleistocene that may have served as a core area from which colonizations and recolonizations of Eurasia occurred (Bar-Yosef 1994; Dennell *et al.* 2011; Finlayson 2004).

Figure 1. The southern Caucasus with major landforms identified; the box marks the area shown in Figure 2A.

In our view, the southern Caucasus is poised to address at least three major issues. The first, and perhaps most intriguing, is the nature and timing of the initial dispersal of humans from Africa. While the list of Eurasian archaeological sites that date to before one million years ago continues to grow (Carbonell *et al.* 2008), it is at Dmanisi in the Republic of Georgia that the earliest undisputed evidence for human occupation outside of Africa is documented at ca. 1·8 million year ago (mya) (Gabunia *et al.* 2001). This evidence, in the form of Oldowan stone tools, butchered animal bones, and the fossil remains of early *Homo erectus* (Gabunia *et al.* 2001; Lordkipanidze *et al.* 2007; Rightmire *et al.* 2006; Tappen *et al.* 2007) demonstrates that southern Caucasian environments were conducive to human habitation during the terminal Pliocene and early Pleistocene epochs. One of the more provocative issues raised by recent data from Dmanisi is the possibility that *Homo erectus* evolved first in Eurasia and migrated back into Africa (Ferring *et al.* 2011), which implies that an earlier, more primitive form (*H. habilis* or perhaps even *Australopithecus*) may have been the first hominin represented outside of Africa (Dennell and Roebroeks 2005). It is currently unclear whether or not the remains at Dmanisi (Ferring *et al.* 2011: 10433–10435) and other early Eurasian sites (Dennell 2003) represent stable, permanent occupations or transitory excursions. Fully testing such hypotheses requires targeted survey for and systematic excavation of additional Plio-Pleistocene deposits in the region. Fortunately, recent research efforts are doing just that (Aslanian *et al.* 2006; Fernández-Jalvo *et al.* 2004; Gasparyan 2010; Liubin and Belyaeva 2008). Particularly relevant in this context is the fact that the southern Caucasus contains numerous paleolakes of Plio-Pleistocene age, which, based on evidence not only from Dmanisi (Gabunia *et al.* 2000) but other areas such as the Olduvai Basin in Tanzania (Blumenschine and Peters 1998), appear to have been both attractive to early humans and conducive to fossil preservation.

The second issue revolves around Middle Palaeolithic (MP) lifeways. There has been a tendency to focus on perceived differences between the MP and the Upper Palaeolithic (UP), which is certainly a worthy research endeavor (see below), while less attention is given to variability within MP cultures. One roadblock to a comprehensive view of MP diversity is a bias towards the evidence from Europe, North Africa, and the Levant. There are numerous reasons for this (not the least of which is the long history of high-quality Palaeolithic research in these areas), but the dynamics within the MP of one area, no matter how well researched, cannot necessarily be generalized to other parts of Eurasia (Kuhn and Hovers 2006: 4). That the southern Caucasian record can participate fruitfully in this conversation is hinted at by the great number of MP sites there (Golovanova and Doronichev 2003; Tushabramishvili *et al.* 1999). Unfortunately, any attempt at integration with other areas of Europe is hampered by the fact that a majority of these sites are either surface scatters or were excavated without the benefits of modern archaeological techniques. This situation is changing rapidly, as recent research at both open-air and cave sites and among existing collections is beginning to place the region's MP record into a more secure framework (Adler 2002; Adler and Tushabramishvili 2004; Díez-Martín *et al.* 2009; Adler *et al.* 2012; Ghukasyan *et al.* 2011; Meignen and Tushabramishvili 2006; Mercier *et al.* 2010; Moncel *et al.* 2013; Pinhasi *et al.* 2011) and the list of chronometrically dated sites is growing. However, there are still precious few well-preserved sites with in situ remains (particularly open-air sites) and until more are discovered and excavated the region will remain a largely untapped source of information on MP adaptations.

The third issue concerns the complicated matter of the Middle to Upper Palaeolithic transition, which is of course intimately tied to questions about MP diversity (above). In fact, any attempt to explain the rapid spread of fully fledged UP cultures after about 47,000 b.p. must consider why the MP adaptations that preceded them were so successful for so long. The shift from MP to UP technologies throughout Eurasia (particularly western Eurasia) is thought by many (Bar-Yosef 1998; Mellars 2005), though not all (Zilhão 2006), to reflect the replacement of archaic groups, including Neandertals, by anatomically and behaviorally modern populations. Although it is clear that Neandertals and other archaic humans no longer existed as distinct groups by the UP, the most recent genetic data suggest that between 1–8% of their DNA is present in non-African modern human populations (Green *et al.* 2010; Reich *et al.* 2010). This of course implies that the MP/UP transition likely cannot be characterized as a wholesale replacement throughout Eurasia of one population by another. The southern Caucasus boasts a handful of caves and rockshelters with lithic material characteristic of both the MP and UP, and these assemblages have been interpreted as evidence for either cultural exchange between incoming UP peoples and resident MP groups or "transitional" phases of the in situ evolution of local MP culture (Cohen and Stepanchuk 1999: 308). However, researchers have cautioned that many of these sites' lithic assemblages may have been artificially mixed through the lumping of distinct strata during excavations (Bar-Yosef *et al.* 2006; Kozlowski 1970; Liubin 1989). This suspicion has been borne out by meticulous excavations at the rockshelter of Ortvale Klde in Imeretia (western Georgia), which have revealed "a clear stratigraphic and technological break…indicating the rapid and complete replacement of one technological tradition [the MP] by another [the UP]," (Adler 2009: 145). Yet there are simply too few well-excavated and well-dated sites in the southern Caucasus with stratified MP/UP deposits to determine if this finding holds throughout the region (Adler *et al.* 2008; Tushabramishvili *et al.* 2012) (table 1).

The modern Republic of Armenia is situated at the very core of this dynamic corridor and will therefore prove critical for understanding the Palaeolithic settlement of the southern Caucasus and beyond. Although Soviet-era archaeologists reported numerous Palaeolithic sites in the country (Panichkina 1950; Sardarian 1954; Yeritsyan 1970, 1975), much of this research, most of which was published in either Armenian or Russian, is poorly known to Western scholars and has not factored significantly in recent regional and pan-regional syntheses (Cohen and Stepanchuk 1999; Golovanova and Doronichev 2003). While this is certainly regrettable, the fact is that the Armenian Palaeolithic suffers from the same deficiencies as those cited for the southern Caucasian record in general: a lack of well-excavated sites with in situ deposits. A new wave of research is now beginning to lay a robust theoretical, chronological, and paleoenvironmental foundation for the county's Palaeolithic settlement (Adler *et al.* 2012; Bar-Oz *et al.* 2012; Bruch and Gabrielyan 2002; Chataigner *et al.* 2012; Fernández-Jalvo *et al.* 2010; Fourloubey *et al.* 2003; Gasparyan 2010; Ghukasyan *et al.* 2011; Joannin *et al.* 2010; Kandel *et al.* 2011; Liagre *et al.* 2007; Ollivier *et al.* 2010; Pinhasi *et al.* 2006, 2008, 2011, 2012). Here, we hope to contribute to this growing body of work and help address the issues discussed above by reporting on a reconnaissance survey for Palaeolithic sites in the Debed River Valley of northeastern Armenia.

Table 1. Chronometric dates from Middle and Upper Palaeolithic sites in Armenia.

Site	Site type	Layer	Technocomplex	Uncalibrated date b.p.	Calendar date	Reference
Hovk 1	Cave	4	???	35,550±650 (OxA-24504)		Pinhasi *et al.* (2011: 3848)
		5	UP?	33,800±500 (Poz-14674)	39,109±cal b.p.	Pinhasi *et al.* (2008: 810)
				>46,000 (Poz-23097)		Pinhasi *et al.* (2011: 3848)
		6	???		54,600±5,700 b.p. OSL	Pinhasi *et al.* (2008: table 1)
		8	EMP		104,000±9,800 b.p. OSL	Pinhasi *et al.* (2008: table 1)
Aghitu 3	Cave	5B	UP	27,110±170 (KIA-39640)	31,345±110 cal b.p.	Kandel *et al.* (2011: fig. 1)
		6	UP	27,120±170 (KIA-39642)	31,349±110 cal b.p.	Kandel *et al.* (2011: fig. 1)
				28,680±200 (KIA-39643)	33,128±314 cal b.p.	Kandel *et al.* (2011: fig. 1)
				30,210±180 (KIA-39641)	34,800±134 cal b.p.	Kandel *et al.* (2011: fig. 1)
Kalavan 1	Open-air	7b	UP	14,070±60 (Ly-3537)	14,630±402 cal b.p.	Pinhasi *et al.* (2008: table 3); Chataigner *et al.* (2012: fig. 5)
				13,800±60 (Poz-19664)	14,483±203 cal b.p.	Pinhasi *et al.* (2008: table 3); Chataigner *et al.* (2012: fig. 5)
		7d	UP	14,060±70 (Poz-19665)	14,818±206 cal b.p.	Pinhasi *et al.* (2008: table 3); Chataigner *et al.* (2012: fig. 5)
				13,750±60 (Ly-3538)	14,419±200 cal b.p.	Pinhasi *et al.* (2008: table 3); Chataigner *et al.* (2012: fig. 5)
		7d1	UP	11,520±50 (UGAMS-03414)	11,404±51 cal b.p.	Chataigner *et al.* (2012: fig. 5)
		7d3	UP	13,450±40 (UGAMS-03486)	14,025±182 cal b.p.	Chataigner *et al.* (2012: fig. 5)
Kalavan 2	Open-air	6/7	MP	16,740±130 (UGAMS-2296)	19,971±309 cal b.p.	Ghukasyan *et al.* (2011: table 3)
		7	MP	34,200±360 (Poz-20366)	39,643±886 cal b.p.	Ghukasyan *et al.* (2011: table 3)
		7?	MP?	27,000±400 (Poz-22181)	31,657±358 cal b.p.	Ghukasyan *et al.* (2011: table 3)
Lusakert 1	Rockshelter	C	MP	26,920±220 (GRA 14949/Lyon 1006)	31,692±190 cal b.p.	Fourloubey *et al.* (2003: 13); Adler *et al.* (2012: 27)
					36,600±2,800 b.p. OSL	Adler *et al.* (2012: 27)
					35,300±2,800 b.p. OSL	Adler *et al.* (2012: 27)
					23,900±1,900 b.p. OSL	Adler *et al.* (2012: 27)
Yerevan 1	Cave	3	MP	32,600±800 (GrN 8028a)		Pinhasi *et al.* (2008: table 3)
				31,600±800(GrN 8028b)		Pinhasi *et al.* (2008: table 3)
		4	MP	>47,800 (GrN 7665)		Pinhasi *et al.* (2008: table 3)
				>49,000 (GrN 7665)		Pinhasi *et al.* (2008: table 3)
		7	MP	27,000±650 (GrN 8860)		Pinhasi *et al.* (2008: table 3)
				28,000±500 (GrN 8860)		Pinhasi *et al.* (2008: table 3)

* EMP=Early Middle Palaeolithic; MP=Middle Palaeolithic; UP=Upper Palaeolithic.

Geographic, Environmental, and Geological Setting

While the location of the southern Caucasus between Europe and Asia has caused some consternation among geographers, the region's position to the south of the Greater Caucasus Range (which shields it from the frigid air of the East European Plain) and to the east of the Black Sea (which provides it with warm, humid air) has resulted in generally favorable climatic regimes relative to nearby areas throughout both the Holocene (Shahgedanova 2002) and Pleistocene (Gabunia *et al.* 2000; Grichuk *et al.* 1984; Volodicheva 2002). Nevertheless, the southern Caucasus is an area of large altitudinal gradients that fostered a wide variety of climate and vegetation zones throughout Palaeolithic times (Volodicheva 2002) just as it does today (Gulisahvili *et al.* 1975; Krever *et al.* 2001).

Armenia is dominated by the Lesser Caucasus and Armenian Highlands (Volodicheva 2002), where the landscape can exceed 4000 m in elevation at the top of dramatic volcanic cones and descend to nearly 300 m at the base of the numerous river valleys that deeply incise the country. This rugged topography formed largely as the result of tectonic and volcanic activity that accompanied the collision of the Arabian and Eurasian plates beginning in the Middle Miocene (Philip *et al.* 1989: 1–2). Volcanic activity in the region, exemplified most dramatically by large stratovolcanoes like Aragats (4095 masl) and Ararat (5165 masl), has occurred more-or-less continuously throughout the late Miocene and well into the Holocene (Arutyunyan *et al.* 2007; Lebedev *et al.* 2008a, 2008b; Mitchell and Westaway 1999). The production of graben (valley) structures via tectonic activity and the rerouting and damming of waterways by basalt flows produced a series of basins (e.g., Aparan, Lori, Pampak, Sisian, Vorotan) that were filled by lakes during the terminal Pliocene and into the early stages of the Middle Pleistocene (Gabunia *et al.* 2000; Gasparyan 2010: 162; Joannin *et al.* 2010; Ollivier *et al.* 2010). These lakes would have provided productive habitats for human occupation, and the lacustrine deposits they left behind were generally well-suited for the preservation of macro- and microfossils. In addition to climatic changes, data from southern Armenia indicate that continued uplift and volcanic activity resulted in the disappearance of many of these lakes after about 1·0 mya; subsequent river incision and glacial activity formed the modern landscape (Ollivier *et al.* 2010: 323–325).

During the terminal Pliocene and Early Pleistocene the area encompassing the modern Lesser Caucasus and Armenian Highlands was trending away from the warmer, more stable environments of the Miocene towards cooler and drier climates. Data from southern Armenia suggest, however, that the region experienced both warmer (mean annual temperature 9.6–13.8 °C) and wetter (mean annual precipitation 630–1210 mm) conditions than today (mean annual temperature 6–9 °C; mean annual precipitation 350–500 mm) (Bruch and Gabrielyan 2002: 43; Ollivier *et al.* 2010: 321). This was probably due, at least in part, to the intermittently expanded seaway (the Paratethys) that connected the Black and Caspian Seas. It is important to note that while the Lesser Caucasus and Armenian Highlands were impacted by global climatic shifts, regional tectonic activity and uplift have resulted in unique local environmental responses. For example, although the Lesser Caucasus and Armenian Highlands oscillated between warm, humid interglacials and cold, dry glacials during the Pleistocene, the area seems to differ from others in that shrubby steppe vegetation (e.g., *Artemisia*, *Ephedra*), while predictably abundant during glacial periods, appears to have persisted through interglacials and up to the present

(Joannin *et al.* 2010). This suggests that the region was subject to a relatively dry continental climate (created by the rainshadow effect of the westernmost ranges of the Lesser Caucasus) throughout the Pleistocene. While this insularity has complicated efforts to correlate paleoenvironmental indicators (e.g., pollen profiles) to global Marine Isotope Stages (Bruch and Gabrielyan 2002: 44–46), recent efforts have met with some success (Ollivier *et al.* 2010).

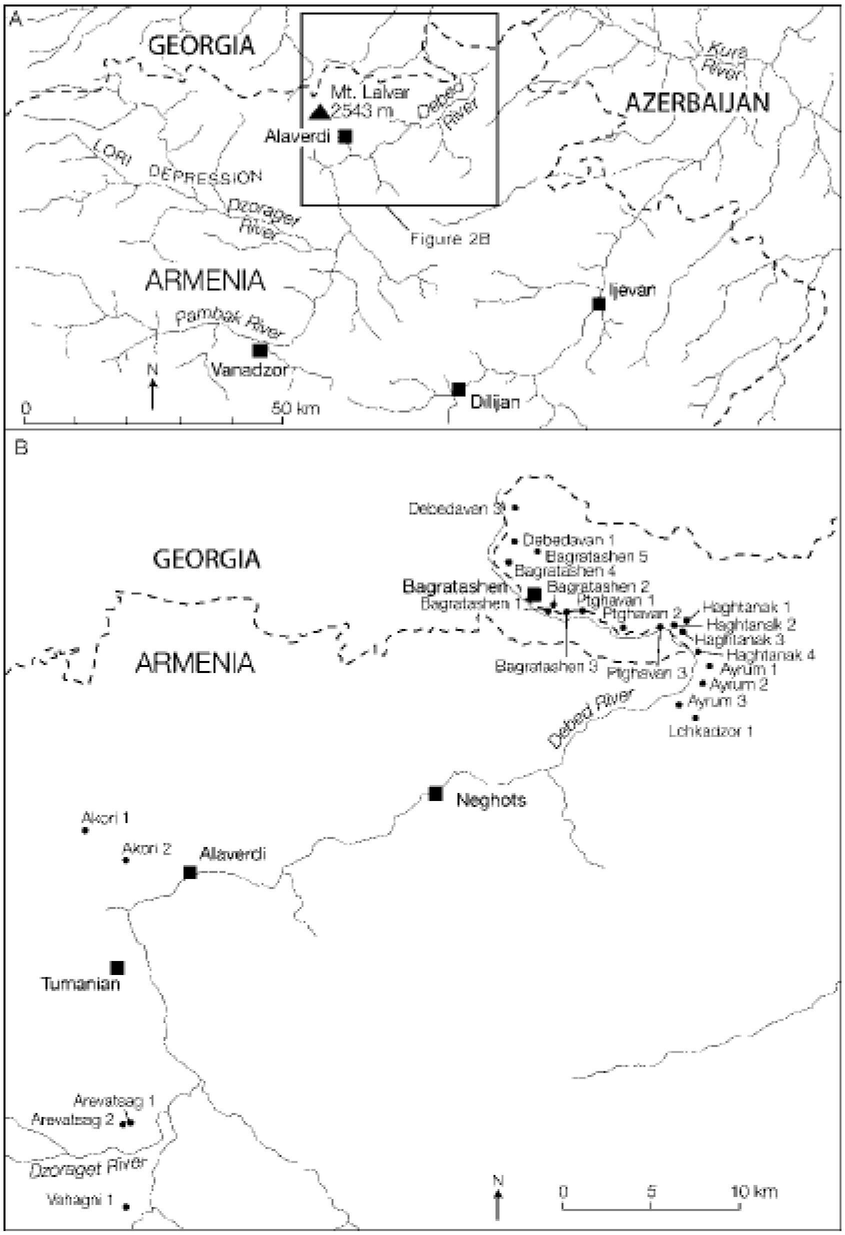

Figure 2. A) Northeastern Armenia with major towns and landforms identified; the box marks the area shown in Figure 2B; B) The study area showing location of villages (squares) and identified archaeological sites (dots).

The modern Debed Basin of northeastern Armenia cuts through the northern ranges of the Lesser Caucasus and is contained within the larger feature of the Lori Depression (figs. 1, 2). The area's modern climate is continental in character and, with annual precipitation of about 400–600 mm and shrubby, steppic vegetation, can be considered sub-arid. Geomorphologically, the landscape through which the Debed passes can be divided into two general zones: the southern area, through which a deep gorge has been cut (fig. 3a) and the northern area near the Georgian border, which is characterized by a low, wide floodplain that spills into the lowlands of the Kura Basin (fig. 3b).

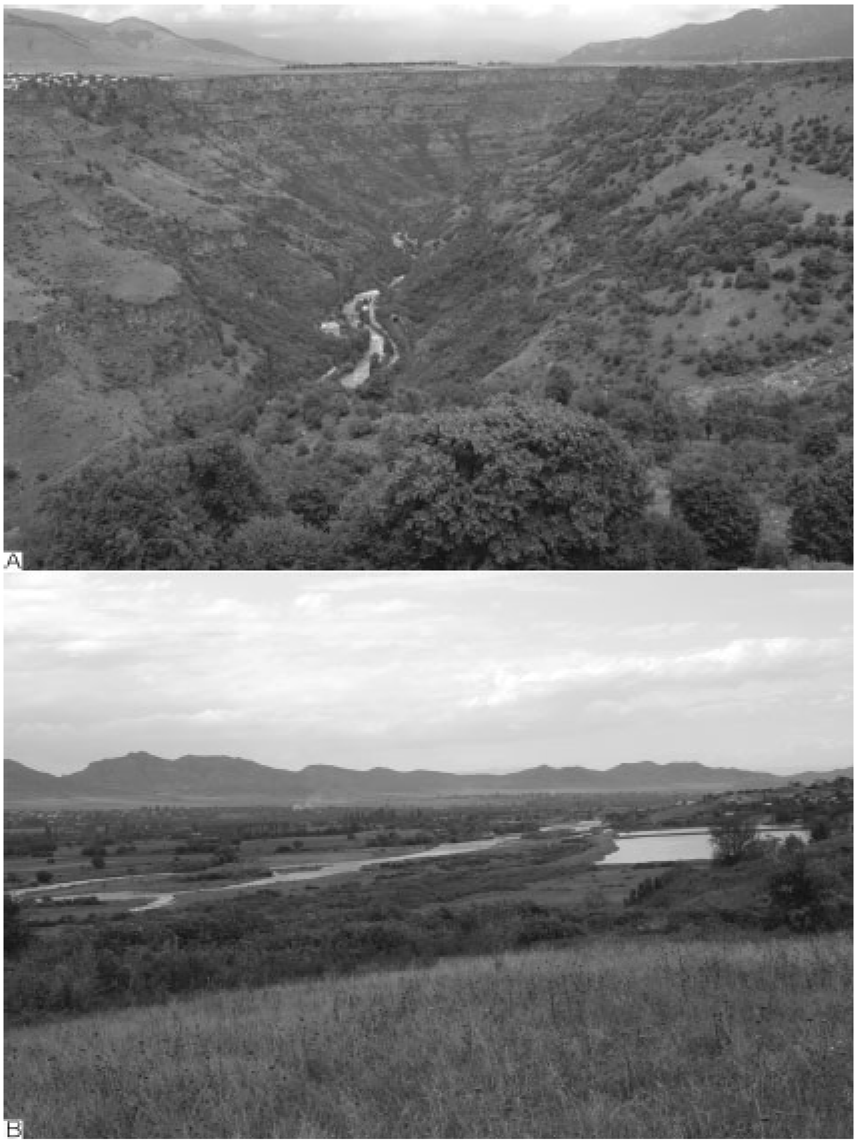

Figure 3. The Debed River. A) Just southwest of the town of Alaverdi; B) Near the modern Armenian-Georgian border.

Previous Research on the Stone Age of the Debed Basin

The history of archaeological work in the Debed Basin begins in the late 19th century when, in 1871, Yeritsov (1882: 85–86) excavated several "pagan" burials near the villages of Vornak (modern-day Akner) and Kobayr. In 1872, reports of finds (medieval manuscripts and other church goods, metal bowls, carpets, coins, weapons, bones, and agricultural tools) from the area’s numerous caves prompted Yeritsov to note the conspicuous absence of stone implements. While he suspected this was due to the locals’ lack of recognition rather than a true absence of such artifacts, Yeritsov’s comment represents the first published reference to Stone Age material in the area. In 1887–1888, Jacques de Morgan, then managing a copper mine at Akhtala, conducted further archaeological excavations along the Debed. His published accounts of these excavations (de Morgan 1889, 1927: 284–307) are justifiably well known for the detailed documentation of some 976 Iron Age burials near the towns of Alaverdi, Akhtala, and Ayrum (the so-called “Lalvar Group” of cemeteries). Embedded in these reports, however, were illustrations of stone tools (de Morgan 1889: 99, 101; 1909: 202), representing the earliest formal documentation of Stone Age material in the Debed Basin.

It was not until the late 1960s, when a comprehensive study of the region was conducted under the direction of H. A. Martirosyan of the Academy of Sciences of the Armenian SSR that further mention was made of Stone Age material. While the expedition’s most impressive discovery was a series of massive Bronze and Iron Age fortresses (Archisi Berdategh, Shahlama I–IV) situated on plateaus overlooking the lower Debed (Chilingaryan 1971: 8–9), the presence of some Palaeolithic material, mainly Levallois points flaked from basalt, granite, flint, and obsidian, was recorded (Chilingaryan 1971: 6).

Since 2003, an Armenian-Russian team has been excavating Palaeolithic through Iron Age sites along the upper Dzoraget River (Aslanian *et al.* 2006, 2007; Dolukhanov *et al.* 2004; Kolpakov 2009), and in 1999 and 2001, geological reconnaissance work in northern Armenia, including the Debed, investigated several basalt plateaus and caves to assess the area’s Palaeolithic potential and, in doing so, identified a handful of stone tools (Fernández-Jalvo *et al.* 2004). Our knowledge of the Palaeolithic settlement of the Debed River Valley is therefore currently limited to a handful of reports scattered over more than 100 years.

Survey Area and Methods

Pedestrian survey was carried out over 13 days during the summer of 2009 along the Debed between its confluence with the Dzoraget River in the south and the Georgian border in the north, a distance of approximately 60 km (fig. 2b). Limited field time precluded a complete and systematic survey of the entire stretch so, based on the location of known sites in nearby areas, GIS predictive modeling was used to identify high potential areas to which the survey team was transported by vehicle (Egeland *et al.* 2010). Once on-site, 5 or 6 individuals spread out at approximately 30–40 m intervals. Work consisted almost exclusively of surface survey (limited subsurface testing was carried out at three sites) and because 2009 was a relatively dry year in Armenia, vegetation cover was sparse and surface visibility was generally excellent. Site locations were recorded at roughly the centers of artifact distributions with a handheld GPS receiver accurate to ±3 m. Although an area of ca. 31 sq km along the Debed was classified as high potential, less than 10% of this area has been surveyed to date.

Samples of artifacts were collected from surface concentrations to assess, in a very general sense, the cultural affinities and raw materials represented at each site. A coarse-grained typological approach was utilized in which artifacts were categorized as Lower Palaeolithic (LP), Middle Palaeolithic (MP), and/or Upper Palaeolithic (UP). Assigning specimens into even these broadly defined cultural periods could be problematic given that surface occurrences often lack additional contextual information. We therefore followed Beyin and Shea (2007: 9) and assigned to cultural periods only those specimens with morphological features generally agreed to be chronologically diagnostic. For the LP, this included large bifacially flaked tools like handaxes and picks, commonly associated with the Acheulean, but excluded choppers or other pebble core forms identified with earlier Oldowan industries. The most diagnostic artifacts of the southern Caucasian MP are Levallois cores and flakes, which are typically modified into a range of scrapers and points (Golovanova and Doronichev 2003), whereas the region's UP is characterized by unidirectional blade cores and retouched and backed bladelets (Adler 2009; Bar-Yosef *et al.* 2006; Kandel *et al.* 2011). All assignments were provisional and will be treated as working hypotheses to be tested through future excavations.

Survey Results

Twenty-three open-air surface scatters were identified with artifacts representing the LP through the UP (fig. 2). Most of these sites lie along the lower Debed near the Georgian border. A total of 437 lithic artifacts were collected from the surface of all sites combined, although only about 80% of these could be confidently assigned to a cultural phase (table 2). Most of the artifacts are MP in character, followed in frequency by UP and finally LP material. A variety of raw materials is represented in the artifact assemblage, although dacite dominates among the MP pieces whereas UP artifacts are most commonly made on flint (table 3). A more detailed examination of each site group (from north to south) is provided below.

Table 2. Palaeolithic artifact numbers and percentages (in parentheses) from the 2009 survey.

Site	LP	MP	UP	Unclassified	Total
Debedavan 1	0 (0.0)	9 (100.0)	0 (0.0)	0 (0.0)	9
Debedavan 3	0 (0.0)	6 (60.0)	1 (10.0)	3 (30.0)	10
Bagratashen 1	1 (1.9)	50 (96.2)	1 (1.9)	0 (0.0)	52
Bagratashen 2	0 (0.0)	12 (70.6)	4 (23.5)	1 (5.9)	17
Bagratashen 3	0 (0.0)	10 (90.9)	0 (0.0)	1 (9.1)	11
Bagratashen 4	0 (0.0)	22 (100.0)	0 (0.0)	0 (0.0)	22
Bagratashen 5	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	3
Ptghavan 1	0 (0.0)	27 (73.0)	2 (5.4)	8 (21.6)	37
Ptghavan 2	0 (0.0)	4 (100.0)	0 (0.0)	0 (0.0)	4
Ptghavan 3	0 (0.0)	5 (62.5)	0 (0.0)	3 (37.5)	8
Haghtanak 1	0 (0.0)	9 (40.9)	5 (22.7)	8 (36.7)	22
Haghtanak 2	0 (0.0)	2 (25.0)	2 (25.0)	4 (50.0)	8
Haghtanak 3	0 (0.0)	59 (50.4)	26 (22.2)	32 (27.4)	117
Haghtanak 4	1 (4.3)	7 (30.4)	2 (8.7)	13 (56.5)	23
Ayrum 1	0 (0.0)	3 (75.0)	0 (0.0)	1 (25.0)	4
Ayrum 2	1 (3.8)	18 (69.2)	3 (11.5)	4 (15.4)	26
Ayrum 3	0 (0.0)	8 (50.0)	3 (18.8)	5 (31.3)	16
Lchkadzor 1	0 (0.0)	5 (83.3)	0 (0.0)	1 (16.7)	6
Akori 1	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	2
Akori 2	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1
Arevatsag 1	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	1

Site	LP	MP	UP	Unclassified	Total
Arevatsag 2	0 (0.0)	28 (93.3)	2 (6.7)	0 (0.0)	30
Vahagni 1	0 (0.0)	8 (100.0)	0 (100.0)	0 (0.0)	8
Totals	3 (0.7)	297 (68.0)	51 (11.7)	86 (19.6)	437

* LP=Lower Palaeolithic; MP=Middle Palaeolithic; UP=Upper Palaeolithic.

Table 3. Raw material numbers and percentages (in parentheses) for Palaeolithic artifacts from the 2009 survey.

	Tuff	Dacite	Felsite	Andesite	Basalt	Quartz	Quartzite	Limestone	Sandstone	Flint	Obsidian	Total
LP	0 (0.0)	1 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)	0 (0.0)	1 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	3
MP	1 (0.3)	279 (94.0)	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)	3 (1.0)	3 (1.0)	8 (2.7)	2 (0.7)	297
UP	0 (0.0)	3 (5.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (3.9)	0 (0.0)	43 (84.3)	3 (5.9)	51
Unclassified	12 (14.0)	1 (1.2)	5 (5.8)	2 (2.4)	6 (7.0)	1 (1.2)	1 (1.2)	47 (54.7)	2 (2.4)	9 (10.5)	0 (0.0)	86

* LP=Lower Palaeolithic; MP=Middle Palaeolithic; UP=Upper Palaeolithic.

The Debedavan sites

Two lithic scatters were identified just outside the village of Debedavan. Debedavan 1 is situated at 468 masl, while Debedavan 3 lies at 407 masl (Fig. 2b). At the latter, lithic material extended almost to the Armenian/Georgian border post. Both sites sit within the eastern floodplain of the Debed. With the exception of a single UP piece from Debedavan 3, these sites are characterized solely by artifacts diagnostic of the MP. No faunal material was recovered.

The Bagratashen sites

The five lithic scatters identified outside the village of Bagratashen all lie atop or within ancient terrace structures of the Debed and are found between 435 and 549 masl (Fig. 2b). As with the Debedavan group, nearly all the diagnostic artifacts are of MP manufacture. Its most notable site is Bagratashen 1, where artifacts were identified eroding out of a recently built roadcut. A small test excavation revealed the presence of in situ MP material. The first indication of the site's existence was the recovery of a well-made handaxe from the surface (fig. 4a), and an elongated retouched point recovered from the test excavation (fig. 4b) compares favorably to dated early MP material from Hovk 1 (Pinhasi *et al.* 2008) and Djruchula (Meignen and Tushabramishvili 2006) caves in the southern Caucasus and to late Middle Pleistocene assemblages in the Levant such as those from lower Layer E and Layer F at Hayonim, Israel (Meignen 2000). The majority of the stone tools on the surface at Bagratashen 1 are of MP manufacture (fig. 5). Systematic excavations in addition to paleoenvironmental, geoarchaeological, and dating work are currently ongoing at Bagratashen 1 and promise to add to our understanding of MP adaptations in the area. Although faunal material was recovered from Bagratahsen 1, all of it derives from either the surface or from within the plowzone and probably dates to the Medieval period.

The Ptghavan sites

The Ptghavan sites occur within the ancient terraces of the Debed atop low basalt plateaus (Fig. 2b). The densest accumulation of material was encountered at Ptghavan 3. Unfortunately, commercial geological trenching and the Bronze/Iron Age fortress of Shahlama IV appear to have destroyed much of the original sedimentary sequence at the site. Although remains of what appeared to be fossilized or sub-fossilized bones were recovered from the area, the mixing of the sediments currently make it impossible to assign them to a particular time period. Most of the lithic material is MP in character.

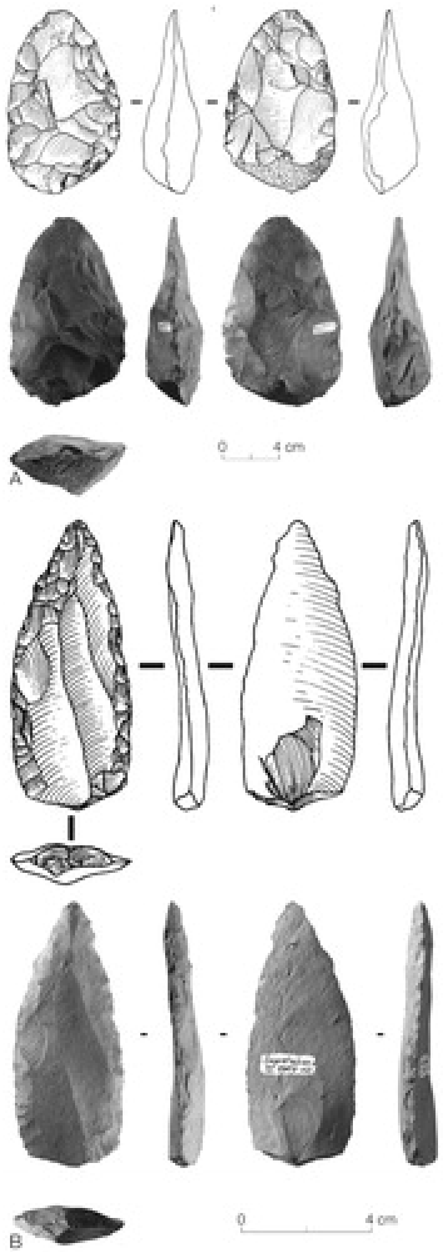

Figure 4. Bagratashen 1. A) Handaxe flaked from dacite recovered from the surface; B) Elongated retouched point flaked from limestone recovered from the test excavation.

The Haghtanak sites

The Haghtanak sites lie to the north and east of the Debed and range between 500 and 521 masl (Fig. 2b). The most interesting site of this group is Haghtanak 3, which is situated atop a basalt plateau overlooking the Debed (fig. 6). With a total of 117 recovered artifacts, Haghtanak 3 is one of the richest sites recorded in the survey area. The commercial geological trenches that pockmark the surface of the site are probably responsible for bringing most of the artifacts to the surface, and the trenches reveal further that parts of the plateau are capped by several meters of sediments. Most of the diagnostic artifacts are MP in character, although the 26 identified UP artifacts represent just over 50% of all UP artifacts identified from the entire survey area. The recovery of a handful of pieces reminiscent of Oldowan chopper forms (though they were not classified as such) is also noteworthy (fig. 7). Test excavations are currently underway in hopes of identifying a pre-Acheulean component at the site. No faunal material has yet been identified at any of the Haghtanak sites.

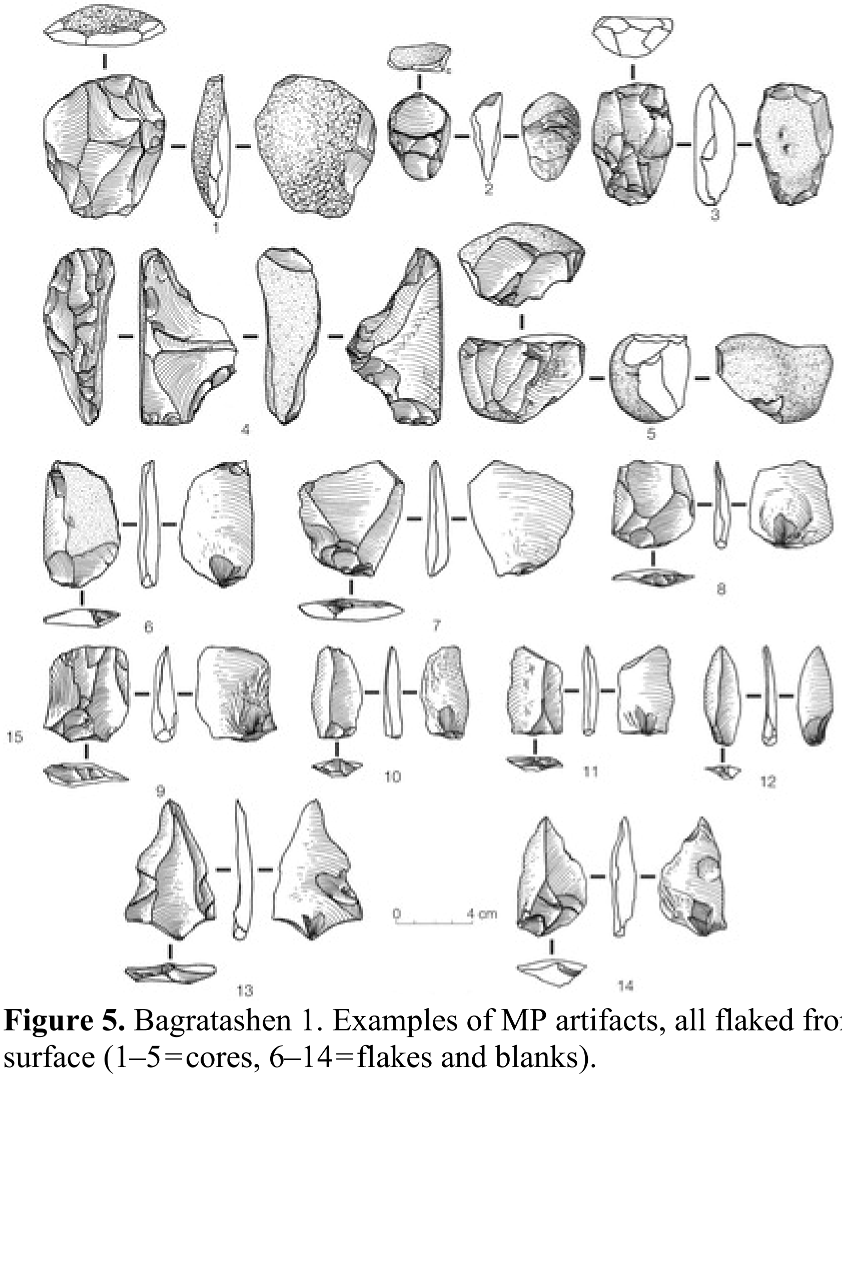

Figure 5. Bagratashen 1. Examples of MP artifacts, all flaked from dacite, recovered from the surface (1–5=cores, 6–14=flakes and blanks).

Figure 6. Haghtanak 3. View looking northwest along the Debed Valley showing the location of the site (arrow).

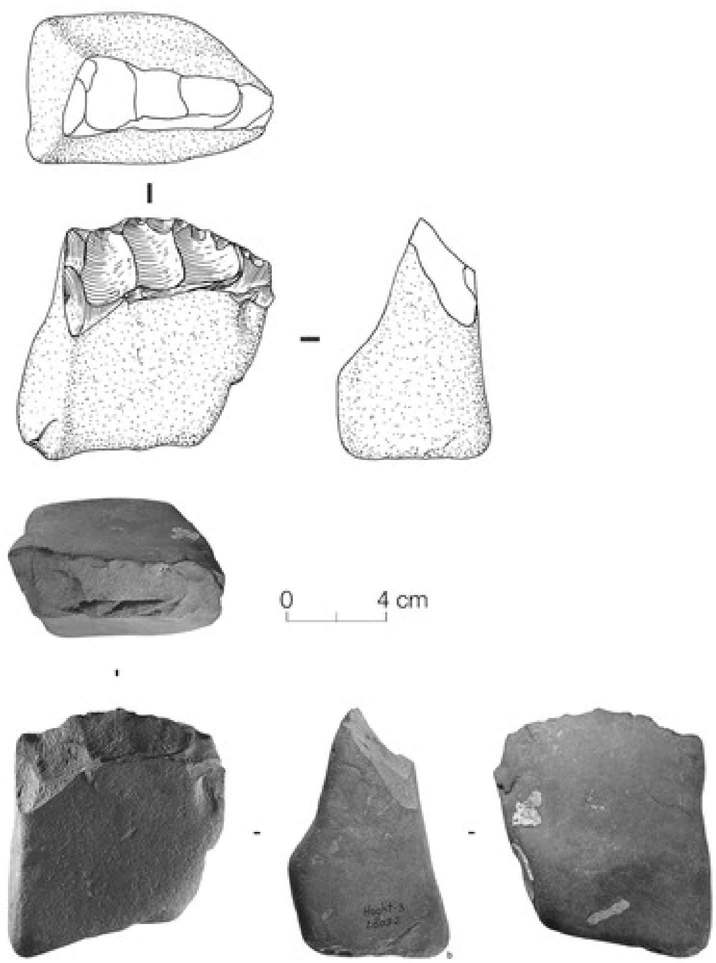

Figure 7. Haghtanak 3. Four views of a chopper-like implement flaked from basalt recovered from the surface.

The Ayrum sites

Lithic scatters near the village of Ayrum were discovered on a series of basalt plateaus rising above the east bank of the Debed at elevations between 543 and 562 masl (Fig. 2b). As with the other sites, the Ayrum group is dominated by MP artifacts, although the LP is represented at Ayrum 2 by a pick flaked from a quartz pebble (fig. 8). A test trench at Ayrum 2 revealed little more than a meter of sediment capping the plateau, and all three sites in the Ayrum group appear to have been heavily disturbed by later Bronze and Iron Age occupations, with Ayrum 2 in particular associated with the fortress of Shahlama II. No faunal material was encountered.

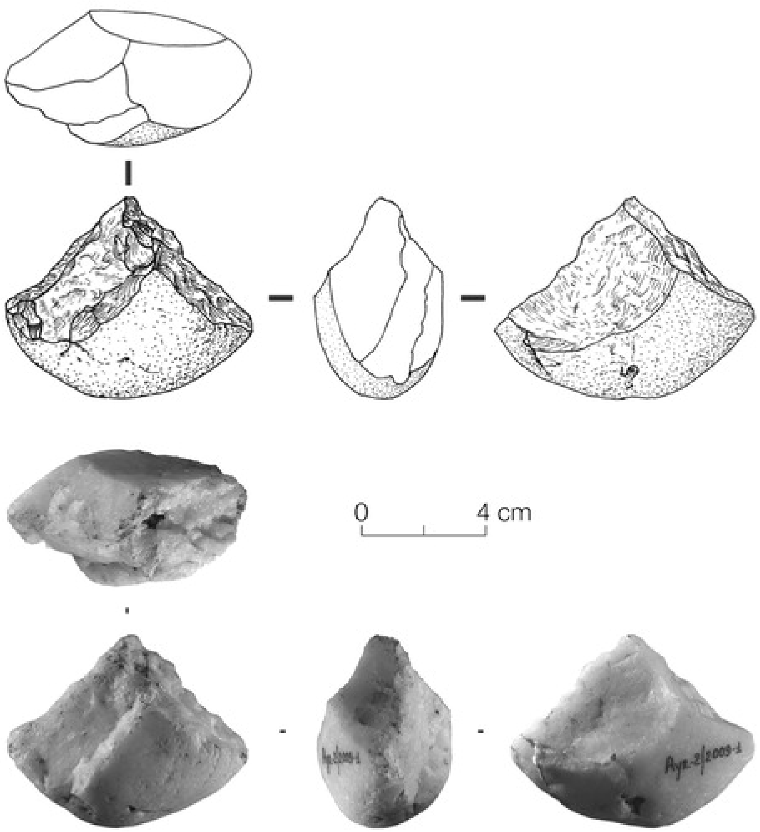

Figure 8. Ayrum 2: Four views of a pick flaked from quartz recovered from the surface.

The Lchkadzor site

A single, small surface scatter of lithics was identified along the slope of a hill under the village of Lchkadzor, where a total of six artifacts, five of which are of MP manufacture, were collected (Fig. 2b). It is likely that the material was transported via slopewash from a higher elevation. No faunal material was recovered.

The Akori sites

Discovered along the gentle southeastern slopes of Mount Lalvar that overlook a bend in the Debed at elevations of 1726 and 1249 masl, the Akori sites are situated at the highest elevation of any in the survey area (Fig. 2b). At Akori 1, two MP artifacts (a discoidal core and a side scraper), flaked from dacite, were recovered, while at Akori 2 a large (length=10 cm) retouched flake was collected. Post-glacial slopewash appears to have scoured most of the area, thus leaving little in terms of in situ Pleistocene-aged sediments. No faunal material was collected from either site.

The Arevatsag sites

The sites of the Arevatsag group overlook the confluence of the Debed and Dzoraget rivers (Fig. 2b). At Arevatsag 1, situated at 1214 masl just under the edge of a plateau, a single, undiagnostic felsite piece that may represent an anthropogenic flake was recovered. The piece was recovered from a test trench in sediments underlying a basalt flow whose age is currently unknown. Arevatsag 2, located at about 1055 masl, consists of a diffuse scatter of mainly MP lithic materials distributed along the slopes of the basalt plateau where Arevatsag 1 is located.

The Vahagni site

A single lithic scatter was identified outside the village of Vahagni at an elevation of 1099 masl (Fig. 2b). All recovered lithic material was diagnostic of the MP, including the base of a Levallois point and two side scrapers.

Discussion

Reconnaissance survey in the Debed Basin reveals that the area was inhabited throughout the Palaeolithic (figs. 9, 10), and this is in general agreement with other research that suggests that the area encompassing modern Armenia was first inhabited during at least the Middle Pleistocene by peoples using late Acheulean technologies (Aslanian *et al.* 2006; Gasparyan 2010). There are numerous claims for an earlier occupation of the country by hominins using Acheulean or even Oldowan technologies (Gasparyan 2010; Liubin and Belyaeva 2008; Presnyakov *et al.* 2012). While it is likely, given the location of Dmanisi within the region, that such claims will ultimately be borne out, the lack of in situ material in association with absolute dates and/or faunal material, coupled with the uncertainties of typological identifications and of distinguishing artifacts from geofacts, means that these assertions (including those presented in this study) should be treated cautiously.

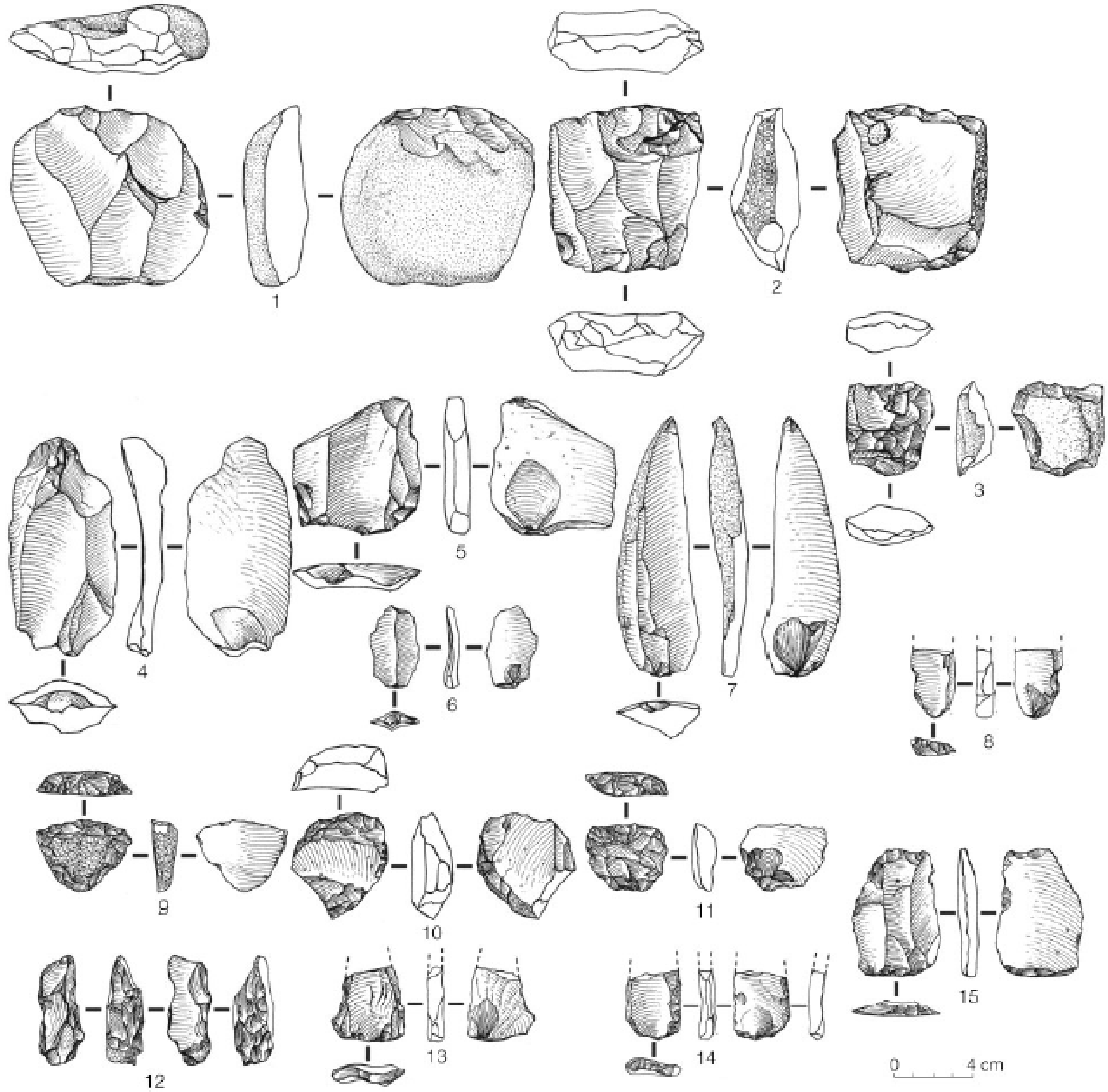

Figure 9. Examples of MP artifacts from the Debed survey surface collections. 1) Dacite Levallois core from Bagratashen 3; 2) Flint Levallois core from Bagratashen 5; 3) Basalt Levallois core from Haghtanak 3; 4) Dacite Levallois flake from Lchkadzor; 5) Dacite Levallois flake from Ayrum 2; 6) Flint Levallois flake from Bagratashen 3; 7) Dacite Levallois flake from Ptghavan 2; 8) Dacite backed tool from Ptghavan 1; 9) Dacite side scraper from Haghtanak 3; 10) Dacite side scraper from Ptghavan 1; 11) Obsidian side scraper from Haghtanak 1; 12) Dacite side scraper from Ptghavan 1; 13) Dacite point from Arevatsag 2; 14) Obsidian point from Vahagni 1; 15) Dacite truncated-faceted flake from Ayrum 3.

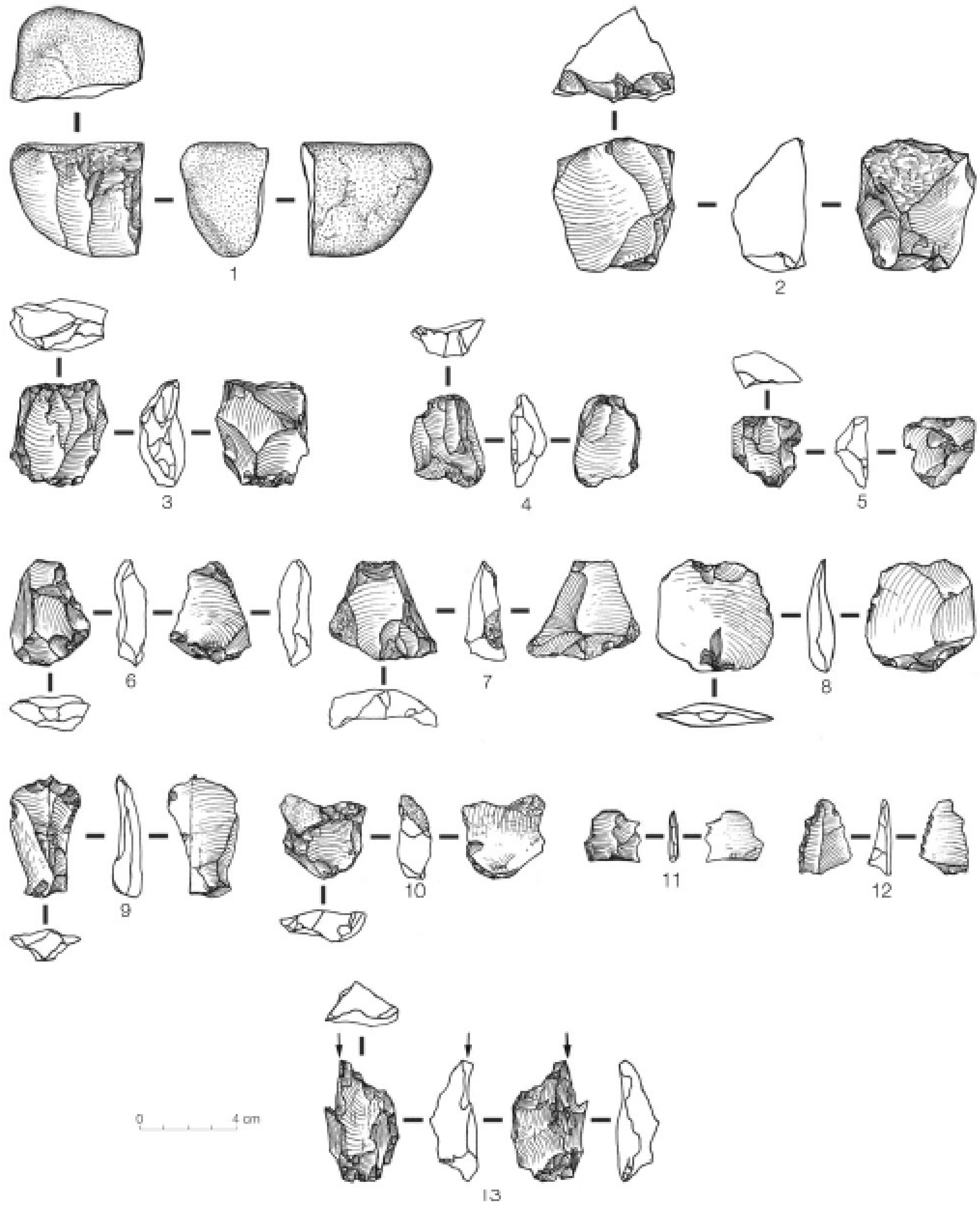

Figure 10. Examples of UP artifacts from the Debed survey surface collections. 1) Flint core from Haghtanak 1; 2) Flint core from Haghtanak 3; 3) Flint core from Debedavan 1; 4) Flint core from Haghtanak 4; 5) Flint core from Bagratashen 2; 6) Flint side scraper from Haghtanak 1; 7) Flint side scraper from Haghtanak 4; 8) Limestone notched tool from Haghtanak 2; 9) Limestone point from Haghtanak 3; 10) Flint beaked tool from Haghtanak 1; 11) Flint beaked tool from Ayrum 2; 12) Flint denticulate from Ptghavan 1; 13) Flint burin from Haghtanak 2.

It is important to note that even those claims for a late Acheulean occupation rely almost exclusively on typological analyses of surface occurrences that have yet to be verified with absolute dates or faunal associations. There are only three sites, Nor Geghi 1, located in the Hrazdan Gorge just northeast of Yerevan, and Dashtadem 3 and Muradovo, both located in northwestern Armenia along tributaries of the upper Dzoraget River, that preserve late

Acheulean material within stratigraphic contexts. The Nor Geghi 1 materials are still awaiting full description, but the lithic assemblage, which is composed exclusively of obsidian pieces, lies directly between two basalt deposits and is thus amenable to high precision dating (Adler *et al.* 2012; Gasparyan 2010: 168). Muradovo also preserves a late Acheulean component, and it has been argued that the lithics found below this occupation represent early Acheulean and pre-Acheulean technologies (Aslanian *et al.* 2007; Liubin and Belyaeva 2008). Dashtadem 3 is a single component late Acheulean site that is currently undated and appears to have suffered some post-depositional disturbance (Kolpakov 2009). Unfortunately, all these sites lack faunal material. The handaxe discovered on the surface at Bagratashen 1 may represent another example of a late Acheulean presence though, as a surface find, this assertion rests solely on lithic typology.

The Debed Basin, like many in the northern Lesser Caucasus, was filled with numerous basalt flows over the course of the Pliocene and Pleistocene. These basalts, which were subsequently exposed through fluvial incision, should provide the basis for a solid chronostratigraphic framework for the earliest occupation of the area. Lebedev and colleagues (2008a, 2008b) assign these basalts to the Pliocene-aged Akhalkalaki Formation, although only a single sample from a basalt near the village of Tumanian (fig. 3) has been argon-argon dated to 1·96 mya (V. Ollivier, personal communication 2009). Overall, very few LP artifacts were discovered in the Debed Basin. This finding probably reflects low population densities, the lack of suitable sediment exposures, and the difficultly of assigning isolated surface material to LP technocomplexes.

If the frequency of surface lithic material is any indication, it appears that the Debed Basin was occupied relatively intensely by MP peoples, a finding that mirrors a rich MP record in Georgia (Tushabramishvili *et al.* 1999). While most of the MP material from Armenia derives from surface contexts, there are notable exceptions, including the cave sites of Lusakert 1, Yerevan 1, and Hovk 1, the rockshelter of Lusakert 2, and the open-air site of Kalavan 2. Based on both chronometric dating and lithic typology, Lusakert 1 and 2, Yerevan 1, and Kalavan 2 appear to have late MP occupations (Adler *et al.* 2012; Fourloubey *et al.* 2003; Ghukasyan *et al.* 2011; Yeritsyan 1970, 1975) while Hovk 1 dates to the early MP (Pinhasi *et al.* 2011). Bagratashen 1 can now be added to the list of sites with MP material in stratigraphic context; typological comparisons tentatively suggest an early MP date for the occupation, although Optically Stimulated Luminescence (OSL) samples from the site have been obtained to further evaluate the site's age in light of work done elsewhere (table 1).

As noted, the MP artifacts of the Debed Valley were most commonly made of dacite and other fine-grained volcanic (FGV) stones while those of the UP were flaked from various flints (table 4). It is possible that the ease with which dacite in particluar could be procured locally and abundantly partially explains its frequent utilization by MP toolmakers. Patterns of raw material exploitation could therefore be seen as a byproduct of differences in residential mobility between MP and UP groups. However, raw material functionality may have played a role as well. In the Great Basin and Mojave Desert regions of North America, for example, it is widely recognized that FGVs (e.g., dacite, andesite, basalt, rhyolite, etc.) were used more frequently by Early Holocene groups than they were among Late Holocene hunter-gatherers, who tended to prefer various cryptocrystalline silicates (CCS) like chert and jasper (Beck *et al.* 2002; Duke and Young 2007; Elston 1994; Jones and Beck 1999; Page 2008). Experimental work with materials from major quarries in the Mojave Desert in the United States shows local varieties of CCS to have superior flaking qualities compared to FGV (Duke 2013), but the crystalline matrices of various FGV types produce more rigid working edges than CCS, facilitating long-term tool durability. This would have been an ideal characteristic for the manufacture of the large projectiles and expedient core and flake tools typical of many Early Holocene assemblages in the Great Basin and Mojave Desert, which were presumably geared toward heavy duty tasks like large game hunting and green plant processing (Duke 2011).

Table 4. Contingency table analysis of raw material frequencies between MP and UP artifacts.*†

Observed values					
	FGV	**Sedimentary**	**Flint**	**Obsidian**	**Total**
MP	281	6	8	2	297
UP	3	2	43	3	51
Total	284	8	51	5	348
Expected values					
	FGV	**Sedimentary**	**Flint**	**Obsidian**	
MP	242.38	6.83	43.53	4.27	
UP	41.62	1.17	7.47	0.73	
Freeman-Tukey deviates (G=196.7, df=3, p=0.00)					
	FGV	**Sedimentary**	**Flint**	**Obsidian**	
MP	**2.40**	−0.23	**−7.40**	−1.10	
UP	**−9.21**	0.76	**7.63**	**1.75**	

*Significant Freeman-Tukey deviates (p=.05, +/−1·20) are bolded. G-tests are similar to chi-square tests, but perform better when expected frequencies are low (Wheater and Cook 2000: 133). Zero-centered Freeman-Tukey deviates enhance G-test results by identifying variables with cell values significantly greater (+) or smaller (−) than expected by the null hypothesis (i.e., no significant difference is expected) (Meltzer et al. 2006: 163). †FGV=tuff, dacite, and basalt; Sedimentary=limestone and sandstone; MP=Middle Palaeolithic; UP=Upper Palaeolithic.

In this vein, FGV may have been better suited to the Levallois flaking techniques employed by MP hunter-gatherers in the lower Debed, which, as noted, emphasized the manufacture of large flake blanks for expedient projectiles, cutting implements, and scrapers. Experimental work suggests that the morphology of Levallois flakes was partially geared towards maximizing durability (Eren and Lycett 2012), a property that may have been enhanced by more durable FGV raw materials. UP technologies, on the other hand, and much in line with those of Late Holocene hunter-gatherers in the Great Basin and Mojave Desert, may have been better served by more easily knappable flints. The small blade cores and backed bladelets typical of UP assemblages in the area, which were likely intended for composite tools, would have served as an effective trade-off between transportability and tool use life. We present these ideas as hypotheses only, to be tested with thorough excavations of in situ sites and detailed knowledge of the distribution and quality of various raw material sources in the Debed Basin (and beyond).

Conclusions

Although previous research has documented a rich record of Palaeolithic occupation in Armenia, its integration into wider discussions of Palaeolithic settlement has been hindered by a lack of well-studied sites. Reconnaissance survey in northeastern Armenia's Debed River Valley has identified 23 new Palaeolithic localities, several of which have great potential to preserve in situ occupations. These results echo earlier work in confirming the long settlement history of the southern Caucasus, although until now the prehistory of Armenia's Debed River Valley has been virtually unknown. It is now clear that this area will provide novel data on Palaeolithic adaptations in the region.

Acknowledgments

This research is part of the Lori Depression Paleoanthropological Project. Suren Kesejyan is a member of the team who does not appear as an author. Sincere thanks are due to Dr. Pavel Avetisyan and the Institute of Archaeology and Ethnography (National Academy of Sciences of the Republic of Armenia) for their support of this research. Samvel Nahapetyan (Department of Cartography and Geomorphology, Yerevan State University) provided important information on the geomorphology of the Debed River Valley, and Vincent Ollivier (Laboratoire Méditerranéen de Préhistoire Europe Afrique) kindly provided argon-argon data on the Debed basalts. This research has been funded by the National Science Foundation (BCS-0936385 to CPE), the Armenian branch of the Gfoeller Foundation, and the Institute of Archaeology and Ethnography of the National Academy of Sciences of the Republic of Armenia. To these institutions we are extremely grateful. We would also like to acknowledge Dan Adler, Philip Glauberman, and one anonymous reviewer for the time and effort they expended in helping to get the manuscript into shape, and Garik Prevyan for drawing the artifacts.

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