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Inglis, Robyn Helen orcid.org/0000-0001-6533-6646, Sinclair, Anthony, Shuttleworth, Andrew et al. (5 more authors) (2014) Investigating the Palaeolithic Landscapes and Archaeology of the Jizan and Asir Regions, Southwestern Saudi Arabia. Proceedings of the Seminar for Arabian Studies. pp. 193-212.

Manuscript submitted to Proceedings of the Seminar for Arabian Studies (2013) Vol 44. Published as: Inglis, R., A. Sinclair, A. Shuttleworth, A. Alsharekh, M. Deves, Saud Al Ghamdi, M. Meredith-Williams and G. Bailey. 2014. Investigating the Palaeolithic Landscapes and Archaeology of the Jizan and Asir Regions, Southwestern Saudi Arabia. *Proceedings of the Seminar for Arabian Studies 44: 193–212.*

Investigating the Palaeolithic Landscapes and Archaeology of the Jizan and Asir Regions, Southwestern Saudi Arabia

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Introduction

The Arabian Peninsula, situated between Africa and Eurasia, is key to narratives of global hominin dispersals. Traditional emphasis on the Nile-Levant corridor as the primary Palaeolithic dispersal route between Africa and Eurasia has recently been challenged by evidence for dispersals across the Southern Red Sea during low sea stands (Bailey 2009; Beyin 2006, 2011; Lambeck et al. 2011; Petraglia & Alsharekh 2003; Rose 2004). Yet despite this renewed focus on Palaeolithic Arabia, the timing and conditions of the presence of hominin populations in the peninsula remains unclear. Lithic assemblages dated to MIS5 in the East and South of the peninsula possess African affinities (Armitage et al. 2011; Rose et al. 2011), whilst a Levantine influence has been proposed for Middle Palaeolithic (MP) assemblages at 75,000BP from Northern Saudi Arabia (Groucutt & Petraglia 2012; Petraglia et al. 2011). MIS3 MP industries from Yemen appear local in origin (Delagnes et al. 2012, 2013; Sitzia et al. 2012). Documented in a range of geographical settings, from the Arabian escarpment foothills to fossil lake beds in the hyper-arid interior of the Peninsula, these discoveries illustrate a rich record of occupation that is crucial to the narratives of global dispersals, but a record that remains, at present, only poorly understood.

Palaeolithic occupation of the Peninsula took place in the context of long term, dynamic environmental trends. During humid periods, populations expanded into now-hyperarid areas across the continent (Groucutt & Petraglia 2012; Parker 2009; Parker & Rose 2008). During arid periods, populations persisted in environmentally-buffered regions at the Peninsula's edges (Delagnes et al. 2012, 2013; Sitzia et al. 2012). Yet whilst broad-scale environmental reconstructions are crucial to understanding peninsula-scale population trends, the physical landscape is important when considering occupation patterns and landscape use. Topographic features at the regional and local scale can moderate or amplify environmental change, altering the distribution of plant, and animal, resources. Features such as watercourses and raw material sources could have attracted activity. Specific landscapes, for example coastlines, may have provided particular concentrations of resources potentially attractive to past populations (Bailey and King 2011; Bailey et al. 2011, 2012). Physical landscape characteristics may have therefore played a key role in hominin dispersals, with groups potentially following attractive concentrations of resources within certain landscape types and ecozones.

The DISPERSE project is undertaking new archaeological and geomorphological survey in Southwestern Saudi Arabia, in Jizan and Asir regions, combined with mapping techniques to reconstruct landscape evolution and site location from the regional to site scale. Such reconstruction will allow the assessment of the relationships between Palaeolithic sites and their landscapes, and potentially choices made by the hominins inhabiting the landscapes. This paper reports on the first full season of geoarchaeological survey undertaken over four weeks in February and March 2013 and presents preliminary observations on the Palaeolithic record of the region.

Geological Setting

The study area can be divided into four broad geomorphic units (Figure 1; Devès et al. 2013). To the East of the study area, the escarpment of the Arabian plateau rises to over 2700m above sea level (asl). Erosion of this scarp has produced steep-sided valleys in the shists, granites and greenstones (Müller 1984). At its foot is the 190km-wide coastal plain, the Tihamat Asir, is divided into the Upper and Lower Coastal Plains along the line of metamorphic schist foothills that run parallel to the escarpment and the Red Sea rift, and rise to ~700m asl 40km from the coast (Müller 1984) - the 'Magmatic Line' (Devès et al. 2013). These hills are associated with Quaternary cinder cones and lava flows, as well as Miocene dyke intrusions. To the West, the Lower Coastal Plain is largely flat, covered by Quaternary and Holocene sediments. To the East, the Upper Coastal Plain has a steeper slope and consists largely of bare basement rock overlain by alluvial fans (Dabbagh et al. 1984; Müller 1984). The topographic uniformity of the Lower Coastal Plain is interrupted in the North by the Harrat Al Birk lava fields, active before and during the Quaternary, and potentially the Holocene (Bailey et al. 2007b; Brown et al. 1989; Coleman et al. 1983).

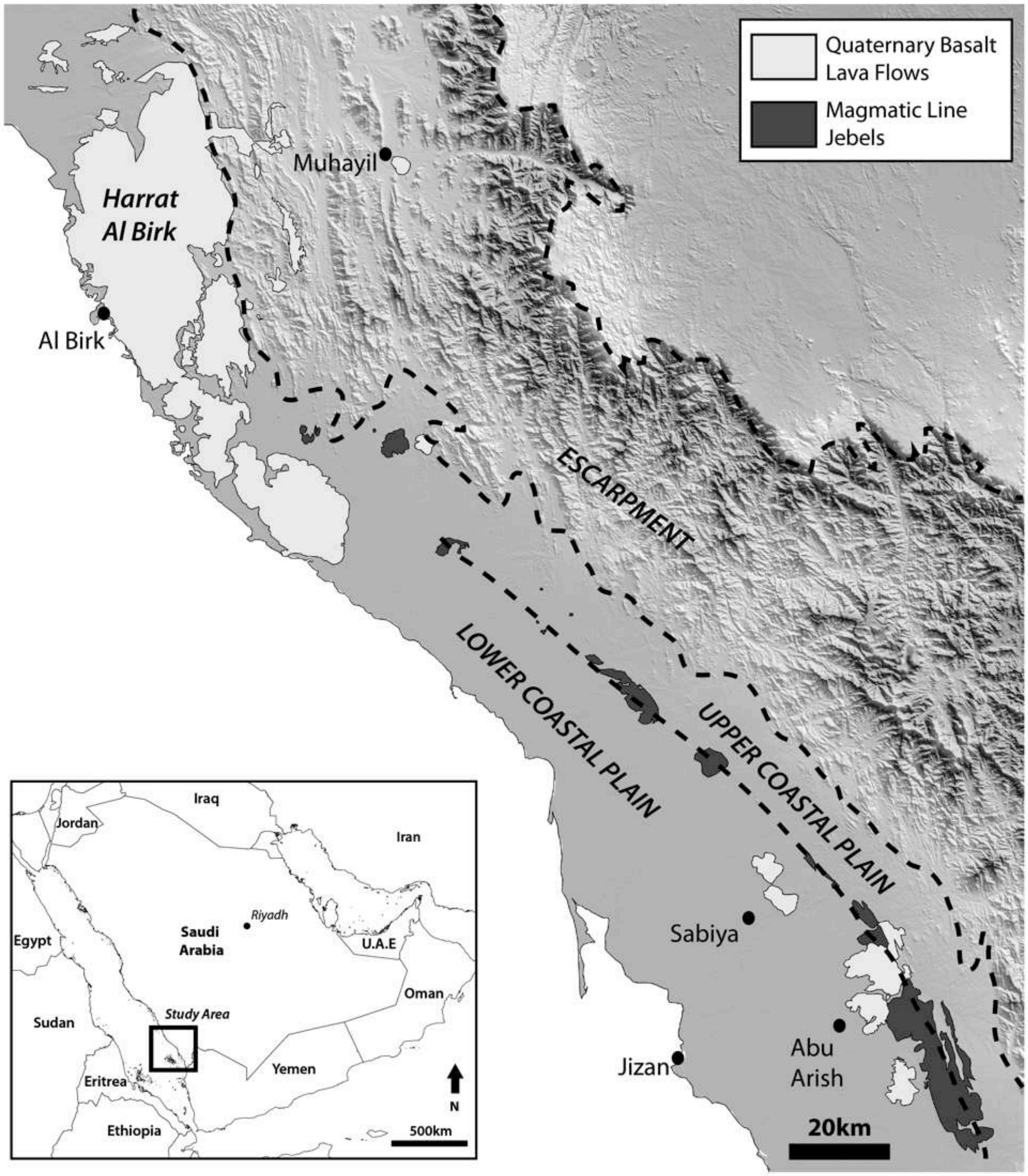

Figure 1: Location of study area and broad scale geomorphological zones in the study area as defined by the DISPERSE project (after Deves et al. 2013). Elevation data © CGIAR-CSI SRTM 90m v4.1 database.

February 2013 Field Season

Prior to survey, satellite imagery (LandsatGeoCover 2000/ETM+ Mosaics and imagery accessed through Google Earth imagery) and DEMs (ASTER GDM v2 and SRTM 90m v4.1) was used to map and classify landforms, with ground-truthing visits in May/June and November 2012 (Devès et al. 2013; Inglis et al. In Prep). Landforms were assessed for their potential for surface Palaeolithic archeology and preservation of, and access to, potentially artefact-bearing stratigraphy. Survey in February 2013 focused primarily on areas of low sedimentation and high potential for visible surface archaeology (e.g. lava flows and exposed bedrock), to rapidly assess the region's archaeological potential. Key geomorphological features for dating landscape evolution, such as raised beach terraces, were targeted for sampling and dating where appropriate.

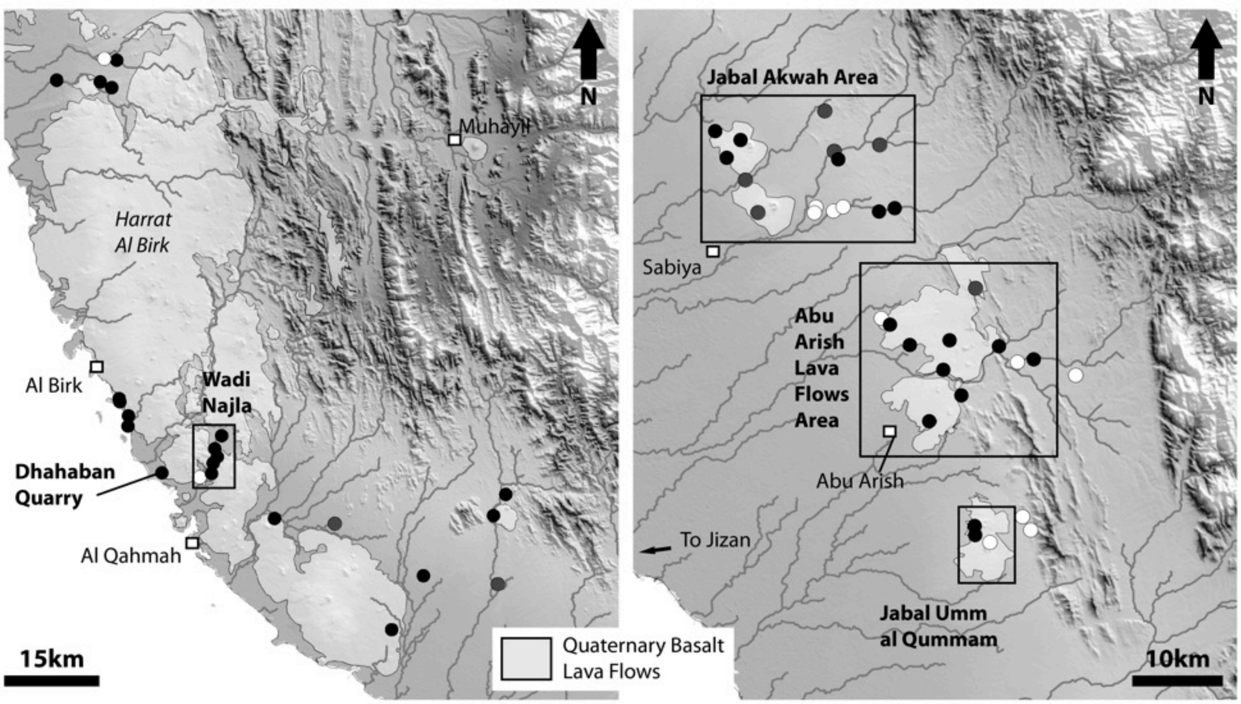

Figure 2: Locations visited during February 2013 survey, showing the locations that yielded Palaeolithic artefacts. Elevation data © CGIAR-CSI SRTM 90m v4.1 database.

54 locations were visited, and Palaeolithic artefacts recorded at the vast majority (Figure 2). Over 700 lithics were recorded, logged with a handheld GPS, and collected. GPS waypoints were grouped later into Localities. Preliminary lithic analysis was conducted prior to deposit in Sabiya Museum, Jizan Province. Whilst work is still at an early stage, this paper highlights locations and their contents that proved particularly useful in informing on the region's archaeological potential and its landscape development. For descriptive purposes, we use the terms Early, Middle and

Later Stone Age to label, in broad terms, assemblages containing, amongst other items, bifacial handaxes, cleavers and large cutting tools (Early Stone Age - ESA), flake and blade products from prepared cores (Middle Stone Age - MSA) and bladelet and microlithic elements (Later Stone Age - LSA), recognizing a broad comparability to the Lower, Middle and Upper Palaeolithic terminology used by others (see Groucutt 2013 for discussion). The use of this essentially African terminology also reflects the Project's interest in the dispersal of hominins out of that continent.

Harrat Al Birk

The Harrat Al Birk extends ~100km along the coast, and the basalt lava flows have yielded previous observations of ESA and MSA artefacts (Overstreet 1973; Zarins et al. 1980, 1981). The flows extend into the sea, and the relatively steep coastline this produces (in contrast to the low-relief Tihamat) has preserved a series of raised beach and coral terraces, themselves sometimes associated with artefacts (Bailey 2009; Bailey *et al.* 2007; Zarins et al. 1981).

Wādī Najla

Wādī Najla runs NE-SW for 12km from the middle of the *harrat* to the sea north of Al Quamah, beginning in a 3.5km wide basin before diving into a deep gorge for ~4km, where a columnar basalt flow filled an existing valley in the schist bedrock (Figure 3A). Overlying the lava in the gorge are numerous tufa/wadi calcrete outcrops, up to 3m in thickness (Figure 3b). At the edge of the lava flow, the wadi widens and flows through a broad valley to the sea.

In the basin at the head of the wadi, 20 lithics, of MSA and ESA typology, were recovered from around the base of a small (c. 20m high) bedrock jabal and a transect extending 150m SW from its base (L0039). Artefacts were primarily basalt, but also quartz and andesite. The material appeared greater in density towards the base of the jabal, in contrast to the flat area to the SW. A potential core rejuvenation flake from a basalt blade core, and a flake from a small basalt pyramidal core suggesting MSA activity were observed on top of the jabal.

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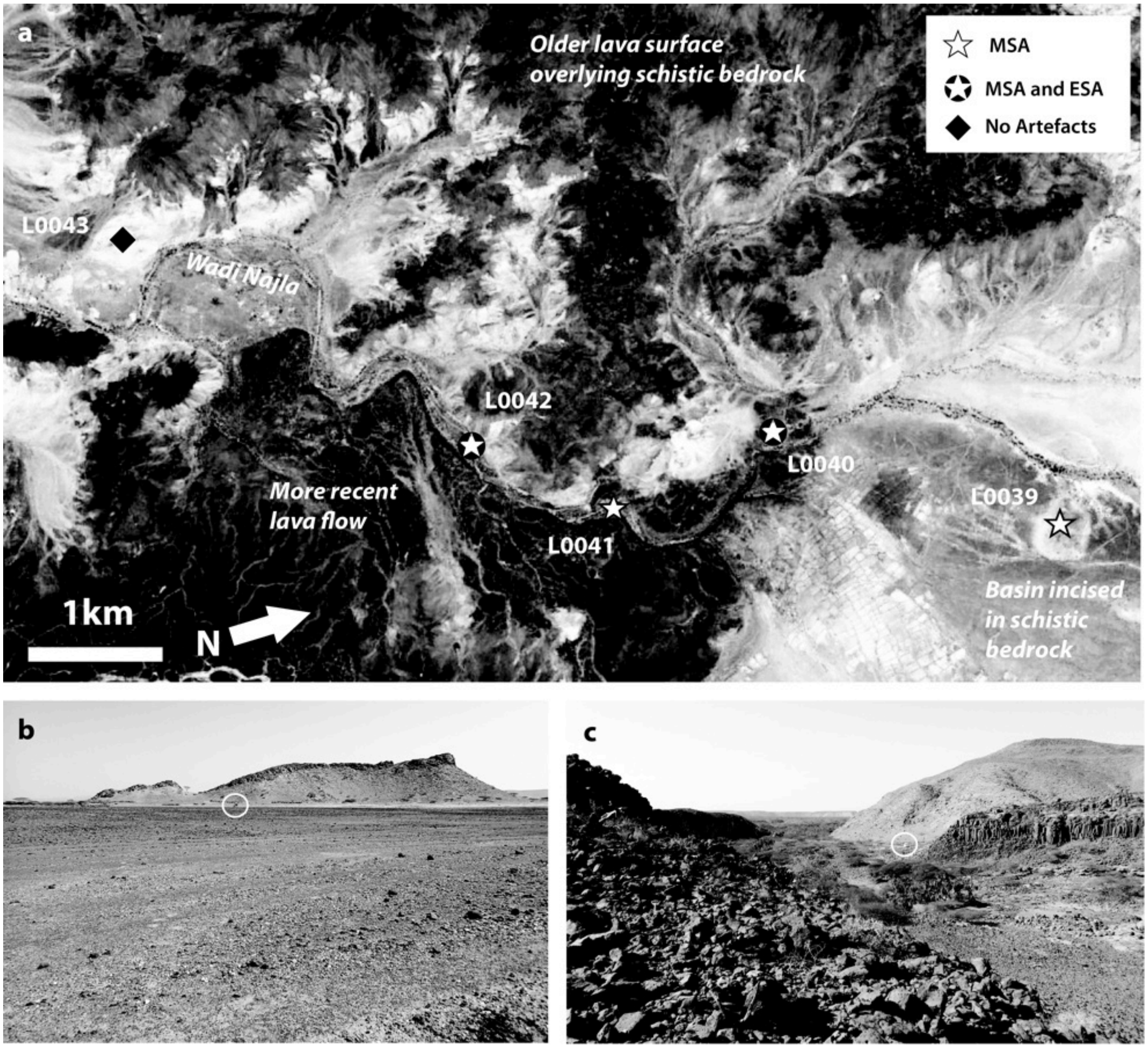

FIgure 3: a) Aerial view of Wādī Najla, showing main geomorphological units and localities visited in the area. Note deep gorge running roughly along the edge of the younger lava flow to the south of the wādī. Satellite imagery © DigitalGlobe 2013, accessed through Google Earth. Imagery Date 7/5/2005. b) View of jabal and L0039, looking E. MSA material was found on the near flanks of the jabal, as well as atop the left hand side of the larger, right hand part of the ridge. Car ringed for scale. Photo: A. Sinclair. c). View from L0041, looking SW down wādī gorge. Note incised columnar basalt lava flow, and tufa outcrops in base of the present wādī to bottom right of photo. Car ringed for scale. Photo: R. Inglis.

At L0041, little archaeology was observed from the gorge floor, or from the lava flow above the wadi to the East, where the potential proximal end of a quartz bladelet with signs of preparation prior to removal was the only lithic observed. A single undiagnostic basalt flake was recorded from just below two small rockshelters on the NW side of the wadi gorge.

A 400m transect, from a short tributary draining the northwest side of the wadi, across wadi floor alluvium to the top of the lava flow (L0042), yielded 12 lithics. In the tributary, large basalt and andesite flakes, one retouched to create a straight ESA large cutting tool edge, were collected. On alluvium at the wadi edge, MSA lithics were observed in the form of an unsuccessful convergent flake on basalt, and a flake from a very small basalt discoid core. On top of the lava flow, an MSA flake from a radial core, as well as two large (potentially ESA) basalt flakes, including one from a possible discoid core, were observed.

At the mouth of the wadi, 1km SE from the edge of the basalt lava flow and gorge, no artefacts were observed around or on top of a bedrock jabal (L0043) rising ~10m above the broad valley.

The archaeological record illustrates the wadi's use by ESA and MSA populations. Whilst the sample remains small, more artefacts were observed in the upper parts of the wadi (e.g. L0039 and L0040), than along the gorge, potentially indicating a focus of activity in the former. This may suggest that the gorge was used as a corridor for movement between the coast and the inland of the *harrat*, and more time spent in its headwaters. The tufa belies a period in the past when the environment was much wetter than present, with the finely laminar nature of the tufa indicating perennial flows in the wadi (I. Candy, Pers. Comm. 2013). Locating unaltered tufa deposits for dating to chronologically constrain this period(s) of humidity will be a key future priority.

Wādī Dhahaban Quarry and Coral Terraces

5km north of Al Quamah, adjacent to the coast road, a quarry exposes sediments overlying a lava flow (L0034) at 11m asl (Figure 4a). Basalt artefacts were observed on the surface of the profile in May 2012 (Devès et al. 2013).

The ~5m deep sequence in the quarry consists of predominantly carbonate and shell sand layers, varying in their degree of consolidation and lamination. The sequence, capped by 1.25m of indurated, heavily weathered beach rock, was interpreted as beach/marine sediments (Figure 4b). Bulldozing has removed the majority of the lateral extent of the beach rock, destroying the clear relationship between these sediments and potential fossil dune deposits on the lava flows at the eastern edge of the quarry.

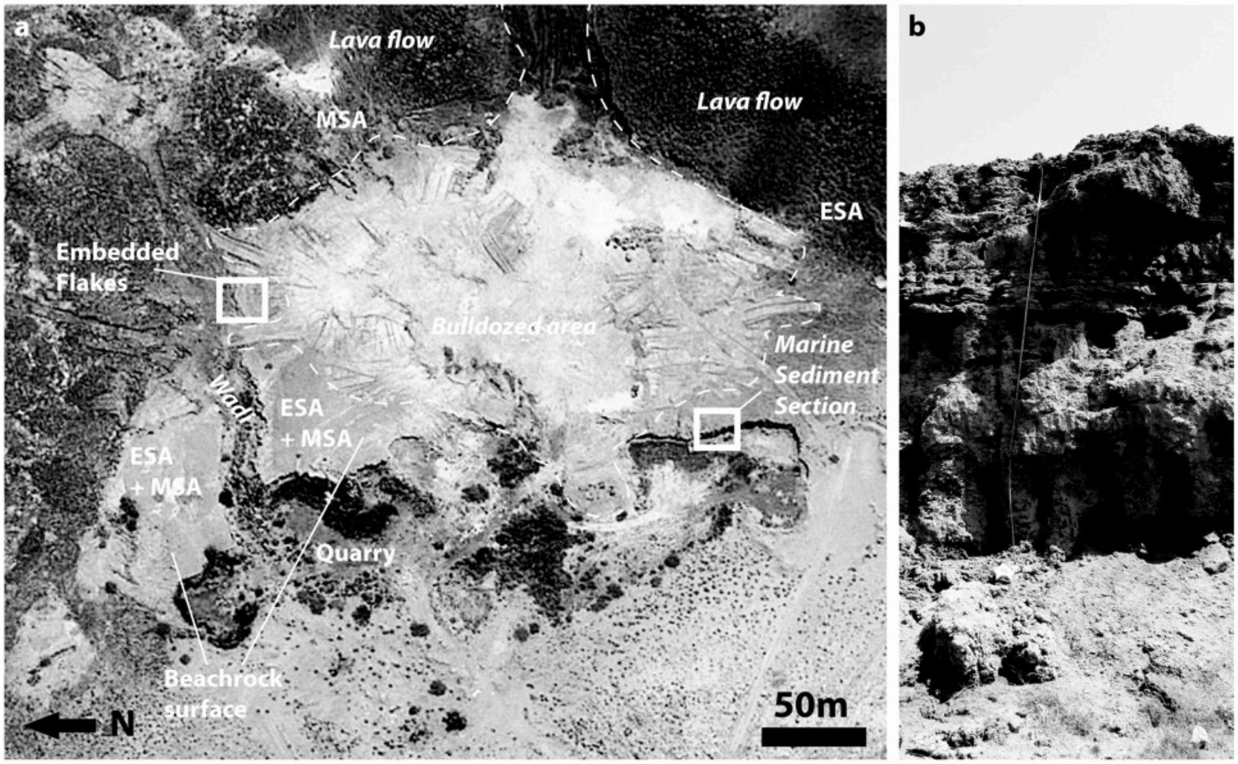

Figure 4: a) Aerial view of Dhahaban Quarry showing the local geomorphological zones, and the location of the section that contains embedded lithics exposed at the edge of the wādī (See Figure 5), as well as the location of the main marine sediment section exposed by quarrying. Satellite imagery © DigitalGlobe 2013, accessed through Google Earth. Imagery Date 21/09/2009. b) Marine sediment section exposed by quarrying. Photo: R. Inglis.

At the northern edge of the quarry, the beach sediments are cut by a small wadi. Here the sequence consists of a poorly-sorted unit of well-rounded cobbles of lava and coral concreted with carbonate, (potentially indicating coastal wadi activity), overlain by finer, laminar units similar to those exposed in the main section (Figure 5a). Unrolled lithics were observed concreted within the cobble unit, as well as a smaller number within the laminar sand units. The lithics were left in-situ pending future detailed recording. Flakes observed within the cobble unit appear to derive from prepared cores consistent with MSA lithics found elsewhere at the locality (Figure 5b) whilst the large basalt flake accommodated within the top of the marine sand unit shows no clear signs of prepared core working (Figure 5c).

Figure 5: a) Area of beach rock and associated sediments containing lithics, exposed by wādī action. Note change from lower, cobble unit to overlying more laminar sands at the height of the feet of the left hand figure. Photo: R. Inglis. b) Basalt flake with potentially prepared striking platform embedded in lower cobble unit of section. Scale with 1cm divisions. Photo: R. Inglis. c) Basalt flake accommodated in upper fine shell sand unit. Scale with 1cm divisions. Photo: A. Sinclair.

~100 ESA and MSA surface lithics, overwhelmingly manufactured on basalt, were collected from the quarry and lava flows. ESA artefacts included large flakes, cleavers and a handaxe, whilst convergent flakes and flake-blades indicated an MSA presence. There was some spatial variation in the cultural affinities - on the un-bulldozed beach rock in the northwest of the quarry, there was a mixture of ESA and MSA artefacts. MSA artefacts were recorded on the edge of the lava flows to the northeast of the quarry, whilst, separately, to the southeast on the lava flows the artefacts appeared predominantly ESA.

At present, the timing and conditions of the deposition of artefacts and their relationship to the marine sediments is unclear. The artefacts may have been deposited on dry land prior to marine transgression, or rolled into the finer sediments from the flows. Future investigations will focus on confirming the sedimentary context of the lithics, as well as dating the beach sediments. Investigation of past shorelines will be extended to recording and dating the raised coral terraces along the Harrat Al Birk coast associated with artefacts (Bailey et al. 2007b; Devès et al. 2013; Zarins et al. 1981).

Southern Jizan

Investigations in Southern Jizan centred around the region East of Sabiya and Abu Arish, specifically on the volcanics associated with the Magmatic Line. Due to the extensive Quaternary and Holocene sediment cover, investigation focused on areas where Palaeolithic surface archaeology would be most visible, such as lava flows and exposed basement rock.

Wādī Sabiya and Jabal Akwah

The twin cinder cones and lava flows of Jabal Akwah lie 8km West of the Magmatic Line. Together with the Magmatic Line jabals, they form marked topographic points in an otherwise flat landscape (dominated by Quaternary and later alluvium and aeolian deposits), rising to ~60m and ~30m above the present plain respectively (Figure 6b). Wādī Sabiya and a tributary, as well as Wādī Nakhlan flow through the Magmatic Line, with Wādī Nakhlan continuing between Jabal Akwah's cinder cones and Wādī Sabiya flowing to the south (Figure 6a). Incision by Wādī Sabiya has exposed up to 15m of silts, wadi sands and gravels under volcanic tuff (Figure 6c). The tuff has been linked to the earliest date for the Jabal Akwah lava flows of 0.44±0.26mya (K/Ar, Dabbagh et al. 1984).

Artefacts were observed at 10 localities, all on areas of low sedimentation (lava flows and jabals), whilst stops on the Quaternary/Holocene alluvial and aeolian sediments yielded no artefacts. On the lava around the northern cinder cone, a total of 23 lithics were recorded at three localities (L0013-15). The material, observed on exposed lava surfaces, includes ESA and MSA forms on basalt and andesite: a potential ESA basalt cleaver or core, and MSA flakes and cores including a recurrent Levallois core. A single undiagnostic andesite flake was observed on the eastern edge of the southern cinder cone lava flows (L0001), and two rounded basalt cobbles were observed on the otherwise angular lava flows overlooking the wadi between the cinder cones (L0019).

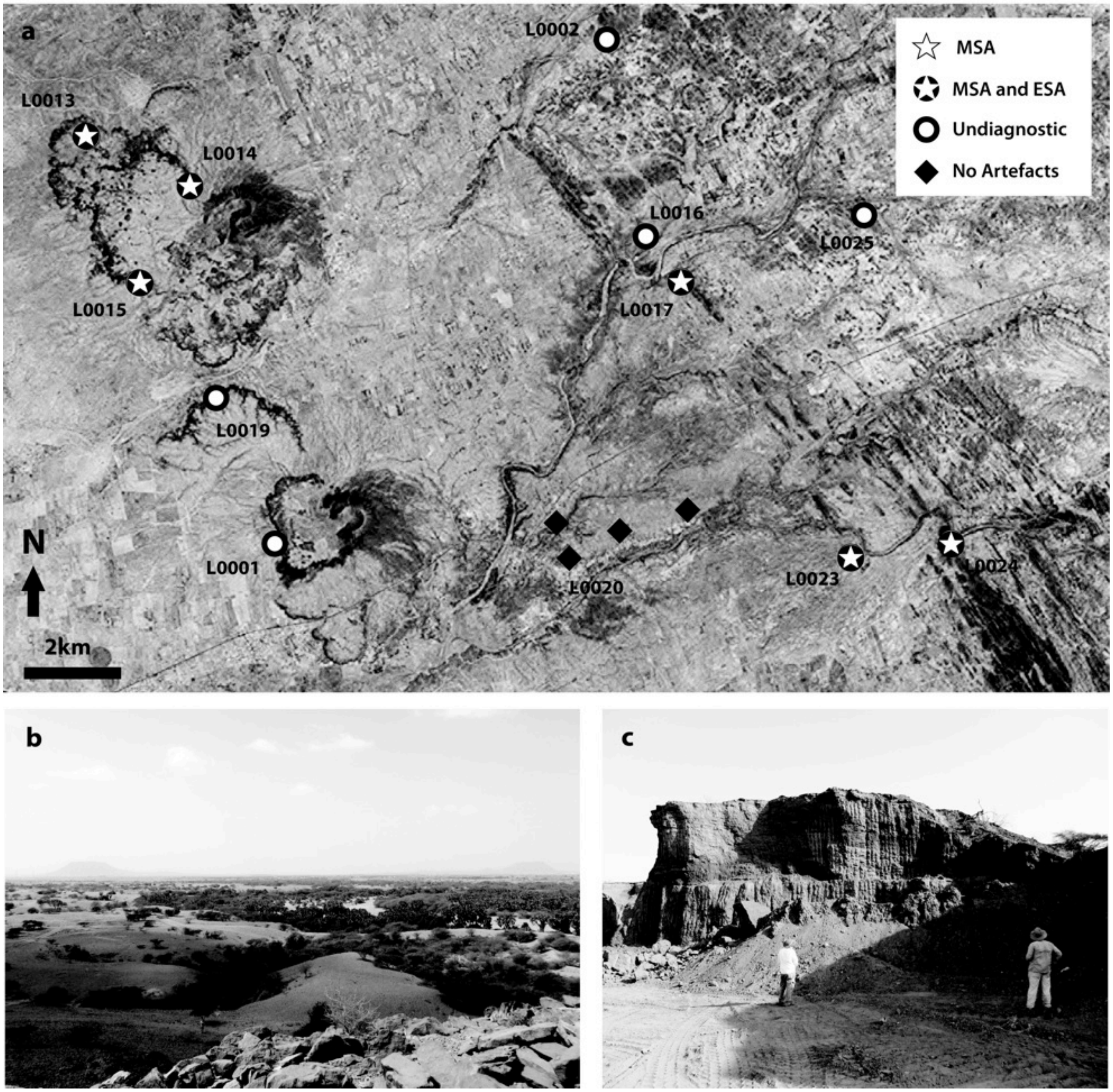

Figure 6: a) Jabal Akwah area showing the localities visited and the cultural affiliations. Note the two cinder cones of Jabal Akwah to the left of the image, with their associated lava flows, and the line of jabals to the right of the image that mark the northernmost part of the Magmatic Line. Satellite Imagery © USGS Landsat ETM+ 2000 Gecover Mosaics. b) View of Jabal Akwah from L0017, showing broad alluvial plain. Note the topographic prominence of the cinder cones. Photo: R. Inglis. c) Wādī floodplain sediments underlying tuff in quarry adjacent to present course of Wādī Sabiya, south of Jabal Akwah. Photo: R. Inglis.

Two areas to the East of Jabal Akwah, where tributaries of Wādī Sabyia flow through gaps in the jabals were visited. The northernmost consisted of two localities: L0016, on alluvium, and L0017, on top of the jabals. Two undiagnostic quartz flakes and a pottery sherd were the only artefacts observed on the alluvium at L0016. The area on the jabals above the wadi yielded 28 ESA and MSA artefacts, on quartz, basalt, chert and shale. The ESA was less prevalent than the MSA, represented by flakes and a potential basalt scraper. MSA artefacts from the jabal top included a potential retouched core preparation basal flake from a recurrent Levallois core, and a quartz flake with a facetted platform. Towards the foot of the jabal, an area a few metres across yielded a particular concentration of MSA flakes and cores on green chert, shale, quartz and basalt, potentially representing at least two clear sets of flaking activity.

This pattern is mirrored 8km to the southwest at L0024, where 38 lithics were recorded on top of the jabals overlooking Wādī Sabiya. A 300m transect from the top of the jabal to the alluvium yielded no artefacts on the alluvium. ESA and MSA artefacts were instead observed on the jabal, as well as a few potential LSA indurate shale flakes. The ESA artefacts are a discoidal core and flake on basalt, whilst MSA pieces comprise the remainder of the assemblage, including potential convergent flakes, points on chert and andesite, as well as prepared basalt cores and flakes.

Away from the cinder cones and jabals, two areas were visited in areas to the East of the Magmatic Line, an area of exposed bedrock (L0002) and a low schist jabal (L0025). Both locations were very low density, with L0002 yielding a small quartzite convergent flake and another chert flake, and L0025 yielding a small number of both basalt and shale flakes.

The final location where artefacts were observed was a basalt dyke (L0023) visible in Wādī Sabiya, 1km downstream from L0024. The andesite flake and basalt discoidal core could be either ESA or MSA. No artefacts were observed in and around the present wadi.

Although the alluvial plain was not investigated extensively, the above confirms its low potential for Palaeolithic surface archaeology. Due to this taphonomic variability, bias in artefact distribution towards the jabals and lava flows cannot be interpreted as a result of behavioural patterning. Yet a difference in artefact density appears to exist between Jabal Akwah (relatively low) and the Magmatic Line jabals (relatively high). Whether this reflects an preferential attraction to the jabals, driven by the views they afforded over watercourses and potential prey requires further testing. In addition, further investigation of the sediments underlying the volcanic tuff in Wādī Sabiya is required: if the eruption of Jabal Akwah dates from 0.44±0.26mya, the sediments protected below the tuff potentially contain sediments and artefacts from within the time period of the earliest hominin dispersals from Africa.

Abu Arish Lava Flows

East of Abu Arish, lava flows from cinder cones in the Magmatic Line spread West over 12km and are incised by Wādī Jizan (Figure 7). The eruption of these flows at 0.8±0.3mya (K/Ar), buried a wadi floodplain (Dabbagh et al. 1984), sediments that are exposed in quarries and wadi sections in the region. Palaeolithic artefacts have been reported from locations around the edges of these flows (Bailey 2012, Pers. Comm; Devès et al. 2013; Zarins et al. 1981).

Locations at the edges of the flows, as well as their interior, were visited. A very low density scatter of ESA and MSA artefacts appears to cover the flows, with a few occurrences of potential LSA artefacts (L0003 and L0026), however, there is some variation in artefact number between locations.

A 200m transect along a lava at the eastern edge of the Wādī Jizan Dam Lake (L0006) yielded 14 artefacts on basalt, quartzite and chert, with MSA or later affinities. These included convergent flakes on basalt, as well as five small chert flakes, three of which have evidence of retouching to scraper form. The locality provides commanding views over the area now flooded by the dam lake, where 4 wadis converge into Wādī Jizan, an area potentially attractive to past animal populations.

At the northeastern edge of the flows, superimposed lava flows were visited. L0008 on a lower, more porous flow yielded no artefacts, yet 1km to the SE, on slightly less porous, younger lava, 2 ESA basalt cores and 10 MSA flakes and cores on basalt (including a possible recurrent Levallois or convergent core) and chert were observed within a few metres. The basalt artefacts were usually found in association with areas of denser, fine-grained basaltic lava.

Other localities overlooked wadis or small basins, aside from one (L0028) situated in the centre of the flows. All (save for L0007 on the NE side of the Magmatic Line where a single, ~30cm undiagnostic basalt flake was observed but not collected) yielded small numbers of ESA and MSA artefacts, with L0003, near SE of the Abu Arish-Fifa road, potentially containing LSA quartz flakes alongside ESA and MSA artefacts.

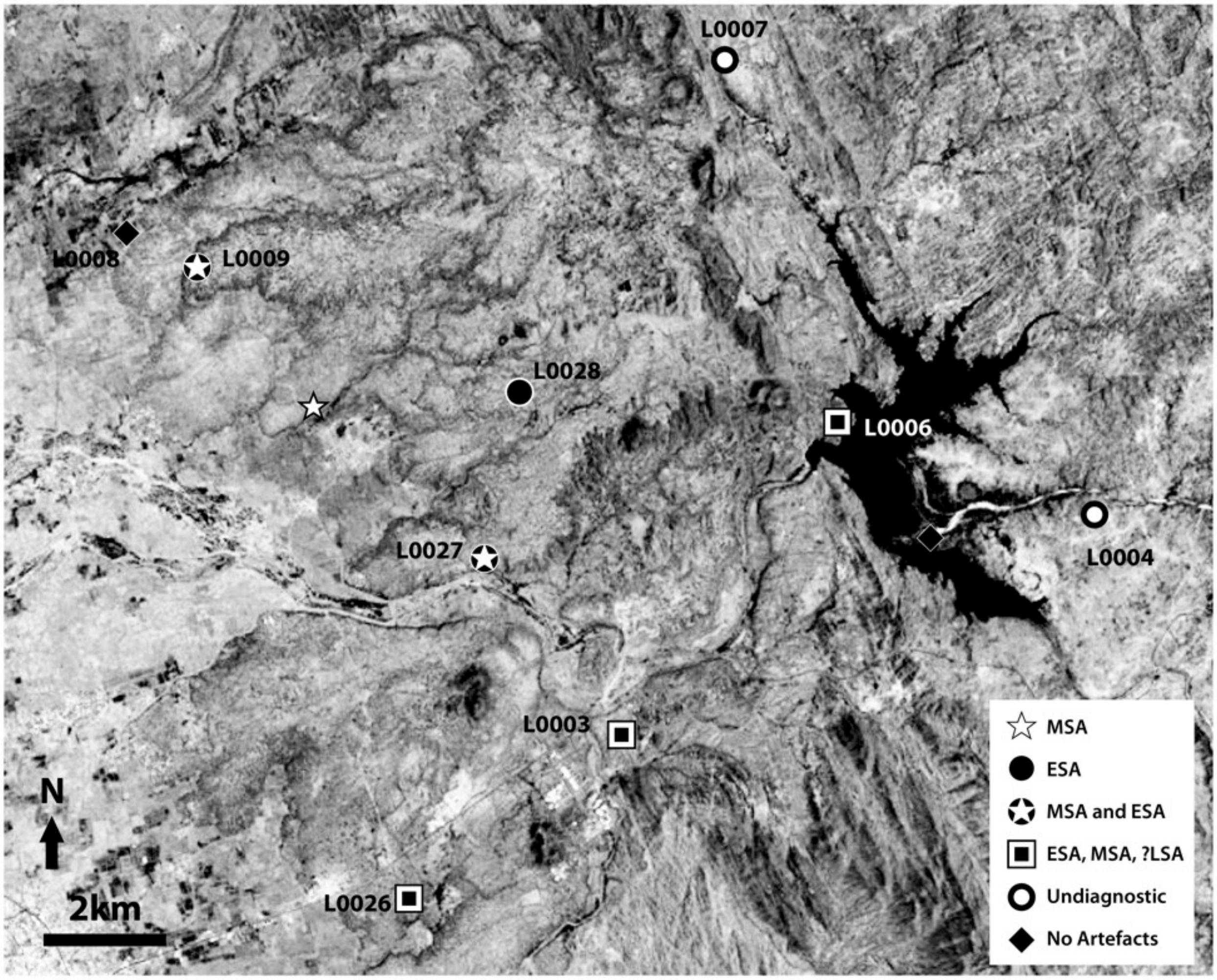

Figure 7: Aerial view of Abu Arish lava flow area. Note the linear schistic jabals to the top and bottom of the picture, and the extensive preservation of the lava flows, as well as the major incision into the lava flows of Wādī Jizan. The town of Abu Arish is visible in the bottom left hand corner of the image. Satellite imagery © USGS, accessed through Google Earth. Imagery Date 6/04/2009.

These localities only begin to illustrate the archaeological potential of the lava flows, but some hypotheses regarding hominin landscape use can be formed. Differences in artefact density between the lava flows at L0008 and 0009 suggest preferences for locations with views over the surrounding landscape, as well as the targeting of certain lava types for exploitation. In the same way, areas on the lava flows overlooking wadis (for example L0006 overlooking the dam lake) may have been visited more frequently due to a concentration of water and potential animal resources, and thus more material deposited. These hypotheses need, of course, to be tested through further systematic survey of the lava flows.

Jabal Umm Al Qummam

To the south of the Abu Arish lava flows, the twin cinder cones of Jabal Umm Al Qummam lie 3km West of the Magmatic Line. Lava flows from the cones, dating to 0.9±0.3mya (K/Ar), are covered by orange, alluvial or aeolian, sediments (Dabbagh et al. 1984). This palaeosurface is buried by aeolian sedimentation, subsequently eroded by dendritic wadis (Figure 8). A calcareous crust and carbonate concretions associated with the old land surface have dated to 8100BP and 7200BP respectively (^{14}C) (Dabbagh et al. 1984: 157). OSL samples were taken from the major sediment units.

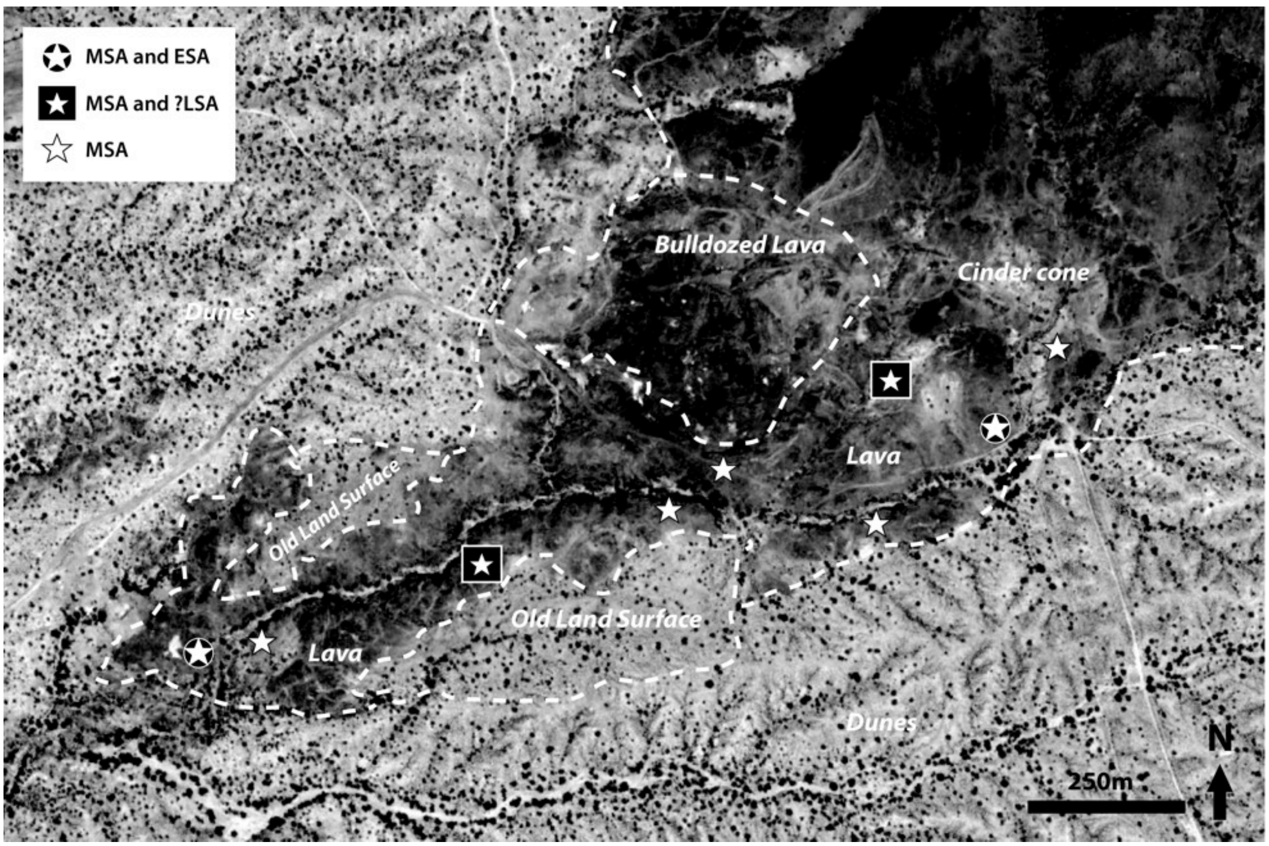

Figure 8: Aerial view of SW edge of Jabal Umm al Qummam's northern cinder cone, locality L0010, showing major geomorphological units and main concentrations of artefacts. Note restriction of artefacts to the exposed lava surface. Transect was walked from lower left hand edge of lava flow NE to the base of the cinder cone. Satellite imagery © Digital Globe, accessed through Google Earth. Imagery Date 29/10/2010.

The western edge of the northern cinder cone yielded a single ESA discoidal core on andesite (L0005). In contrast, a 1.2km transect along the exposed lava to the SW of the cinder cone, bisected by a wadi, yielded 62 artefacts (L0010) (Figure 8). The artefacts, predominantly ESA and

MSA, were overwhelmingly basalt, with some chert, quartz and andesite pieces. ESA artefacts included large flakes and simple cores as well as a basalt cleaver. MSA affinities were present in recurrent Levallois flakes, including a convergent flake struck from the tip, and a blade core. The MSA artefacts were predominantly basalt, yet quartzite and chert flakes were present. The LSA is potentially present in the form of a fine retouched chert flake, as well as a fragment of a basalt bladelet core and a quartz bladelet. Material was concentrated towards the southern end of the transect, but was present at low density across the entire lava surface. No artefacts were observed on the old land surface or the dunes, consistent with a relatively recent deposition.

The number of artefacts observed in this location was rivalled by few other locations (e.g. L0034) during this survey season. Whether this is linked to preservation of the lava surface and artefacts, or to attractive locality features such as raw material availability, views over the coastal plain, and the potential capture of water and prey in the small gorge, remains to be tested. Given the high potential for preservation of stratigraphy above the ~1mya lava flow, future work will include test pitting and renewed dating of the major landscape units in this area.

Discussion

This fieldwork has widened our understanding of the potential of the region to inform on the Palaeolithic occupation of Arabia. Whilst the hypotheses outlined above must be tested with further survey, some preliminary conclusions can be made from the material recovered.

Lithic Observations

The lithic assemblages observed and recorded by the survey allow us to draw preliminary observations about the typology and technology of lithic tools in the region, some initial thoughts on the choice and use of raw materials, and some clear observations about the nature of technological behavior in this landscape.

Typologically speaking, artefacts collected as individual finds or parts of assemblages from localities testify to a prolonged, but not necessarily continuous hominin presence in the region. In all of the areas examined by the survey, we have found pieces that can be typologically identified as ESA or MSA, as well as a smaller number of localities with materials identified as possibly of LSA date.

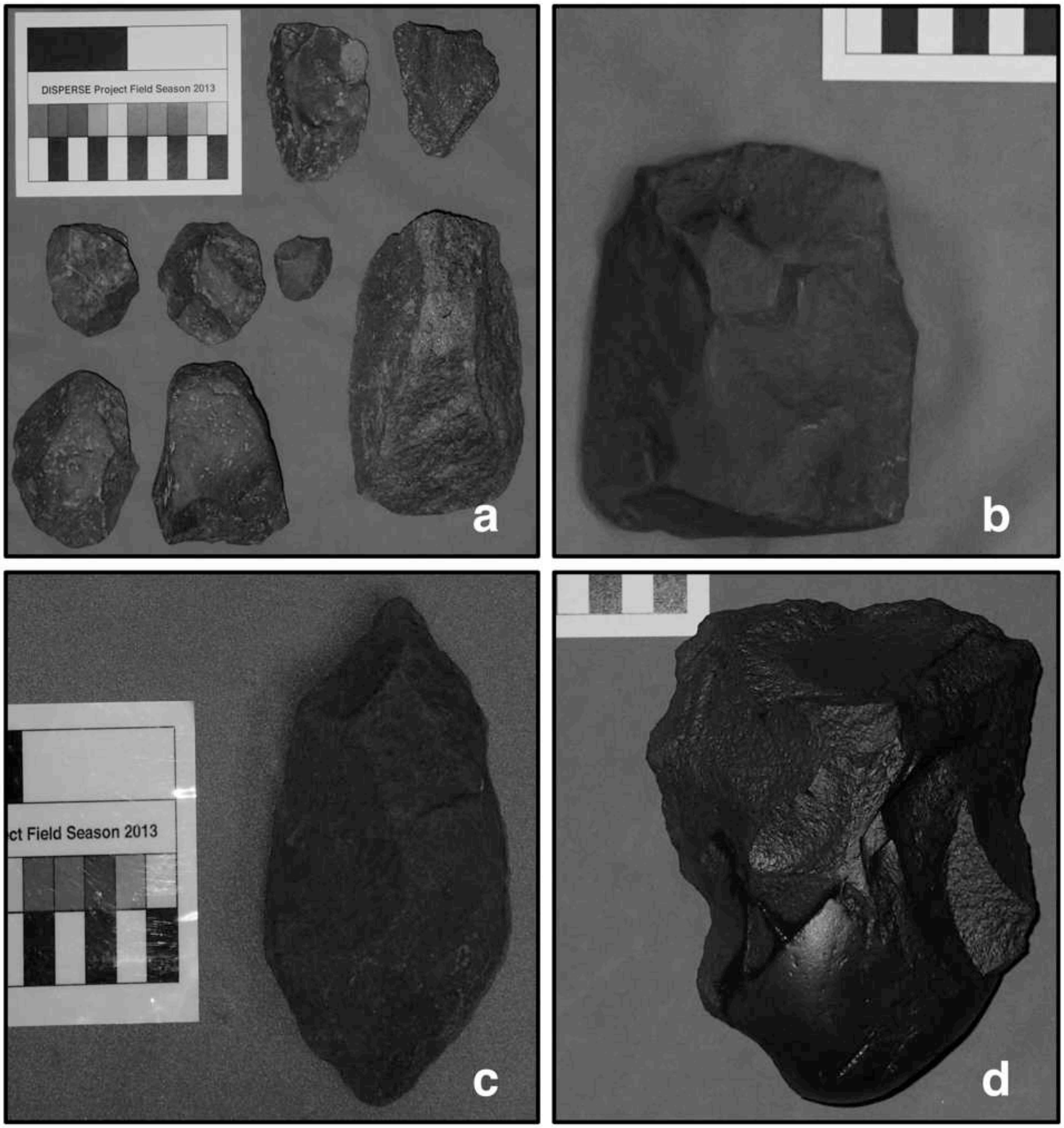

Figure 9: Examples of ESA artefacts recorded in the survey. a) Flakes and discoidal cores (Wādī Jizan, L0006). b) Cleaver (Jabal Umm Al Qummam; L0010). c) Hand axe (Abu Arish Lava Flows: L0009). d) Possible cleaver (Jabal Akwah; L0013). All photos: A. Sinclair.

ESA artefacts, though fewer in number than MSA artefacts, include a small number of cleavers and handaxes, as well as cutting tools on large flakes. There are also a number of large and medium-sized discoidal cores and associated flakes (Figure 9a). Handaxes, on basalt, andesite and quartzite, are relatively simply made, with bifacial retouch outlining the perimeter, and minimal bifacial retouch covering interior faces (Figure 9c). They are not dissimilar to those from Ad-Dawadmi (Whalen et al. 1983). Two basalt cleavers have been identified. One piece has the sharp cleaver edge at the end of the tool created as a natural distal end of a large flake blank, with flake removals to shape the other end and sides (Figure 9b). The other (possible) cleaver is made on a large cortical flake from a rolled cobble, with large flakes removed once struck to shape (Figure 9d). With the exception of flakes from discoidal cores, other ESA flakes are large and irregular, giving the impression of largely opportunistic manufacture.

MSA artefacts, on a range of materials, were the most common artefacts recorded. They include a large number of identifiable flakes from prepared cores, core forms including radial cores, pointed-flake cores and flake-blades cores (Figure 10). There is also a small number of blade cores that are conical in form and almost classically prismatic in their working. The MSA flake-blade artifacts are similar in form to Levallois blade collections reported from Wādī Surdud (Delagnes et al. 2012, 2013), though the raw material differs and it is impossible as yet to say whether the cores are worked in the same exact fashion as at Wādī Surdud. Pointed flake forms appear have been almost exclusively made on unidirectional point cores, with no evidence so far observed for the Nubian complex working observed in Oman (Rose et al. 2011) and central Saudi Arabia (Crassard et al. 2013). In addition to classic prepared core flake forms, localities with MSA artifacts often contain small discoidal shaped cores and their flakes, made on similar materials to accompanying, larger prepared cores and flakes.

Possible LSA artefacts are few in number, and restricted in to localities in the Abu Arish lava flows (L0003 and L0026) and Jabal Umm Al Qummam (L0010). They include bladelets and small blade cores made on quartz and basalt, as well as small retouched flakes made on a variety of cherts.

The raw materials utilised vary widely. Basalt artefacts predominate, as might be expected from the survey's initial targeting of basalt lava flows. However, quartz, andesite, shales, cherts and even fine-grained sandstone were all utilised by Palaeolithic populations, and this diversity reflects the available material within the study area. In addition to basaltic lava flows, areas of

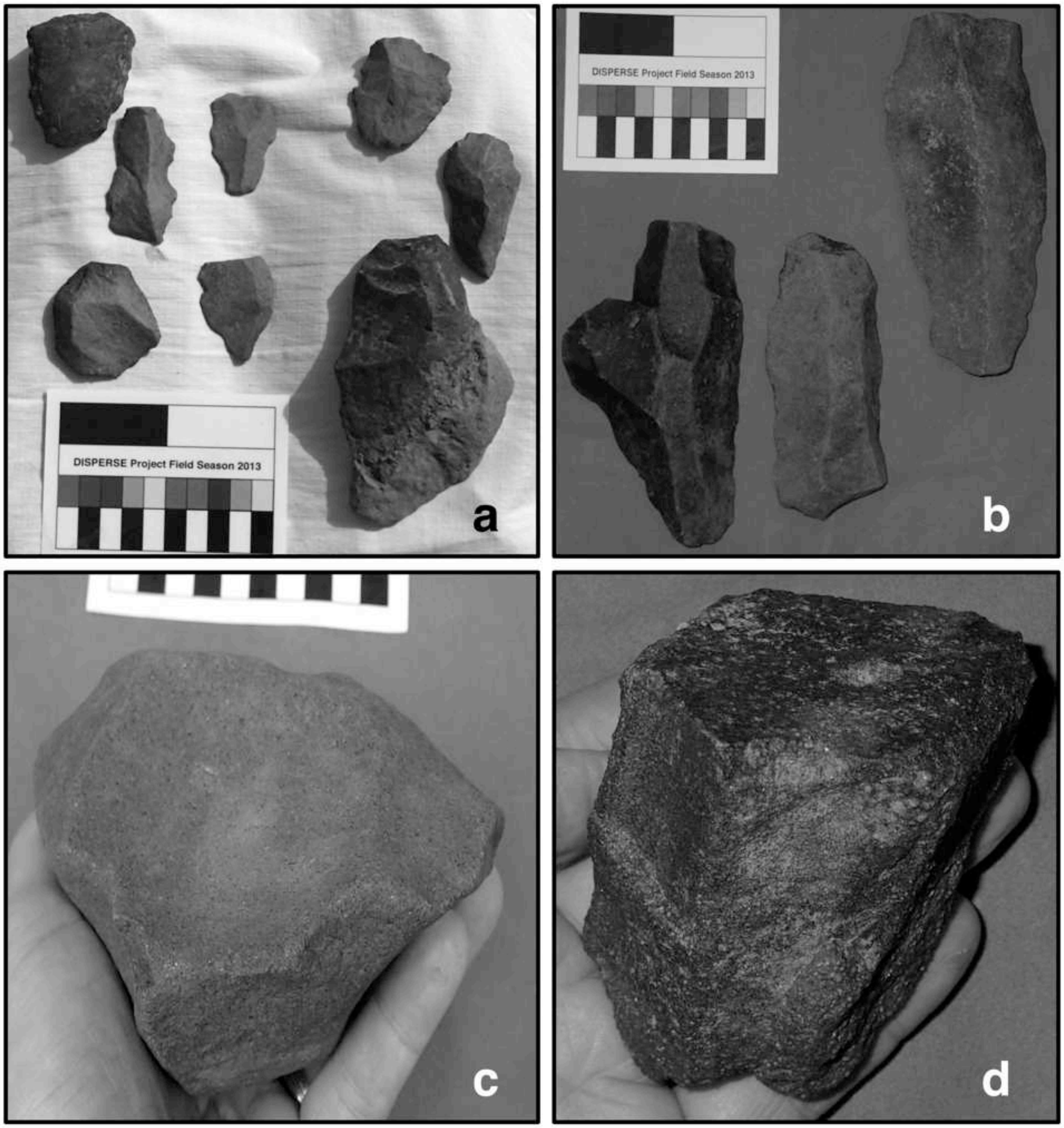

Figure 10: Examples of Middle Stone Age artefacts recorded in the survey. a) Flake-blades, pointed flakes and a radial core (Jabal Umm Al Qummam; L0010). b) Flake blades and a pointed flake (Harrat Al Birk; L0032). c) Radial core (Jabal Bagarah; L0054). d) Prismatic blade core (Jabal Akwah area; L0017). All photos: A. Sinclair.

exposed basement would have provided access to quartz and shales, as well as chert sources. Furthermore, wadis draining the escarpment facilitated transport of materials onto the coastal plain, providing other potential raw material types. Such abundance and wide distribution of raw material indicates that human groups were not limited in their movements by the availability of raw material.

Despite this abundance, however, finely worked tool forms are rare. Indeed, with the exception of the prepared core forms, lithics show little evidence of extensive time spent in manufacture or retouch, or regularity in finished form. There is a general lack of ESA handaxes, despite their presence elsewhere in the Peninsula (e.g. Petraglia et al. 2009, Whalen et al. 1983, 1984; Zarins et. al 1979, 1980). Where they are found, they lack extensive bifacial retouching. This evident simplicity in tool manufacture might be explained by a number of factors. Raw material abundance may have precluded the need to manufacture tools for use in areas of material scarcity, or to ensure a necessarily long use-life. Given the raw material abundance in the region, an effective technological approach may have been based on extensive, simple flaking and selection of a small number of appropriate blanks, as has been observed in other areas with abundant materials (e.g. Holdoway and Douglass 2011). Moreover, many of the use actions imagined for finely retouched tools, e.g. handaxes, can be achieved using simple edges with minimal retouch. This apparently simple approach to blank production is accompanied by rapid discard of flakes after use, as evidenced by minimal retouching, although a few rare examples of flake tools do show more extensive retouching of working edges.

Landscape Archaeology and Site Distribution - Lithics in Their Landscape

The observations highlight the taphonomic role of sediment cover in understanding surface artefact distributions at regional and local scales. At the broad scale, investigation specifically focused on areas of low sedimentation and high potential archaeological visibility, areas that almost always yielded artefacts. When areas of high sedimentation were visited, albeit briefly, no Palaeolithic artefacts were observed. This is mirrored at the local scale, e.g. at Jabal Umm Al Qummam, where artefacts were restricted to the exposed lava surface. Further mapping, field observations and targeted absolute dating will be required to characterise and temporally constrain landscape development in the region in order to locate surfaces of Palaeolithic age, as well as to target areas where buried surfaces can be accessed.

Furthermore, the presently limited coverage of the study area means that the data above cannot be used to interrogate regional patterning. Yet, within areas of low sedimentation, such as the Abu Arish lava flows, surfaces may have been largely stable since the Palaeolithic. The distribution of artefacts within these areas can therefore be more confidently interpreted as the result of spatial variation in artefact deposition, rather than of taphonomic factors. Variation in artefact numbers between L0008 on the lower, more porous lava flows, and L0009 on an adjacent, but higher and more fine-grained lava flow, could indicate preference for certain raw materials, and a concentration of highly archaeologically visible manufacturing activities around these sources. It may also represent repeated visits to a location with good views over the surrounding landscape for navigation or prey location. This potential emphasis on views over areas of prey movement is mirrored in L0006 above the Wādī Jizan Dam lake, above the confluence of a number of wadis in a broad plain. In addition, between areas of low sedimentation, there is variation in the number of artefacts. Whilst in part this may be due to variations in time spent investigating each area, localities such as Jabal Umm Al Qummam (L0010), a flat topped volcanic jabal on the southern edge of the Harrat Al Birk, (L0032), and Dhahaban Quarry (L0034), yielded higher numbers of artefacts, atypical of the majority of localities. These localities may represent particular focal points in the landscape, potentially due to factors such as view over the landscape, and raw material and water availability.

The surface artefacts observed comprise a palimpsest created over many thousands of years. The pattern of artefact distribution is therefore time-averaged, with the isolation of single visits difficult. Observed artefact concentrations are unlikely to be 'living sites', but may be locations that were visited repeatedly, where lithics were worked and discarded. Yet there are occasional concentrations of artefacts whose forms, similarity of working and of raw material imply that they represent the still-recognizable remains of discrete moments of observable short-term action. Reduction of a green chert nodule at L0017 is one possible instance. What remains to be disentangled from this pattern of repeated visits is whether they were for the same purpose, or were subject to a shift of different actions occurring in the same place – an ‘archaeology of place' (Binford 1982).

Whilst acknowledging the impact of time averaging, one broad-scale distinction can be tentatively drawn between cultural units on typological grounds. The vast majority of ESA lithics were on local material, usually basalts, observed in locations close to flows or dykes. MSA material was almost always also present in these locations, sometimes alongside LSA. Yet, in a few cases, MSA and LSA material was the only material recovered from the tops of the jabals (e.g. L0039, Wādī Najla). Together with the use of apparently more exotic materials (e.g. chert) during these periods, this may indicate a 'release from proximity' (following Gamble 1998) of later populations from raw material sources. Whilst this requires further testing, it may mark differential landscape use between earlier and later, more mobile, populations.

Conclusions

On the basis of typological observations we believe that Palaeolithic occupation of the region was not restricted to a single period. The presence of ESA, MSA and LSA artefacts highlights a long, though by no means continuous, occupation history of the study area. This fits well with the potential of the coastal area to be habitable throughout the Pleistocene (Bailey 2009), and supports previous archaeological surveys (Bailey at al. 2007a, 2007b; Overstreet 1973; Zarins et al. 1980, 1981). This inference is also supported by recent findings in the Yemeni foothills to the immediate south of the Jizan region (Delagnes et al. 2013, 2013). Importantly, the presence of possible lithic evidence of an LSA contrasts to sites in the interior of the Arabian Peninsula that lack LSA/Upper Palaeolithic assemblages (Groucutt and Petraglia 2012) due to their depopulation during hyperarid episodes. Exact timings and conditions of occupation in this coastal region, however, can only be established through future location and dating of stratified sites. The possibility remains therefore that the Southwestern Arabian refugium suggested for Yemen and parts of Oman may have extended into the study area, and possibly further.

The survey has highlighted the major potential of the Jizan and Asir regions to inform on the archaeological record of the Arabian peninsula, with artefacts from throughout the Palaeolithic sequence documenting a long history of occupation. Issues of taphonomy hamper conclusions at the regional scale, and can only be approached through a more detailed understanding of Quaternary landscape evolution. Yet within areas of high visibility of surface archaeology, some patterns in site locations and artefact typology are emerging. By integrating a detailed understanding of landscape evolution and the Palaeolithic occupations within it, future survey and mapping will allow the assessment of the ways in which these populations were moving through, and depositing lithics within, their landscapes.

Acknowledgements

We thank HRH Prince Sultan bin Salman bin Abdul Aziz, President of the Saudi Commission for Tourism and Antiquities (SCTA), KSA, Professor Ali Al-Ghabban, Vice-President, and Jamal Al Omar, for granting fieldwork permission and for supporting our work in Saudi Arabia. Grateful thanks are also extended to the staff of the SCTA offices in Jizan and Sabiya. The 2013 survey team consisted of Bassam Al Hilal (National Museum, Riyadh, KSA), Aied Al Hmaed, (SCTA Dawasir, KSA), Robyn Inglis (University of York, UK), Hussein Mofareh, (SCTA Sabiya, KSA), Andrew Shuttleworth and Anthony Sinclair (Universiy of Liverpool, UK). The work is funded by European Research Council Advanced Grant 269586 ‘DISPERSE: Dynamic Landscapes, Coastal Environments and Hominin Dispersals'. This is DISPERSE contribution no. XXX (TBC).

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