



Evidence of Middle Palaeolithic human occupation in south-central Oman

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Debate surrounds the early peopling of the Arabian Peninsula. The first evidence of the Levallois lithic technology in the Huqf area of south-eastern Arabia now extends the Middle Palaeolithic record of hominin activity into central Oman and helps to diversify the picture of Arabian prehistory.

Keywords: Middle East, Arabia, Middle Palaeolithic, lithic artefacts, Levallois, weathering

Introduction

The number of research projects into the Middle Palaeolithic of southern Arabia (200–40 kya) has increased in recent decades, providing diverse archaeological data from surface scatters of stone tools and from stratified sites (Rose *et al.* 2011; Delagnes *et al.* 2012; Bretzke *et al.* 2022). Palaeoenvironmental and archaeological data (Parton *et al.* 2015) suggest an intensification and northward shift of low-latitude rain-bearing systems in Marine Isotope Stage 5 (MIS-5, *c.* 130–71 ka). Middle Palaeolithic occupation of southern Arabia was likely widespread, but isolation events may have occurred later during the more arid MIS-4 (*c.* 71–57 ka).

The Huqf anticline in central Oman (Figure 1) has remained a blank spot with regard to Middle Palaeolithic occupation, even after a series of intensive surveys (Jagher & Pümpin 2010). Despite the abundance of high-quality chert, natural springs and freshwater lakes in this area during the Late Pleistocene (129–11.7 kya) (Rosenberg *et al.* 2011), Middle Palaeolithic finds are elusive. This study contributes to the infilling of this knowledge gap by using a multi-scalar approach to analyse locations not previously surveyed.

Received: 22 April 2024; Revised: 11 July 2024; Accepted: 13 September 2024

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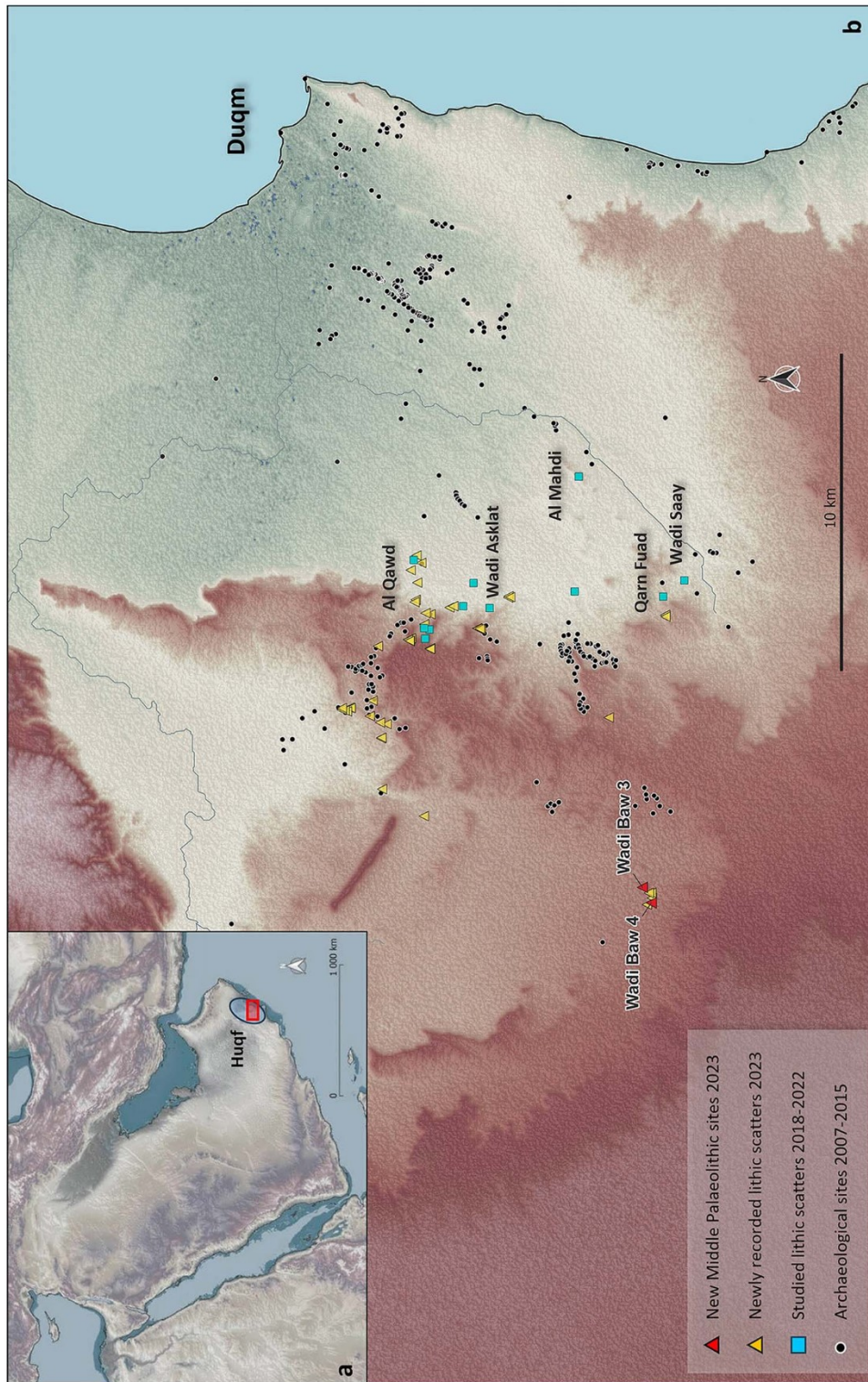


Figure 1. Map of the Duqm area showing the location of WB3 and WB4 and other relevant archaeological sites (base map (a) GEBCO 2022 grid (<http://gebcoset.org>); (b) SRTM 1 Arc-Second, generated using QGIS v.3.26 Buenos Aires; figure by authors).

Research questions and method

Our project aims to assess the timing and nature of human occupation in the Late Pleistocene of southern Arabia to establish whether it was episodic and refugial or widespread and interconnected. Survey methods used to locate Palaeolithic sites build on desk-based assessment of potential locations derived from geological maps, field reports and geomorphological assessment of the landscapes of south/central Oman. Following the identification of Middle Palaeolithic finds, we employed a targeted collection of cores and diagnostic finds. Detailed techno-typological analysis of the lithic sample allowed comparison with other Middle Palaeolithic sites in the region and surrounding regions (East Africa, Levant, Middle East).

Results

The expedition recorded two new sites exhibiting Middle Palaeolithic characteristics in the area known as Wadi Baw East, south-west of Duqm, southern Huqf. Wadi Baw 3 (WB3) is a very low-density archaeological site on top of an inselberg without raw material outcropping (Figure 2A & B). The collected assemblage (Table 1) includes one heavily weathered preferential centripetal Levallois core, two unidirectional flat cores and debitage. Wadi Baw 4 (WB4) is a large (length >100m) and relatively dense (>30 artefacts/m²) lithic scatter located on a slightly elevated limestone ridge with outcropping chert nodules at its base and flanks (Figure 2C & D). Both sites are elevated and are most likely deflation surfaces caused by wind erosion of fine material. There may have been potential movement of coarser material in the past wet phases.

Lithics at both sites exhibit specific weathering patterns indicating two different post-depositional trajectories (Table 1). Artefacts showing a high degree of ridge rounding, edge damage, surface erosion, potlids and generally dark manganese coating fall within the Middle Palaeolithic technological spectrum. Artefacts presenting an advanced desert varnish, with moderately sharp ridges and moderate edge damage, can be classified as blades and bifaces (Figure 3). The raw material used to manufacture both sets of lithics is the same and—while not *in situ* as evident from the edge damage and rounding observed on the specimens—the Middle Palaeolithic finds are clearly discernible from the later, less-weathered blade/biface assemblage. Recycled, double-patinated artefacts (Figure 3E) further support the suggested relative chronology.

Most of the Middle Palaeolithic cores might be categorised as unidirectional parallel and orthogonal flat cores for flakes without or with only minor preparation of striking platforms and convexities of exploited surfaces (Table 2). Five cores might be classified as Levallois (*sensu stricto*) and these include three preferential centripetal Levallois cores, one preferential bidirectional core and one small Nubian Levallois Point core (Figure 4). Besides the core reduction strategies, the assemblage contains one heavily weathered, small (up to 100mm) possible biface (Figure 4, no. 9) and three bifacial thinning flakes.

At both sites, the lithics exhibiting typical desert varnish weathering relate to the production of blades from unidirectional single platform cores and small to medium-sized biconvex and bi-pointed bifaces. Similar industries are well attested in the area (Jagher & Pümpin



Figure 2. Images of the archaeological sites of WB3 (A & B) and WB4 (C & D) (figure by authors).

Table 1. Number of finds and weathering patterns.

		Weathering			Total
		Heavily weathered	Holocene weathering	Double patina	
WB 3a	Core	10	1	0	11
	Blades	1	1	0	2
	Flakes	28	8	2	38
	Chunk	6	2	1	9
	Total	45	12	3	60
WB 4	Biface	2	2	4	8
	Core	33	3	5	41
	Blade	2	6	1	9
	Flake	24	1	0	25
	Total	61	12	10	83

2010) and might be tentatively dated to the terminal Pleistocene/mid-Holocene (14–6 kya) based on analogous sites in Dhofar (Hilbert 2014).

Discussion

WB3 and WB4 represent the first evidence of Middle Palaeolithic activity in Huqf. The lithic assemblages exhibit technological variability and weathering heterogeneity, indicating a palimpsest of Pleistocene and Holocene occupation phases. Surface erosion has affected both sites and subjected the lithics to mechanical weathering since their deposition. Subsequent exploitation of the site as a raw-material quarry, possibly by Holocene groups, has resulted in the recycling of larger Middle Palaeolithic artefacts, introducing bias to the assemblage.

Despite this, some preliminary observations can be made. The small Nubian Levallois core from WB4 might indicate a tenuous link to the Nubian technocomplex in Arabia, which needs to be explored further in the coming seasons; the rest of the assemblage, however, is dissimilar from Nubian sites in adjacent Dhofar. Centripetal Levallois cores are rare within Dhofar Nubian assemblages (Rose *et al.* 2011) but are reported from south-western and central Arabia (e.g. Bretzke 2015; Crassard & Hilbert 2020). Additionally, the majority of the Middle Palaeolithic WB4 assemblage shows simple, unidirectional, occasionally orthogonal flake production. Weathering of the Levallois components suggests similar exposure periods to post-depositional agents as the non-Levallois (flat) cores; these technologies, however, are seldom reported except at Jebel Faya (Bretzke 2015).

The lithics from WB3 and WB4 may indicate a cultural separation of Huqf and possibly a larger part of eastern Arabia, with only infrequent Nubian production sites (Beshkani *et al.* 2017). This separation could be attributed to the geographical barrier of the Jiddat al-Harasis desert, as suggested elsewhere (e.g. Hilbert 2014; Bretzke 2015), allowing only sporadic visits rather than continuous occupation. Work is in progress to establish a robust chronostratigraphic framework for these sites through a multitechnique dating approach.

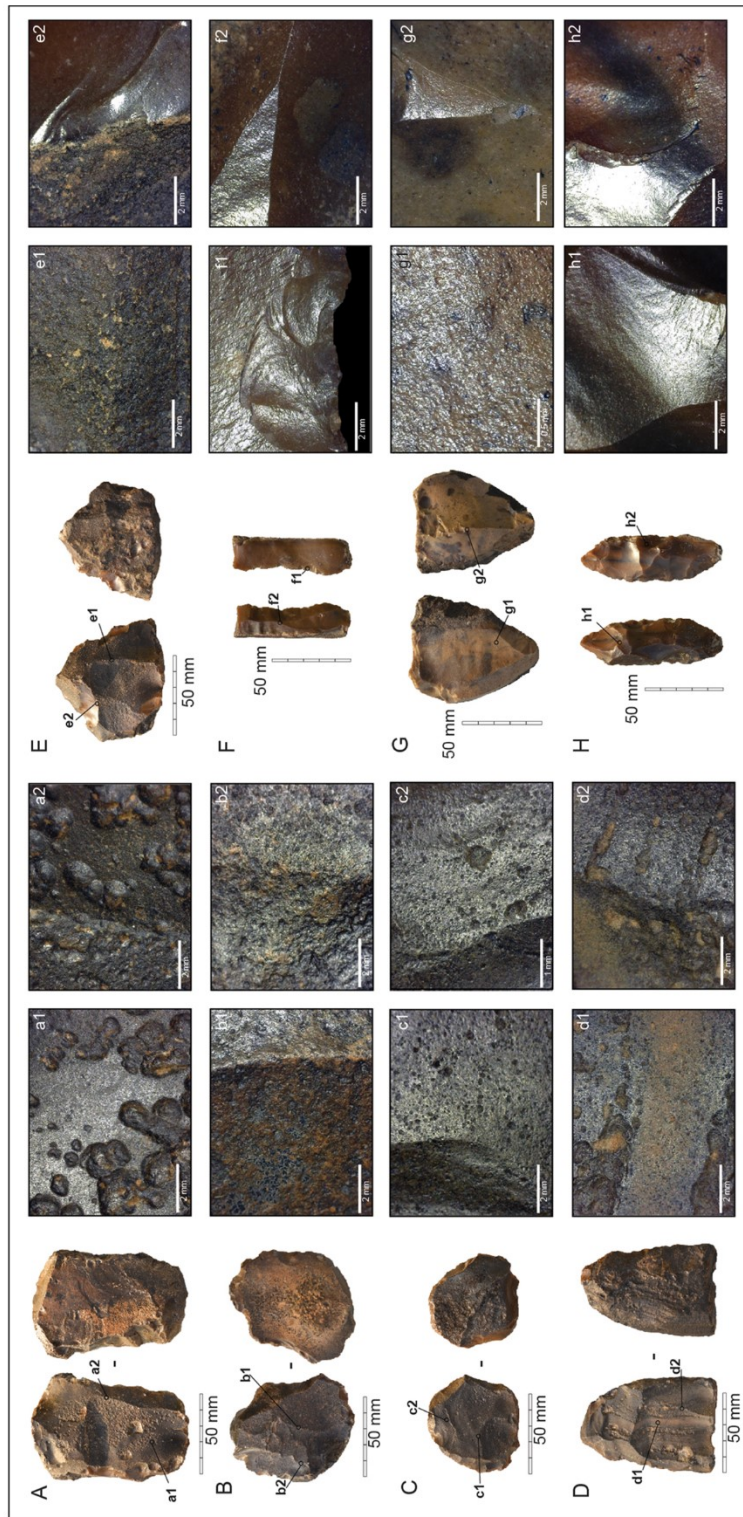


Figure 3. Weathering patterns on artefacts from WB3 and WB4: A–D) Middle Palaeolithic finds with advanced ridge and edge abrasion, pits and surface dissolution; E) Middle Palaeolithic find with traces of reuse; F–H) Early Holocene material (figure by authors).

Table 2. Wadi Baw 4 core types.

Wadi Baw 4, Cores		Cortical	Plain	Dihedral	Polyhedral	Faceted	Unidentified	Total
Flat cores	Unidirectional	5	7	0	1	0	0	13
	Unidirectional distal-divergent	0	1	0	0	0	0	1
	Bidirectional	1	0	0	0	0	0	1
	Orthogonal	2	2	0	0	0	0	4
Levallois	Levallois centripetal	0	0	1	0	2	0	3
	Levallois bidirectional	0	0	1	0	0	0	1
	Nubian	0	0	0	0	1	0	1
	Discoidal core	0	0	0	0	0	4	4
	Unidir. blade core	0	5	0	0	0	0	5
	Unidentified	0	1	0	1	0	6	8
	Total	8	16	2	2	3	10	41

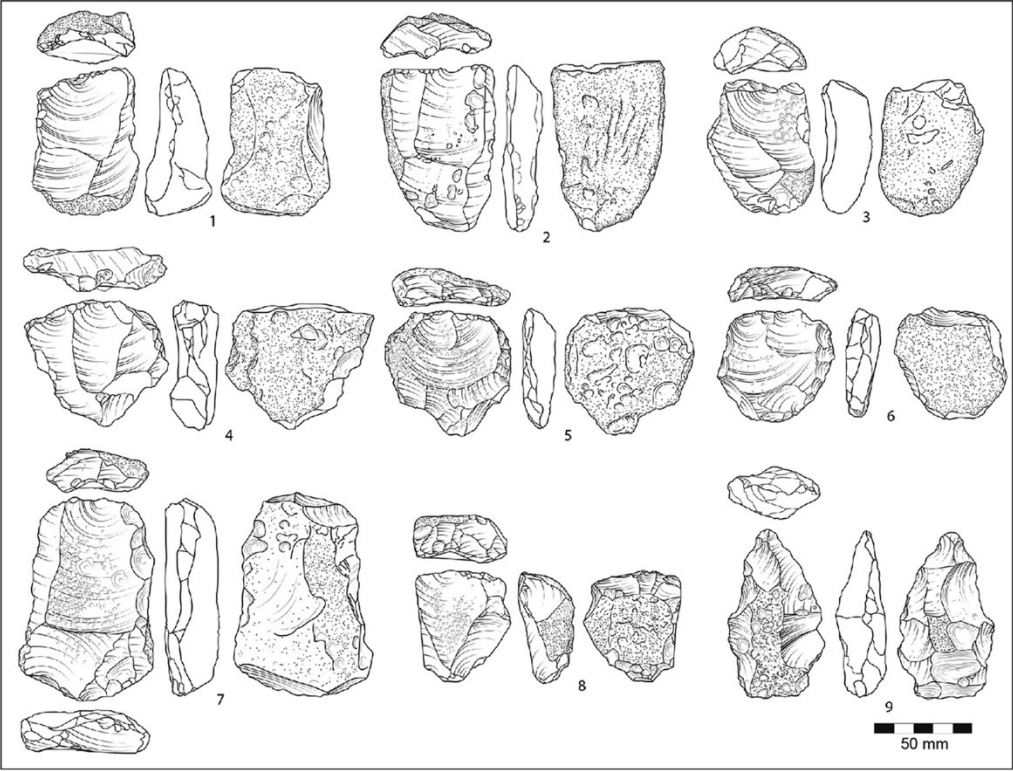


Figure 4. WB4 artefact sample: 1–3) unidirectional parallel cores; 4) orthogonal core; 5–7) preferential Levallois cores; 8) Nubian Levallois core; 9) possible biface (figure by authors).

Acknowledgements

We are deeply grateful to the Ministry of Heritage and Tourism of the Sultanate of Oman for providing permission and support for fieldwork. The research was conducted in collaboration with the Czech expedition ARDUQ (Archaeological Landscapes of Duqm and Dhofar) active in Duqm. We thank the reviewers for their insight and comments that have greatly improved this manuscript.

Funding statement

Funded by Australian Research Council project DP230100152 and Praemium Academiae of the Czech Academy of Sciences. Yamandú H. Hilbert is financed in the frame of the REVIVE project, European Research Council grant #101001889. Mathieu Duval is supported by the Spanish Ramón y Cajal Fellowship RYC2018-025221-I, funded by MCIN/AEI/ 10.13039/501100011033 and 'ESF Investing in your future'.

References

- BESHKANI, A., T. BEUZEN-WALLER, S. BONILAURI & G. GERNEZ. 2017. The first evidence of Middle Palaeolithic Nubian technology in north-central Oman. *Antiquity* 91. <https://doi.org/10.15184/aqy.2017.4>
- BRETZKE, K. 2015. Paleolithic assemblages from the Central Region of the Emirate of Sharjah (UAE) and implications for human settlement dynamics in southern Arabia, in N.J. Conard & A. Delagnes (ed). *Settlement dynamics 4*: 105–25. Tübingen: Kerns.
- BRETZKE, K. *et al.* 2022. Multiple phases of human occupation in Southeast Arabia between 210,000 and 120,000 years ago. *Scientific reports* 12.
- CRASSARD, R. & Y. HILBERT. 2020. Lower and Middle Paleolithic sites from the Rufa Graben, central Saudi Arabia. *Proceedings of the Seminar for Arabian Studies* 50: 43–65.
- DELAGNES, A. *et al.* 2012. Inland human settlement in southern Arabia 55,000 years ago. New evidence from the Wadi Surdud Middle Paleolithic site complex, western Yemen. *Journal of Human Evolution* 63: 452–74. <https://doi.org/10.1016/j.jhevol.2012.03.008>
- HILBERT, Y.H. 2014. *Khashabian: a Late Paleolithic industry from Dhofar, southern Oman* (British Archaeological Reports International Series 2601). Oxford: BAR. <https://doi.org/10.30861/9781407312330>
- JAGHER, R. & C. PÜMPIN. 2010. A new approach to central Omani prehistory. *Proceedings of the Seminar for Arabian Studies* 40: 185–200.
- PARTON, A. *et al.* 2015. Alluvial fan records from southeast Arabia reveal multiple windows for human dispersal. *Geology* 43: 295–98. <https://doi.org/10.1130/G36401.1>
- ROSE, J.I. *et al.* 2011. The Nubian complex of Dhofar, Oman: an African Middle Stone Age industry in Southern Arabia. *PLoS ONE* 6. <https://doi.org/10.1371/journal.pone.0028239>
- ROSENBERG, T.M. *et al.* 2011. Humid periods in southern Arabia: windows of opportunity for modern human dispersal. *Geology* 39: 1115–18. <https://doi.org/10.1130/G32281.1>