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Occupation during the Lower and Middle/Late Palaeolithic period in the Sufrat Valley (Adam region, Sultanate of Oman)

S. Bonilauri, T. Beuzen-Waller, J. Giraud, M. Lemée, G. Gernez & E. Fouache

Summary

This paper reports the results of surveys undertaken on the Palaeolithic periods in the Adam region (north central Oman) carried out since 2013 by the French Mission of Adam. The aim of these surveys was to provide a basic overview of these sites, in terms of their geographical scope and relative chronological limits. The Adam region (north interior Oman) is already well known for its sites of the Neolithic and protohistoric periods; the discovery of an area very rich in Palaeolithic industries (the Sufrat Valley, located on the western side of the Jabal Salekh), positioned our region of study as a suitable strategic territory for human occupation that has occurred since the prehistoric periods. The favourable environmental frame, including in particular the hydrological network of this region, certainly constitutes the principal factor for human establishments from prehistoric periods until today. Even if the Sufrat Valley's lithic industries lie exclusively on surfaces (hence their lack of chrono-stratigraphical context), the typo-technological traits has allowed most of these artefacts to be assigned to the Middle or Late Palaeolithic and, for some pieces, to the Lower Palaeolithic. These ancient lithic remains bear witness to Palaeolithic occupations on the eastern side of the Arabian Peninsula, situated at the crossroads between Africa, the Middle East, and Asia.

Keywords: Sultanate of Oman, Adam region, Sufrat Valley, Middle/Late Palaeolithic, Lower Palaeolithic

1. Introduction

The French Mission of Adam (successively run by Dr Jessica Giraud and then by Guillaume Gernez) has conducted survey programmes, excavations, and research since 2007 in the Adam (Ādam) region, a region of transition located between the Hajar Mountains (Jibāl Ḥajar) and the margins of the Rub al-Khali (al-Rub^{c} al-Khālī) desert. Its activities led to the identification of numerous archaeological sites attributed from the Neolithic to the pre-Islamic periods (e.g. Giraud et al. 2012). In 2010 some lithic artefacts related to the Palaeolithic period were discovered on the south-eastern foothills of the Sufrat Dishshah (Ṣufrat Dishshah, one hill of the Sufrat Valley/Wādī al-Ṣufrāt); this event introduced the development of an axis of research focused on prehistoric occupations in the Sufrat Valley (Fig. 1). The first investigations conducted in the Sufrat Valley highlighted several areas of high-density lithic artefacts, that sometimes lie in surface undisturbed, all included in a geographical sector of more than 10 km^2. In our current state of research, systematic surveys and analyses have only been done on a part of the Sufrat Valley, mostly radiating around the south-eastern area of the Sufrat Dishshah (the location of our first findings) (Fig. 1/c). Our initial results denoted the presence of numerous lithic artefacts found on hill summits as well as on slopes and piedmonts that have typo-technological traits attributable to the Middle Palaeolithic — and perhaps form the Late Palaeolithic period — and certainly, for some of them, to the Lower Palaeolithic period. They bring forward the geographic importance of the Sultanate of Oman, more notably the northern part, in terms of occupation during the Lower and Middle Palaeolithic periods. Indeed, during the last decades research conducted in Oman has highlighted a significant number of Palaeolithic sites (e.g. Biagi 1988; 1994; 2004; Doe 1976; Edens 1988; Jagher 2009; Jagher & Pümpin 2010; Maggi 1990; Rose 2007; Rose & Usik 2009; Rose & Hilbert 2014; Smith 1977; Usik et al. 2012; Whalen 2003; Whalen, Zoboroski & Schubert 2002), with the main part of these sites attributable to the Lower and Middle Palaeolithic periods located in the south of the Huqf region (e.g. Biagi 1994; Jagher 2009; Jagher & Pümpin 2010; Whalen 2003) and in the centre of the Dhofar region (e.g. Hilbert 2012; 2014; Hilbert, Rose & Roberts 2012; Hilbert et al., in press; Rose 2007; Rose & Usik 2009; Rose & Hilbert 2014; Usik et al. 2012). Until recently, however, similar findings were

extremely unusual in the northern part of the Sultanate of Oman. Consequently, even if they were found lying on surfaces and without a chrono-stratigraphical context, this discovery still remains fundamental to complete the understanding of Palaeolithic occupation in this region and more generally in the Arabian Peninsula.

2. Setting and environment

The Adam region is an area of transition between the mountains and the desert environment. Located at the southern piedmont part of the Hajar Mountains (northern Oman), it is characterized by an anticlinal chain (the Salekh Arch/Jabal Salakh), which is the last southern mountain fold before the expansive Rub al-Khali desert, and by an alluvial plain sectioned from north to south by seasonal wadis that originate from the Hajar Mountains. Our area of study, the Sufrat Valley, consists of several low marly hills that are defined by flat-top summits which provide elevated spots overlooking the valley and the Wādī Umayri (Wādī ᶜUmayrī) passage, one of the most important watercourse in this region (Fig. 1). These low hills also offer a rich geological setting that supplies raw materials. The lithic resources in this valley are abundant and consist of radiolarian chert outcrops organized in veins or chert nodules. Thanks to differential erosion and deflationary processes, these nodules (either whole or fractured) are freed from their chalky matrices and are therefore readily available. The quality of siliceous material is excellent, marked by a brown colour with perfectly homogeneous fine grains; it has largely been exploited by prehistoric people for flake or blade debitage as well as bifacial production.

Even if the current deserted landscape presents the valley as inhospitable, several geomorphological formations inherited from past pluvial periods have been identified along the dried-out watercourses, indicating that cooler/wetter conditions had an impact on the Sufrat valley environment. This testifies that a higher fluvial activity existed, as much in the interior valley as in Wādī Umayri, which today presents itself as an ecological niche. In light of its raw materials and past water resources, this valley was certainly an ideal place for human group settlements. Geomorphological and palaeoecological investigations are still in process.

3. Methods

The principal aim was to obtain an overview of the archaeological area and its chronology, firstly by defining the geographical scope and limits of the area with archaeological potential, secondly by estimating the density of some punctual sites, and finally by evaluating lithic remains, notably through the study of technological and typological features. As a result, various scales of study were used, ranging from regional to micro-local: 1) a regional survey conducted in the whole of the Sufrat Valley without artefact sampling, was made by car, on foot, and through satellite imagery; 2) a local survey, in this case focusing on one small hillside (south-eastern slope of the Sufrat Dishshah) where the most significant materials were collected; 3) systematic surface collections undertaken in 1 x 1 m^2 areas.

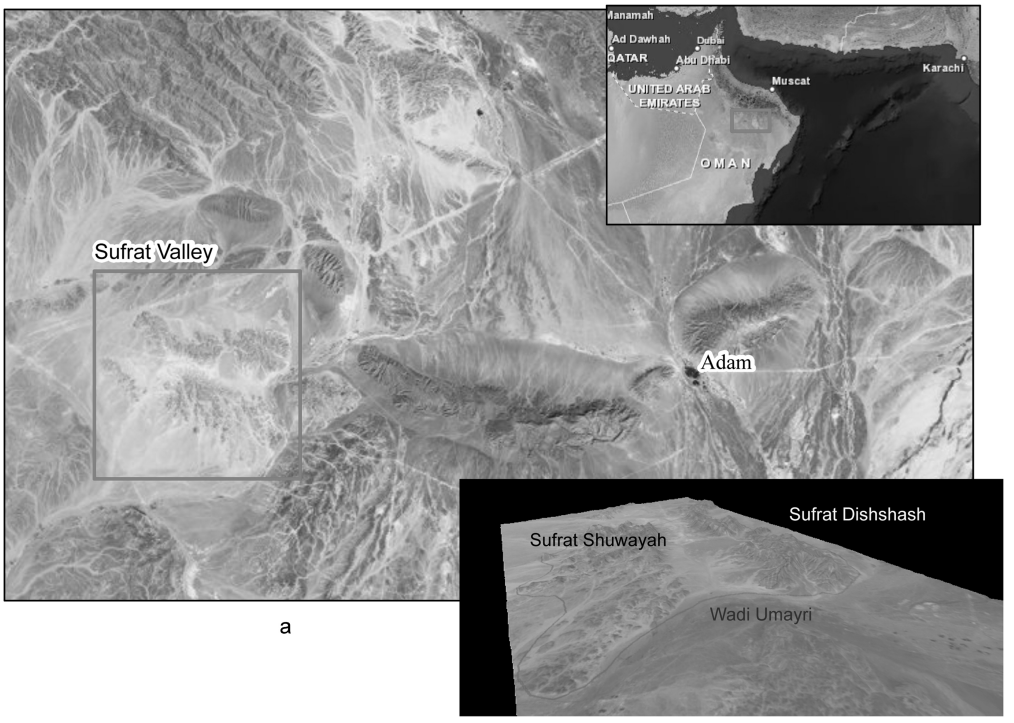
These different methods of analysis allowed a preliminary delimitation of the area with archaeological potential in the Sufrat Valley, estimated at more than 10 km^2; an evaluation of the density of lithic remains for each topographical unit (summit, slope, and piedmont) of the south-eastern flank of the Sufrat Dishshah; and finally, also for this area, a typology of the artefacts found during systematic collection, which will be presented below.

4. Lithic artefacts

4.1 An area with a high density of lithic remains

Lithic artefacts were found both on the flat-top summits of the Sufrat Dishshah and on its slopes and piedmonts areas. The highest density of materials was found on the summits (with an average of eighty artefacts per square metre) (Fig. 2). This high density can be partially explained by the phenomena of chronological overlapping caused by deflationary processes. Despite the lack of stratigraphical context, these artefacts appear unremoved and may certainly be mostly undisturbed surface scatters. Furthermore, they were generally well preserved, without any apparent post-depositional alterations with the exception of patina.

When looking at the Sufrat Dishshah slopes, they are characterized by both a high and a medium density of artefacts (forty-eight artefacts per square metre). They were found mixed with rock and debris deposits that had been disturbed by slope dynamics and gravity (Fig. 3). The majority of them certainly come from upper tabular surfaces, which are gradually shredded by erosion processes. In light of these dynamics, two types of conservation states were observed: one that is well-preserved, undoubtedly related to slow perturbation that characterizes artefacts found *in situ*; and one less well-preserved that applies to rolled and fractured artefacts, disturbed by slope dynamics.



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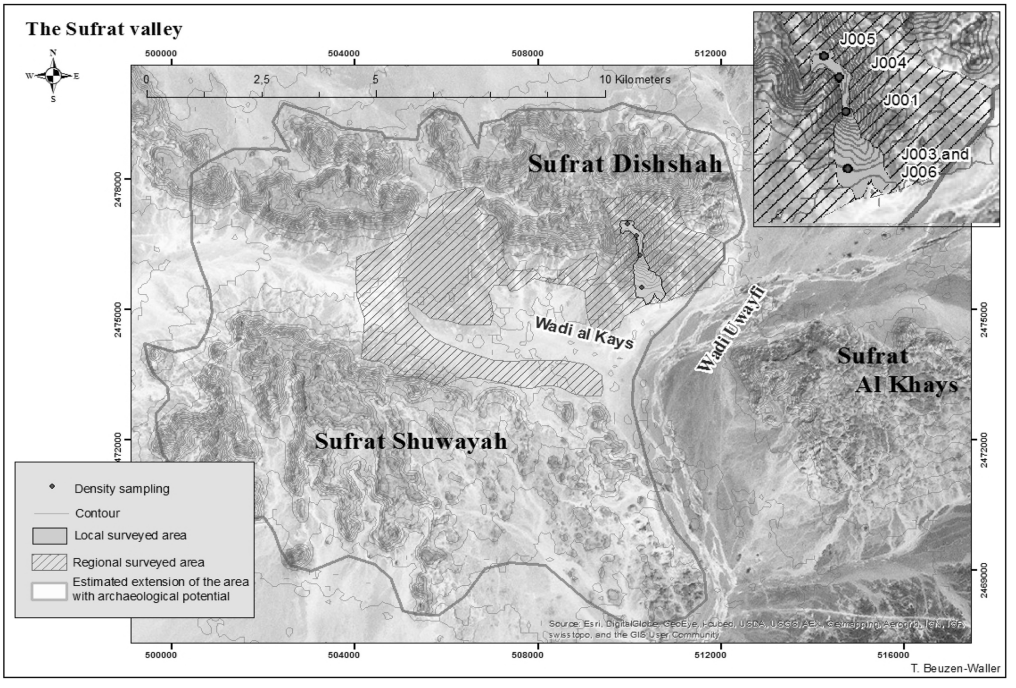

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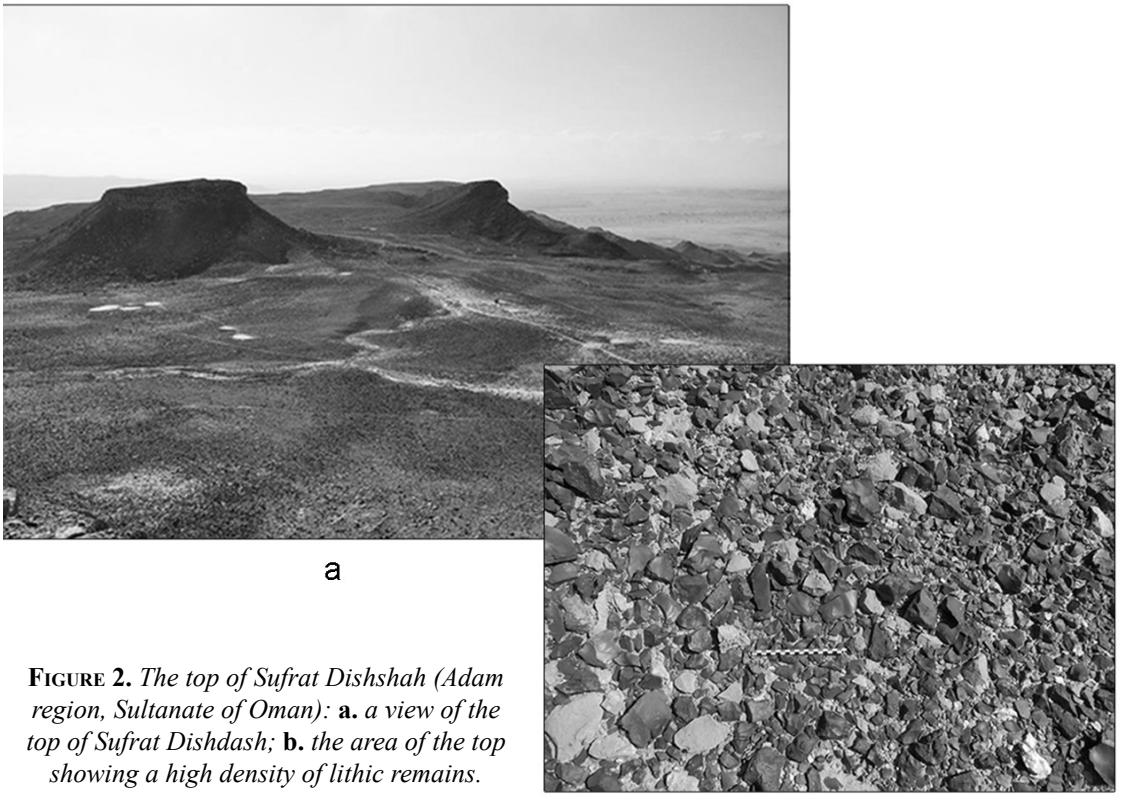
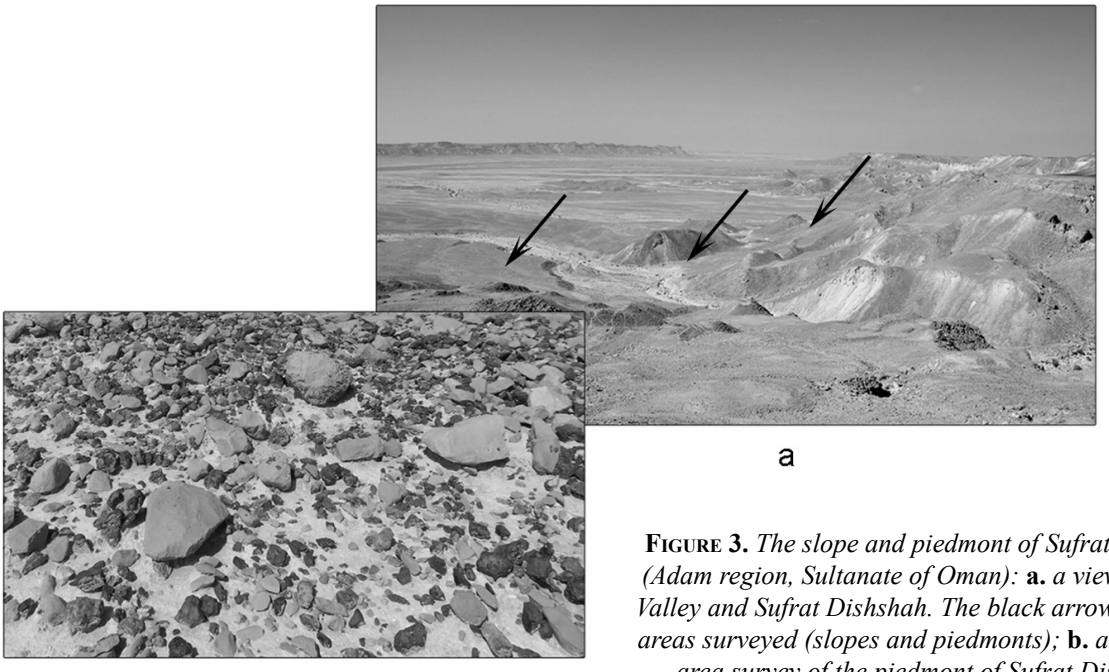
Figure 1. *Maps of the Adam region, Sufrat Valley, and Sufrat Dishshah:* **a.** *the location of the Adam region and Sufrat Valley in the Sultanate of Oman;* **b.** *a view of the Sufrat Valley;* **c.** *a view of Sufrat Dishshah and the area of survey in Sufrat Dishshah.*



a

b

Figure 2. *The top of Sufrat Dishshah (Adam region, Sultanate of Oman):* **a.** *a view of the top of Sufrat Dishdash;* **b.** *the area of the top showing a high density of lithic remains.*



a

b

Figure 3. *The slope and piedmont of Sufrat Dishshah (Adam region, Sultanate of Oman):* **a.** *a view of Sufrat Valley and Sufrat Dishshah. The black arrows show the areas surveyed (slopes and piedmonts);* **b.** *a view of an area survey of the piedmont of Sufrat Dishshah.*

4.2. Types of lithic remains

Many types of artefacts were discovered lying on the surface in the midst of each topographical unit of the Sufrat Dishshah (summits, slopes, piedmonts). Their typo-technological characteristics enable us to link them from the Lower Palaeolithic to the Middle and maybe to the Late Palaeolithic period, even despite the lack of a clear stratigraphic context. The most significant materials of the Sufrat Valley and their characteristics will be presented below.

Levallois remains

Levallois products present a certain number of cores dominated by a Levallois debitage of a unique preferential flake. The objectives here are to produce predetermined removals of various contours, whereby they are convergent and non-convergent. Convergent products, including Levallois points with three removals (e.g. Boëda, Bourguignon & Griggo 1998) and triangular flakes, are characterized by a convergent unipolar preparation. Non-convergent products including wide or oval flakes and elongated Levallois flakes are characterized by a centripetal preparation (Figs 4 & 5).

In addition, we also find centripetal, bipolar, and convergent unipolar recurrent Levallois cores. The aims of these cores are also to produce predetermined removals of various contours such as convergent flakes and non-convergent flakes. Convergent products, including 'constructed' Levallois points (e.g. Boëda, Bourguignon & Griggo 1998) and triangular flakes, are characterized by a convergent unipolar and centripetal preparation. On the other hand, non-convergent products, including wide or elongated removals, are characterized by a centripetal and a bipolar preparation (Figs 4 & 5). Many Levallois flakes of various contours (Levallois points, triangular flakes, and wide Levallois flakes) are also identified and often found in association with Levallois cores. Some of these flakes are retouched but most of them remain unretouched (Fig. 4).

These types of Levallois remains, their preparation method, and the production objectives identified on several of the cores are similar to those discovered in neighbouring regions such as Hadramawt in Yemen (e.g. Amirkhanov 1994; Crassard 2007; 2009) or in the Shabwa region (e.g. Inizan 1989; 1997; Inizan & Ortlieb 1987). Those types of Levallois artefacts, in particular convergent products,

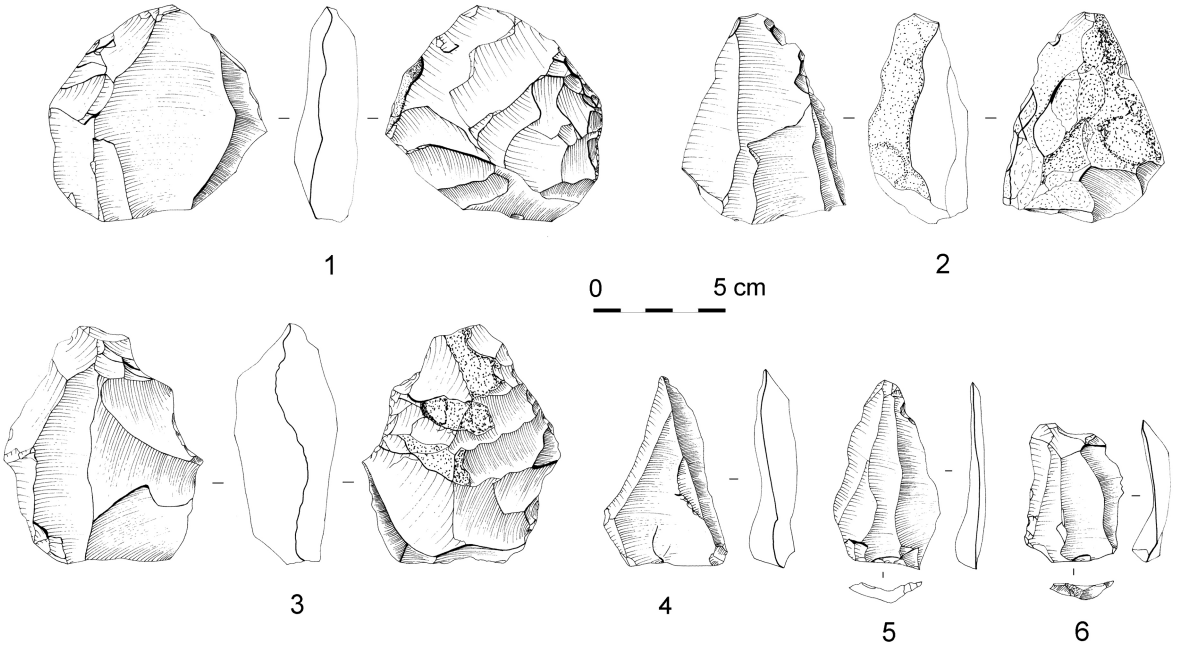


Figure 4. *Levallois artefacts (Sufrat Dishshah, Adam region):* **1–2.** *preferential Levallois cores;* **3.** *a recurrent Levallois core;* **4–5.** *convergent Levallois flakes;* **6.** *a non-convergent Levallois flake.*

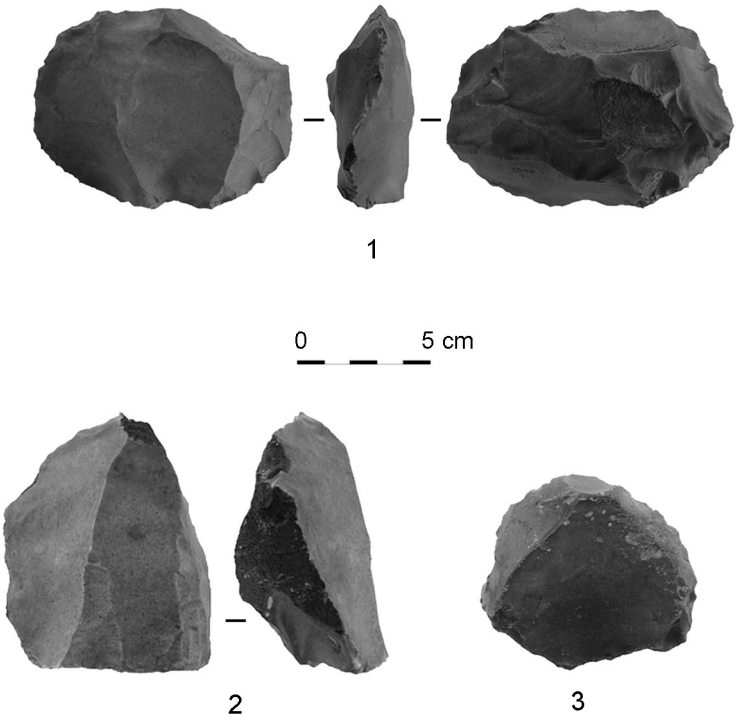


Figure 5. *Levallois preferential cores (Sufrat Dishshah, Adam region).*

may also be closely linked to the Levantine Mousterian culture. This emblematic technical culture of the Near East occurred during the recent middle Palaeolithic and was orientated towards the production of convergent products. It notably included 'constructed' Levallois points, points with three removals, and triangular flakes (e.g. Boëda, Bourguignon & Griggo 1998; Meignen 1995; 1998).

Significantly, there seems to be a complete absence of Nubian products even though one would have expected to find Nubian cores. Indeed, Nubian products are well represented in others sites of the Arabian Peninsula, such as in central Saudi Arabia (Crassard & Hilbert 2013), the Hadramawt region in Yemen (e.g. Crassard 2009; Crassard & Thiébaut 2011), and the south of Oman, in the Dhofar (Ẓufār) region (e.g. Rose et al. 2011; Rose & Hilbert 2014; Usik et al. 2012). Their absence in the Adam region still remains unexplained.

Waᶜshah types remains

Numerous types of Waᶜshah cores, similar to those studied in Wādī Waᶜshah (Wādī Waᶜshah, the Hadramawt region in Yemen) were discovered (e.g. Crassard 2007; 2008). They are characterized by a preferential unipolar convergent laminar debitage that aims to produce predetermined elongated convergent products with three removals, with the result that they are relatively narrow (Fig. 6). The volumetric conception of the cores (two ranked secant debitage surfaces) and the platform surface (with technical predetermination criteria; left/right lateral convexities; distal convexities) are for us similar to the Levallois debitage and in particular the preferential convergent Levallois debitage. In effect, the preparations of these cores are made through lateral unipolar removals (that lead to a favourable rib). Moreover, this method of preparation has already been studied and identified on Middle Eastern convergent Levallois cores.

Despite these observations leading to rank the Waᶜshah cores types into the Middle Palaeolithic period, we remain cautious as certain authors (e.g. Crassard 2007; 2008) view the laminar debitage conception and the probable use of indirect percussion as a production conception of an Upper or Late Palaeolithic conceptualization or in a more recent conceptualization of the Holocene age (e.g. Crassard 2007; 2008; Hilbert 2012; Hilbert, Rose & Roberts 2012; Hilbert et al., in press).

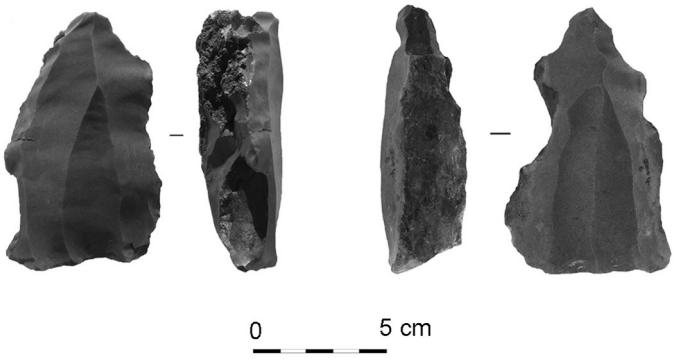


Figure 6. *Waᶜshah cores (Sufrat Dishshah, Adam region).*

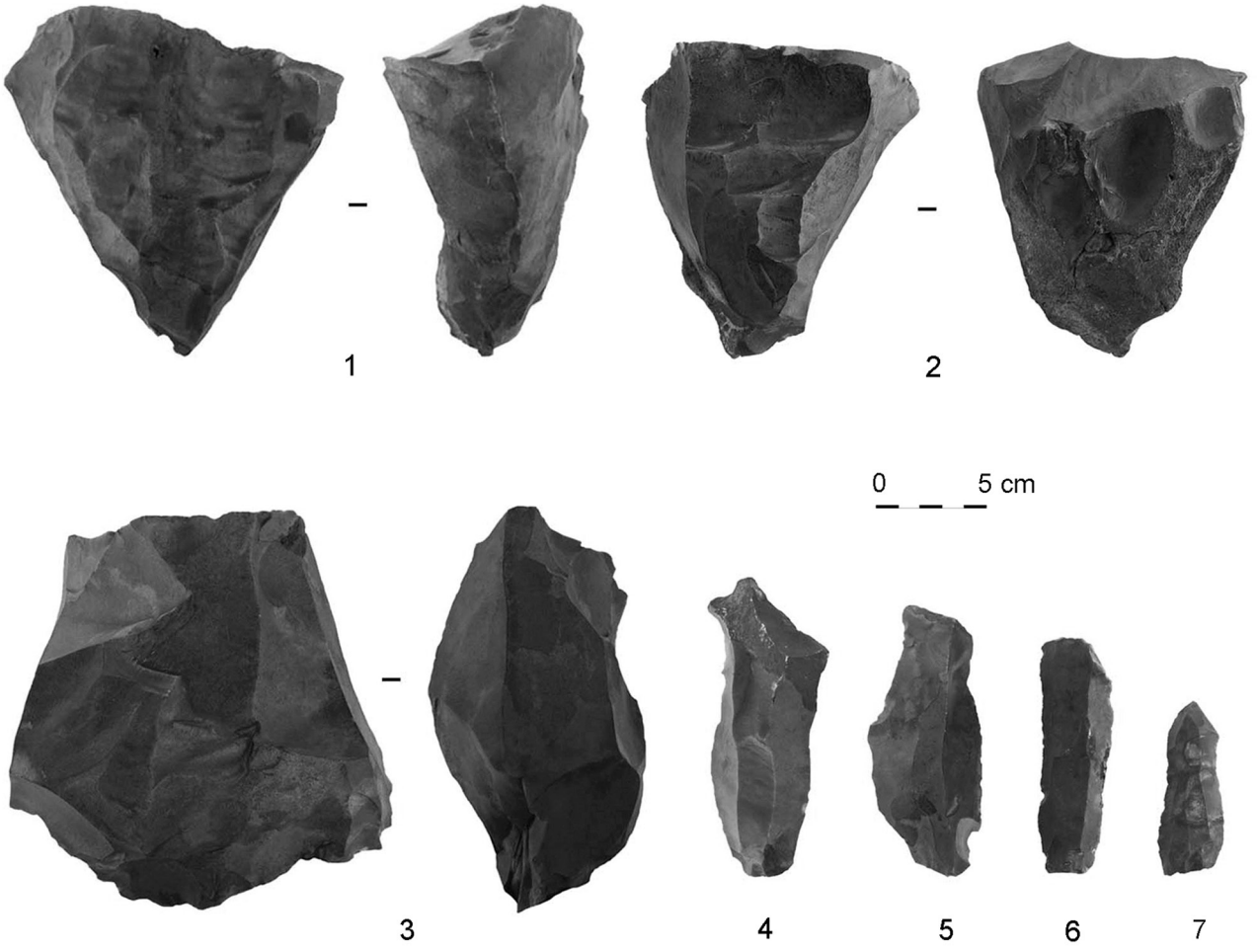


Figure 7. *Laminar artefacts (Sufrat Dishshah, Adam region):* **1–3.** *blade cores;* **4–6.** *unretouched non-convergent blades;* **7.** *an unretouched convergent blade.*

Laminar remains

Numerous laminar remains (blade and laminar cores) were systematically identified in association with Levallois and bifacial remains. Their cores (triangular in nature) have a platform surface or an opposed platform surface. Debitage is made through internal percussion with a hard hammer and in line with recurring bipolar or unipolar production methods (convergent or non-convergent). The principal aim is to produce a series of laminar removals from each debitage surface, whether they are convergent or not. Numerous blades were also identified; they are relatively thick and, with a few exceptions, never retouched (Fig. 7). Those remains are relatively rare in the Arabian Peninsula but nevertheless have been identified in close outlying regions, specifically in central Oman (e.g. Jagher 2009; Jagher & Pümpin 2010; Rose & Usik 2009; Hilbert 2012).

If it is difficult to attribute these remains to a defined chronological period, it is interesting to note that they possess common typo-technical traits with a laminar industry found in central Syria (e.g. Boëda 2005). This laminar industry was uncovered under a Levallois stratigraphic layer. It has been linked to an ancient Middle Palaeolithic industry, contemporary with or prior to the Hummalian technical phenomenon (characterized by exclusive blade production). The Hummalian phenomenon is peculiar to the ancient Middle Palaeolithic in the Levant and has been dated around 200,000–150,000 years BC (e.g. Hours 1982; Le Tensorer 2005; Copeland & Hours 1983). Even if these remains were found without a chrono-stratigraphic context, this laminar industry could still be associated to the Middle Palaeolithic period.

Bifacial remains

In association with Levallois and laminar remains, numerous bifacial pieces were discovered. They measure on average between 80 and 120 mm in length and between 40 and 80 mm in width. These pieces are

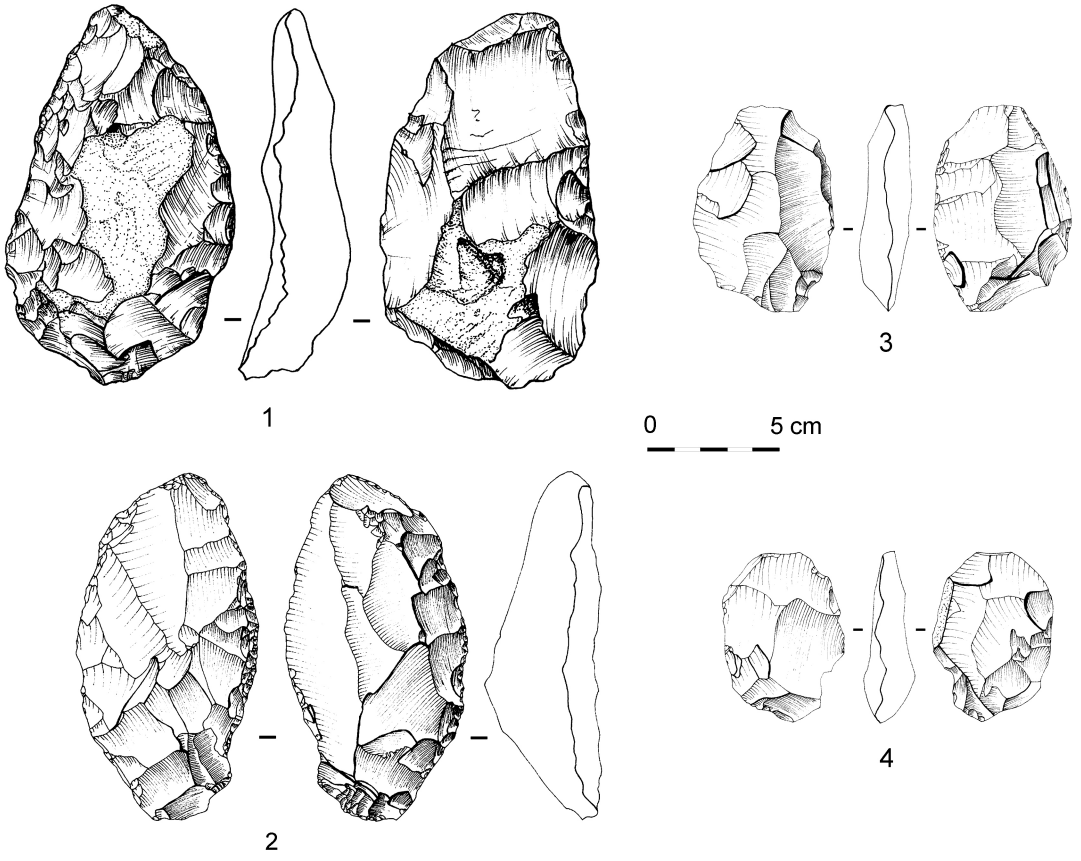


Figure 8. *Bifacial pieces (Sufrat Dishshah, Adam region):* **1–2.** *convergent bifacial pieces;* **3–4.** *non-convergent bifacial pieces.*

entirely shaped and have diverse morphologies (large or narrowly elongated and/or oval in shape). Their lateral edges are convergent or non-convergent and have some varied delineations (convex, concave, straight) (Fig. 8). It is important to note that the plan section of some convergent pieces are plano-convex, such as some eastern European micoquian bifacial pieces that have been dated to the recent Middle Palaeolithic. On the other hand, still in central Syria (e.g. Boëda 2005), similar industries in terms of technical characters have been uncovered at the level containing laminar industries located under a Levallois layer. These Middle Eastern bifacial industries were attributed to the ancient Middle Palaeolithic.

Finding those bifacial pieces is far from a rare occurrence. In fact, they were commonly found in other Palaeolithic industries that were studied, for example in the south of the Arabian Peninsula, in Oman (e.g. Biagi 1994; Rose 2004; Rose & Usik 2009; Jagher 2009; Hilbert 2014; Hilbert et al., in press), in the United Arab Emirates (e.g. Armitage et al. 2011; Scott-Jackson, Scott-Jackson & Rose 2009; Wahida et al. 2009), and in Yemen (e.g. Crassard 2007). From our point view, they could even constitute a kind of 'regional specificity' during the Middle Palaeolithic but also during the Late Palaeolithic and the Early Holocene. Indeed, it is likely that among all the bifacial pieces found in the area of Adam but also in other parts of the Arabian Peninsula, some of them correspond to the Middle Palaeolithic, while other bifacial pieces would correspond to a late Palaeolithic or a Holocene age such as those discovered in the southern Najd in Oman (Hilbert 2014; Hilbert et al., in press).

Bifacial remains from the Lower Palaeolithic

In the south-eastern foothills of the Sufrat Dishshah two bifacial pieces were found in association with many large elongated flakes and a few flake cores (cores with one striking platform and a single flaking surface for the detachment of one or two wide thick removals). The two bifacial pieces of amygdaloid and oval contours are

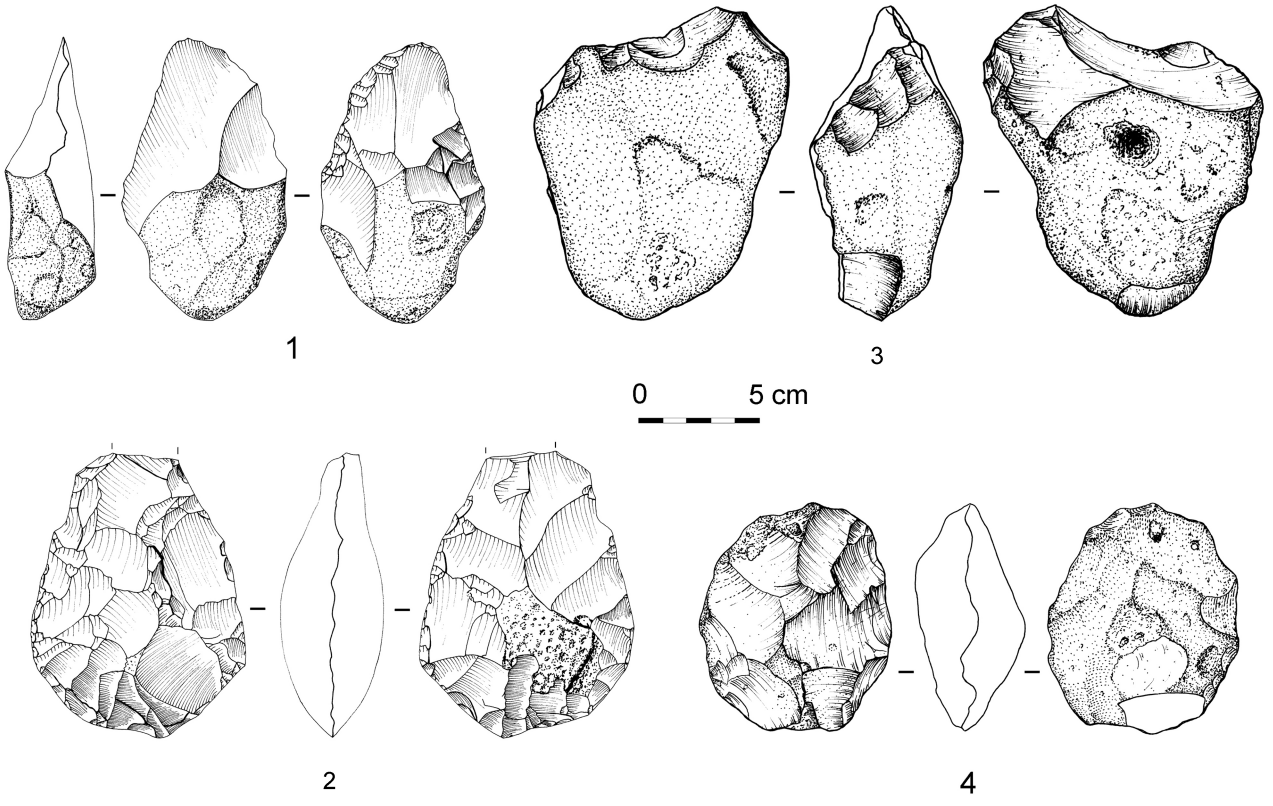


Figure 9. *Handaxes and cores (Sufrat Dishshah):* **1–2.** *handaxes;* **3–4.** *flake cores.*

formed by two relatively convex secant surfaces and are shaped by an internal and tangential percussion (Fig. 9). Their volumetric configuration and their technical traits are similar to those on certain Lower Palaeolithic bifacial pieces of the Arabian Peninsula, in East Africa, the Near East, and Pakistan, to cite only the neighbouring regions. Indeed locally, in south-west Oman, Yemen, and particularly in Saudi Arabia, similar artefacts have been reported, for example, the sites of Wādī Fatimah (Wādī Fāṭimah, e.g. Whalen et al. 1988; Petraglia 2003), Dawadmi (al-Dawādimī, e.g. Petraglia 2003; Petraglia, Drake & Alsharekh 2009; Whalen et al. 1983; Whalen, Siraj-Ali & Davis 1984; Zarins et al. 1980), Saffaqah (Ṣaffāqah, e.g. Whalen et al. 1983; Whalen, Siraj-Ali & Davis 1984; Zarins et al. 1980; Petraglia 2003; Petraglia, Drake & Alsharekh 2009), or in the Nefud desert (Ṣaḥrāʾ al-Nafūd) in northern Arabia (e.g. Shipton et al. 2014). Outside the Peninsula in the Near East, certain volumetric and technical similarities can be observed between these two pieces and those at Latamné (al-Laṭāminah, e.g. Clark 1966*a*; 1966*b*), Nahal Zihor (e.g. Ginat, Zilberman & Saragusti 2003; Grosman, Smikt & Smilansky 2008), and Nadaouiyeh Aïn Askar (al-Nadwiyyah ʿAyn ʿAskar, e.g. Le Tensorer 2006; 2009). Technical similarities are also identifiable, for example between these two bifaces and those found in north-east Pakistan in the Jhelum Basin at the sites of Dina and Jalapur (e.g. Allchin 1995).

These bifacial pieces discovered in the Adam region, although limited, are nonetheless important since with the recent discoveries in the central region of Sharjah (al-Shāriqah) in the UAE (e.g. Bretzke 2015), they are current evidence of one of the eastern extensions of the bifacial phenomenon of the Lower Palaeolithic on the Arabian Peninsula and attest to Lower Palaeolithic occupations on the edge of the Asian continent.

5. Conclusion

As an outcome of the first Palaeolithic survey campaigns conducted by the French Mission of Adam, the Sufrat Valley has been defined as a vast area (more 10 km^2) where numerous large lithic surface scatters of high density have been identified on each topographical unit of the valley. The study of these lithic remains has enabled us to attribute them to the Middle/Late Palaeolithic period and, for two pieces, to the Lower Palaeolithic. In this region of north central Oman, similar findings remain extremely rare and the site of the Sufrat Valley is, for the moment, the most easterly of the Arabian Peninsula. All the pieces identified are certainly the reflection of many technical facies, considering that the Lower and Middle Palaeolithic periods are two large entities comprising several cultural and technical facies. For this reason they are evidence of the successive occupation of the territory by different cultural human groups.

In addition, the Levallois, laminar, and bifacial remains discovered in the Sufrat Valley share some technical similarities with other remains found in close or far outlying regions, as seen in the Middle East. Based on these technological resemblances, some links could be drawn between the west and the east but also the north and the south during different periods. They can be the results of various scenarios: 1) some technical convergences resulting from the invention or reinvention in different places of one or several technical ideas, without any of these ideas being passed on to different groups; 2) the dissemination of ideas through connections between different human groups; 3) the successive anthropological phenomenon of hominids. At the crossroads between the east of Africa and the Middle East, the Arabian Peninsula has always been occupied by Palaeolithic populations and has often been considered as a turning point in the diffusion of cultural streams and/or population migration from eastern Africa to the Middle East and to western and eastern Asia.

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