Reto Jagher
University of Basel
Reto.Jagher@unibas.ch

Dorota Wojtczak
University of Basel
Dorota.Wojtczak@unibas.ch

Maysoon al-Nahar
University of Jordan
maysnahar2016@gmail.com

Khaled Abu Ghaneimeh
Yarmouk University
khaled.m@yu.edu.jo

Fuad Hourani
University of Jordan
f.hourani@ju.edu.jo

Jean-Marie Le Tensorer
University of Basel
Jean-Marie.LeTensorer@unibas.ch

Reto Jagher, Dorota Wojtczak, Maysoon Al Nahar, Khaled Abu Ghaneimeh, Fuad Hourani, and Jean-Marie Le Tensorer

The First Human Settlements on the Left Bank of the Jordan Valley: The 2015, 2016, and 2018 Surveys

Abstract

This project, focusing on the Palaeolithic period of the Upper Jordan Valley between the Yarmouk River and Dayr ʿAllā, is a joint Jordanian-Swiss research venture of the University of Basel, the University of Jordan, and Yarmouk University. Two hundred and nineteen Palaeolithic sites and 96 undiagnostic sites of unknown age were located during three field seasons in 2015, 2016, and 2018. All of these discoveries are open-air factory sites exposed on the modern surface, and only five of these are well stratified with more pending confirmation. This paper is an interim report of an ongoing project. There is possible evidence of an Early Palaeolithic occupation that needs further investigation. Acheulean-style hand axes are widespread as surface finds, with only a single major site confirmed. The most important discoveries include: the Yabrudian sites embedded in the travertine of the Ṭabaqat Fiḥl and strong evidence of an Early/Middle Palaeolithic blade industry rarely observed in the Middle East. About half of the diagnostic discoveries observed during the surveys confirm a widespread and constant presence of humans during the Middle Palaeolithic. One of the survey sites north of Ṭabaqat Fiḥl showed evidence of the Upper Palaeolithic in the Jordan Valley. Late Palaeolithic occupation centres on a small area north of the Ṭabaqat Fiḥl, but few isolated finds demonstrate a farther reach.

Introduction[1]

New discoveries in the El Kowm region (Central Syria) of the Middle East triggered new discussions about human dispersal from Africa into Eurasia and caused re-evaluation of our understanding of the earliest occupations in the Levant (Le Tensorer *et al.* 2015). The initial human colonisation of the Arabian Desert and the

[1] Spelling of place names in this work may differ from the orthography used in other publications by the authors due to standardization procedures during editing, per the series guidelines.

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Levant occurred about 1.8 million years ago and can be associated with the oldest lithic technologies of the Oldowan stage, typically seen in East Africa from about 2.5 million years ago. Expansions out of Africa occurred many times, although the routes taken by these early humans into Eurasia are still poorly understood. However, it appears that the Near East stands as a favoured pathway to Asia and Europe. The sites studding the length of the corridor formed by the Dead Sea and the Jordan and Beqa'a Valleys evidence the route taken towards the North, a natural passageway resulting from the tectonic movements of the Syro-African rift (Le Tensorer 2009; Le Tensorer *et al.* 2015).

In the catchment area of the Jordan Valley between the Sea of Galilee and the Dead Sea, the Lower Palaeolithic site of 'Ubeidiya on the left bank of the River Jordan and observations from Abū Hābīl or the Dawqara Formation prove the antiquity of the dispersals and the first human settlements in the region (Muheisen 1988a; Bar-Yosef and Goren-Inbar 1993; Parenti 1997; Copeland 1998; Malago 2015). Despite its central position in the geography of the Levant, the Jordan Valley hitherto has never been subject to systematic surveys concerning the earliest human cultures in the Middle East. A preliminary synthesis by Mujahed Muheisen (1988a), and the geological work of P. Macumber (1992) in the Mashara Region, identified a prospective sector on the east bank along the Jordan Valley between the Yarmouk River and Dayr 'Allā.

The Jordan Valley

The Jordan Valley owes its existence not to riverine activity, but to tectonic plate movement. The valley was formed by a strike-slip fault at the eastern margin of the Arabian plate drifting northeastwards against the Sinai-Africa plate, along the Dead Sea Transform Fault running from the Gulf of 'Aqaba to the foothills of the Taurus Mountains. The Arabian plate has been moving northwards for about 18 million years at a rate of about 4–5 mm per year during the Late Pleistocene (Ferry *et al.* 2007). Secondary lateral movements opened successive strike-slip basins, like pearls on a string, resulting in today's graben structure. In compensation for the subsidence movement of these basins, the lateral margins were lifted upwards. The relative displacement of these movements created the spectacular margins of the valley. Locally, such movements could equal several millimetres per year, permitting substantial vertical displacements of several metres per millennium in a relatively short geological time frame and creating important topographical changes. The present-day topography of the Jordan Valley is the result of a multitude of local episodes, and it continues to be in a permanent state of evolution.

The topographic delimitation of the endorheic valley and the low altitude create specific climatic conditions. The height of the valley wall protects the floor from most of the prevailing winds, which, with the additional density of the atmosphere, results in a mean temperature about 7–8°C higher than in the adjacent landscapes. These conditions were probably attractive for Palaeolithic hunters and gatherers during winter, especially in colder climatic periods during the Pleistocene. Considersing the geography of the Middle East, the valley served as a refuge, providing shelter against the cold.

The climate in the Levant over the past million years was considerably different, with substantially lower temperatures for most of this period. Under glacial conditions, mean annual temperatures were at least 6–7°C lower than in the present (Affek *et al.* 2008), leading to much less evaporation. However, even with reduced precipitation, moisture was more readily available to plants for a longer period than is the case today, allowing a build-up of a much

larger biomass (Wirth 1971). These lower temperatures and decreased evaporation led to runoff from the surrounding areas filling the endorheic Jordan Valley basin, which under favourable conditions could create a freshwater lake that stretched some 245 km from the Sea of Galilee in the north to the Dead Sea in the south. Estimates based on the youngest of these episodes, known as Lake Lisān (*e.g.*, Abu Ghazleh and Kempe 2009; Lisker *et al.* 2009; Abu Ghazleh 2011; Torfstein *et al.* 2013), together with observations from older episodes such as Lake Samra and Lake Amora (Waldmann *et al.* 2009, Torfstein 2017), and the aid of palaeoclimate proxies (*e.g.*, Lisiecki and Raymo 2005; Affek *et al.* 2008) permit the reconstruction of a massive barrier to movement for at least two-thirds of the Middle Pleistocene.

This change in palaeogeography had a deep impact on migration routes, a fact that is easily overlooked in our perception of the Levant. This massive barrier separated the coastal areas from the interior, forcing both humans and animals to make considerable detours either to the north or the south. Crossing the Naqab (Negev; Negeb) desert was a possibility for humans, but only certain animals could attempt the same. Today a trip from ʿAmman to Jerusalem would take two or three days on foot, however with the presence of the lake, the journey becomes four or five times as long. For most of the Palaeolithic, the Jordan Valley has to be considered as a massive barrier that limited movement.

According to global and local climate archives (*e.g.*, Bar-Mathews *et al.* 2003; Lisiecki and Raymo 2005), the current climate with wet winters, hot dry summers and relatively high annual mean temperatures has prevailed for about 11,000 years, but only corresponds to relatively short periods since the Middle Pleistocene (*i.e.*, in the past 800,000 years). Precipitation was brought by west winds from the Mediterranean Sea, and its restricted size meant that massive cyclones were rare (Rogerson *et al.* 2019 and literature therein). In cooler conditions, potentially less moisture was transported, but lower temperatures meant less evaporation, hence better conditions for the development of the plant cover (Pabot 1956; Haude 1969; Wirth 1971; Schiebel 2013).

Survey Strategy and Procedures

Screening for lithic artefacts was carried out over the natural and ploughed surfaces within defined sectors (Fig. 1). Depending on the topographical situation, either regular transects or systematic inspections of promising locations were walked by individuals or in small groups of two to three.

All observations, regardless of the presence or absence of archaeological evidence, were documented with their GPS coordinates. In order to establish a comprehensive archaeological map of the surveyed area, both positive and 'negative' observations (*i.e.*, the absence of archaeological finds) were strictly and congruently documented.

In order to gather the greatest amount of data possible in the time allotted, the discovery of potential sites was recorded with only their basic chronological context. Comprehensive studies of these sites (except for exceptional discoveries) were not planned at this stage of the project, in favour of a wider ranging dataset.

The general database contains GPS coordinates for each point surveyed, the presence or absence of archaeological finds, chronological evaluations, discovery situation, artefact abundance, number of sample finds taken, and artefact characteristics according to basic technomorphogical classification. Furthermore, topographical and geological survey sectors and special observations were noted together with the local place names. Altitude was measured with a high-resolution digital elevation

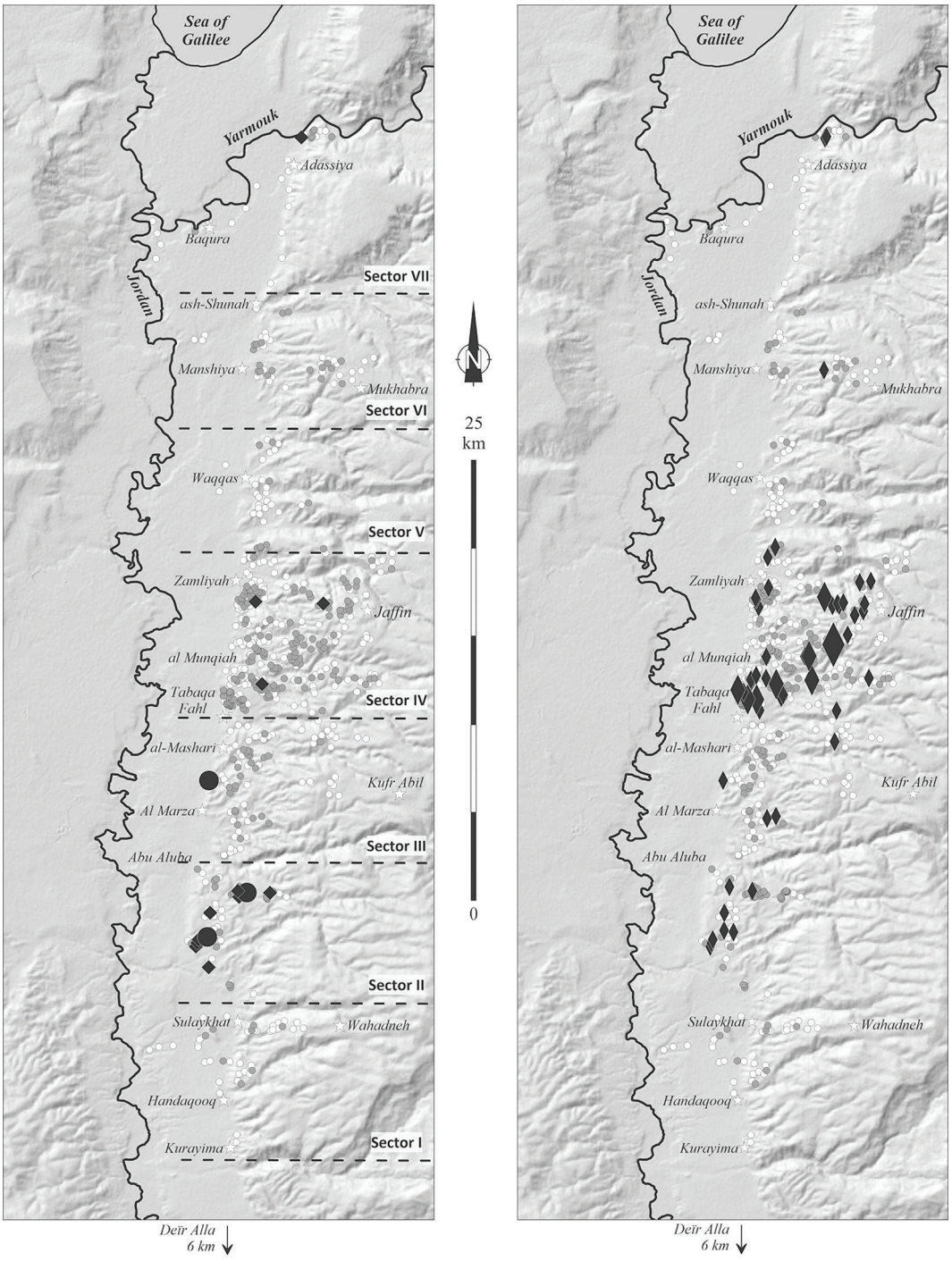
1. Screening for artefacts at the Munqiah 10 site on the western margins of the Jaffin formation.

model, based on the USGS (United Stated Geological Survey) SRTM1 (Shuttle Radar Topography Mission) data set with a resolution of 1 arc-second (*i.e.*, 31 x 26 m on the ground), as vertical GPS measurements showed considerable variance. As a whole, the dataset consists of 11,500 documented entries relating to 663 locations.

Survey Area

The scope of the survey in the original project design was to cover the area of the northern half of the Jordan Valley between Dayr ʿAllā and the Yarmouk River. Potential survey areas were defined based on their geographic and geological settings. Few topographical maps with the necessary resolution were available, so the initial fieldwork preparation essentially relied upon satellite imagery and digital terrain models. However, the remote sensing data from Google Earth appeared misleading as the potentially identified bedrock exposures were covered with Upper Pleistocene lake sediments. Moreover, the intensive agriculture of the valley floor impeded any useful observations. Other than a few explorative attempts, this sector was quickly abandoned.

Survey activity focused on the foothills of the Jordanian escarpment (Fig. 2.1), between the village of Kurayima (*ca.* 12 km north of Dayr ʿAllā) and the Yarmouk River approximately 45 km distant (Le Tensorer *et al.* 2016; Jagher *et al.* 2017, 2019). Agriculture was hindered here by the lack of irrigation. The northern sector was only briefly explored; field work essentially concentrated along a narrow strip, about 36 km by 2–6 km wide, between Kurayima and Ash Shūnah situated about 550 m above the valley floor. A systematic and continuous



2.1. (Left) Distribution of pebble tools: diamonds n=1, dots n=4; surveyed places (white dots); locations with lithic artefacts (grey dots). Dashed lines show limits of survey sectors.

2.2. (Right) Distribution of hand axes: small rhombs, isolated discoveries; medium rhombs, small group of hand axes; big rhomb, major Acheulean site of Jaffin 4; surveyed places (white dots); locations with lithic artefacts (grey dots).

3. Collecting artefacts at the Al Marza 7 Middle Palaeolithic site on the first foot-hills just above the Jordan Valley plain.

survey was impeded by the nature of the terrain, ravines, and erosional gullies cutting deep into the slopes of the Jordanian Valley.

In the first stage of the project, special emphasis was given to the identification of Lower Pleistocene deposits and associated archaeological sites, thus concentrating on the valley floor and the directly adjacent hills. No clear evidence of Lower Palaeolithic sites was uncovered. Early Pleistocene deposits in the Jordan graben were exposed in only a few restricted zones. Old graben sediments have so far only been observed in the sector between ʻAdassiyyah and Ṭabaqat Fiḥl. Farther south, excluding the enigmatic Abū Hābīl Formation, probably an alluvial fan rather than a true graben filling, no Lower Pleistocene deposits were positively identified during the survey.

During the second stage of the survey, more attention was given to the lower part of the foothills of the Jordan Valley (Fig. 3), as the valley floor is completely covered with Late Pleistocene deposits, again intensive agricultural works impeded the study of the natural features.

For the third survey season, the attention was moved to the Jaffin area (Fig. 4), rich in flint raw material identified late in the second season. Furthermore, local observations made in the vicinity of the valley in the previous seasons were investigated. A transect of approx. 8 km by 5–6 km along the valley foothills was surveyed to a height of 550 m above the valley floor.

Raw Material Availability in the Jordan Valley

Along the entire foothills of the northern part of the Jordan Valley suitable raw material is scarce. Only seven locations out of 663 showed primary outcrops of flint. In

4. View from the Jaffin 1 site to the Jordan Valley. Artefacts are eroding in the foreground from the caliche (calcium-carbonate precipitations which are consolidating the former surface).

every case there was restricted accessibility to the flint due to the nature of the exposure or the extension of the beds. Moreover, the low degree of silicification, the presence of fissures (from tectonic stress), the size of the blocks, and the low quantity yielded only poor quality flint for flaking.

However, some alluvial deposits in secondary position are rich in flint nodules. During transportation from the original outcrop, poor and fissured material was naturally discarded and the remaining nodules deposited in the current location. The original source of the flint here is the conglomerates of the Abū Hābīl Formation, but suitable raw material is available only in small quantities.

So far, only a single area has shown to be rich in excellent raw material during the survey. In the hills, east of the Ṭabaqat Fiḥl and north of az-Zumaylah, about 250–450 m above the valley floor, extensive outcrops of old fluviatile deposits are rich in large flint cobbles of excellent quality. The age of this so-called Jaffin Formation is unknown and covers a well-defined area of about 10 km^2 (*ca.*7 km from north to south and 1–2.3 km from east to west), delimited on all sides by tectonic faults.

Downhill from these outcrops there are a few accumulations of flint cobbles in residual alluvial deposits in tertiary position. The Munqiah workshop sites are located adjacent to them. The flint accumulations at az-Zumaylah about 2.5 km to the north of Munqiah also seem to be derived from the Jaffin Formation, but from an older displacement.

Despite the scarcity of raw material in the surveyed area, not every outcrop of flint in the Jaffin area was exploited during the Palaeolithic. Indeed, 43% of the flint

occurrences surveyed here, for no obvious reason, were barely or never exploited during the Palaeolithic. Just one-third of the flint outcrops were heavily used for tool production. The reason for selecting certain sites for tool production remains puzzling. Alongside this, one fifth of the artefact-rich sites in the area are not directly connected with flint outcrops. Obviously, Palaeolithic people had a clear understanding of the criteria needed to set up workshops for flint knapping, but their choices depended on wider criteria than just the local availability of suitable raw material.

The Ṭabaqat Fiḥl Travertine Formation

The plateau of the Ṭabaqat Fiḥl (next to Al Mashari) is one of the most prominent topographical structures on the eastern flank of the Jordan Valley between Dayr ʿAllā and the Yarmouk River. The actual appearance of this plateau is due to an extremely active spring system that deposited a massive travertine complex in the Middle Pleistocene. The travertines extend more than 1.5 km north-south along the valley rim and cover a surface area of at least 1 km^2 with an estimated thickness of about 100 m. The depth into the interior of the plateau is less evident, as the formation is deeply covered by younger terra rossa deposits. Visible outcrops indicate that the travertine formation is at least 600 m wide in the north, and 750 m at its southern end.

The Ṭabaqat Fiḥl travertine formation originated as shallow pools and terraces of tens of metres across, where mineral detritus and flowstones accumulated with the upward movement of the outer rim. At the margins of these pools, dense stands of Poaceae reeds and other plants were rapidly covered by thick precipitations of calcium carbonates. Accumulation rates must have been high, attested to by the still visible stalks in the deposits, probably due to intense evaporation. Exposures along the western façade of the Ṭabaqat Fiḥl travertines show a general stratification within these deposits which dips slightly to the south, *i.e.*, a progressive growth of the formation from north to south.

Considering the volume of deposited carbonates, these springs must have been active over many tens of thousands of years. The age of this formation can be estimated as they are 'bookended' by embedded archaeological sites. Two Acheulean sites are confirmed at the base, and at the top a series of Yabrudian sites are covered by a thin layer of travertine, thus indicating an age between the end of the Acheulean and the beginning of the Yabrudian, approximatively 350–300 ka.

The face of the structure, which was white when the springs were active, must have been a conspicuous feature in the Jordan Valley. The striking appearance of the travertine and the abundant availability of water in this semi-arid region must have been attractive for game and humans, who found ideal shelter on the terraces.

The Palaeolithic in the Jordan Valley between Kurayima and the Yarmouk

The Lower Palaeolithic

The presence of Lower Palaeolithic sites on the eastern side of the Jordan River has been claimed for a few decades (Huckriede 1966; Muheisen 1988b; Villiers 1980, 1983). However, the evidence is scarce, and controversy still surrounds the archaeological data and the geological situation of the discoveries.

The Abū Hābīl Formation, an extensive area covered by a thick layer of poorly sorted alluvial and loosely structured conglomerates, has an archaeological (supposedly Oldowan) context (Huckriede 1966) that has caused it to be attributed to the Lower Pleistocene. Subsequent finds of archaic pebble tools and primitive hand axes corroborated an early age for these discoveries, techno-typologically attributed to the ʿUbeidiya finds (Muheisen 1988b).

Observations by Macumber and Edwards (1997) found no Oldowan artefacts and suggested a much younger age for the formation. In 2015, the joint team of the Jordan Valley Palaeolithic Survey spent three days investigating the conglomerates of the Abū Hābīl Formation. Artefact density was surprisingly low. Artificial profiles in construction pits and natural outcrops along erosional gullies, often up to 10 m deep, were scrutinised for *in situ* artefacts with no result. Pebble tools, such as choppers and chopping tools, were observed in two spots, one of which yielded four pebble tools (see Fig. 2.1). The three hand axes found in the context of the Abū Hābīl Formation show some archaic features but cannot clearly be attributed to the early Acheulean as they were heavily eroded, like all surface material from the area. Today the available evidence no longer supports the presence of a very old period at Abū Hābīl.

The presence of archaic-looking pebble tools was not only noted at Abū Hābīl but also in the neighbouring areas of Kurkuma, Ṭabaqat-az-Zumaylah-Jaffin, and ʻAdassiyyah. In each of these areas just one lone pebble tool was recorded, giving no evidence of very early occupation. The only exceptions are the observations at Abu Aluba, where the walls of an artificial outcrop yielded four pebble tools, an archaic-looking hand axe, and a few associated flakes. The appearance of the assemblage and its geological context, a coarse, poorly structured conglomerate, confirm the integrity of the collection, with the possibility of a very early date. However, further confirmation of these brief observations is needed in order to corroborate the chronological claim.

The Acheulean

Hand axes are easily recognised, and immediately identified as significant finds during surveys by their size and characteristic morphology (Fig. 5). These are characteristic objects with a specific cultural label (Muhesen and Jagher 2011). In many cases, accompanying artefacts are often neglected or handled cursorily as the hand axe takes importance. However, it is pertinent to ask whether each of these tools is Acheulean and whether the presence of every hand axe denotes an Acheulean site.

In fact, about two-thirds of the sites that yielded hand axes are places where just a single tool of this type was found. Just eight out of 55 'Acheulean' sites produced more than six hand axes, with just one site yielding 19 such tools. It is difficult to specify a minimum threshold that would define a true Acheulean site (Muhesen and Jagher 2011). For this Jordan Valley survey, the standard in the interim has been set at more than six hand axes. Compared to the locations of the isolated finds, the places with abundant hand axes are concentrated in a well-defined area in the centre of the valley, in the Ṭabaqat Fiḥl and Jaffin areas (see Fig. 2.2). It is no surprise that hand axes are more frequent in the Jaffin sector where there is more plentiful raw material. The sites on the Ṭabaqat Fiḥl are at least 2–3 km away from the closest flint outcrop, a relatively short distance. The few sites where hand axes were present in a significant number can be assigned by their shape and style of finish to a later stage of the Acheulean, *i.e.*, the Upper Levantine Acheulean (Jagher 2016), with an approximate age between 700 and 350 ka. It is not possible to more accurately date these finds under the given circumstances (*i.e.*, that they are surface finds and occurring in limited numbers).

Clearly two sites, Ṭabaqa 20 and 21, are Acheulean, discovered on a similar stratigraphic level in the basal part of the Ṭabaqat Fiḥl travertine formation, although Ṭabaqa 20 is slightly above Ṭabaqa 21 (Fig. 6). Each produced about 500 artefacts with lithics perfectly preserved and edges in a pristine state. At both sites, artefacts

5. Hand axes from Acheulean contexts from different sites in the central area of the survey. Scale bar = 3 cm.

were still embedded in the rocks. However, their orientation (*i.e.*, inclination), as well as their nature within the original deposit, suggests some mechanical dynamics prior to definite embedding and sedimentation.

Preliminary observations indicate some characteristic features for each of the two sites, such as a much larger number of cores and dominant flake production in Ṭabaqa 20 and a much higher quantity of hand axes and associated reshaping flakes in Ṭabaqa 21. Retouched flakes are rare and quickly produced at both sites.

Despite the modest number of hand axes,

6. Surveying at the Ṭabaqa 21 Acheulean site stratified within the basal layers of the Ṭabaqat Fiḥl travertines, just above the Jordan Valley plain.

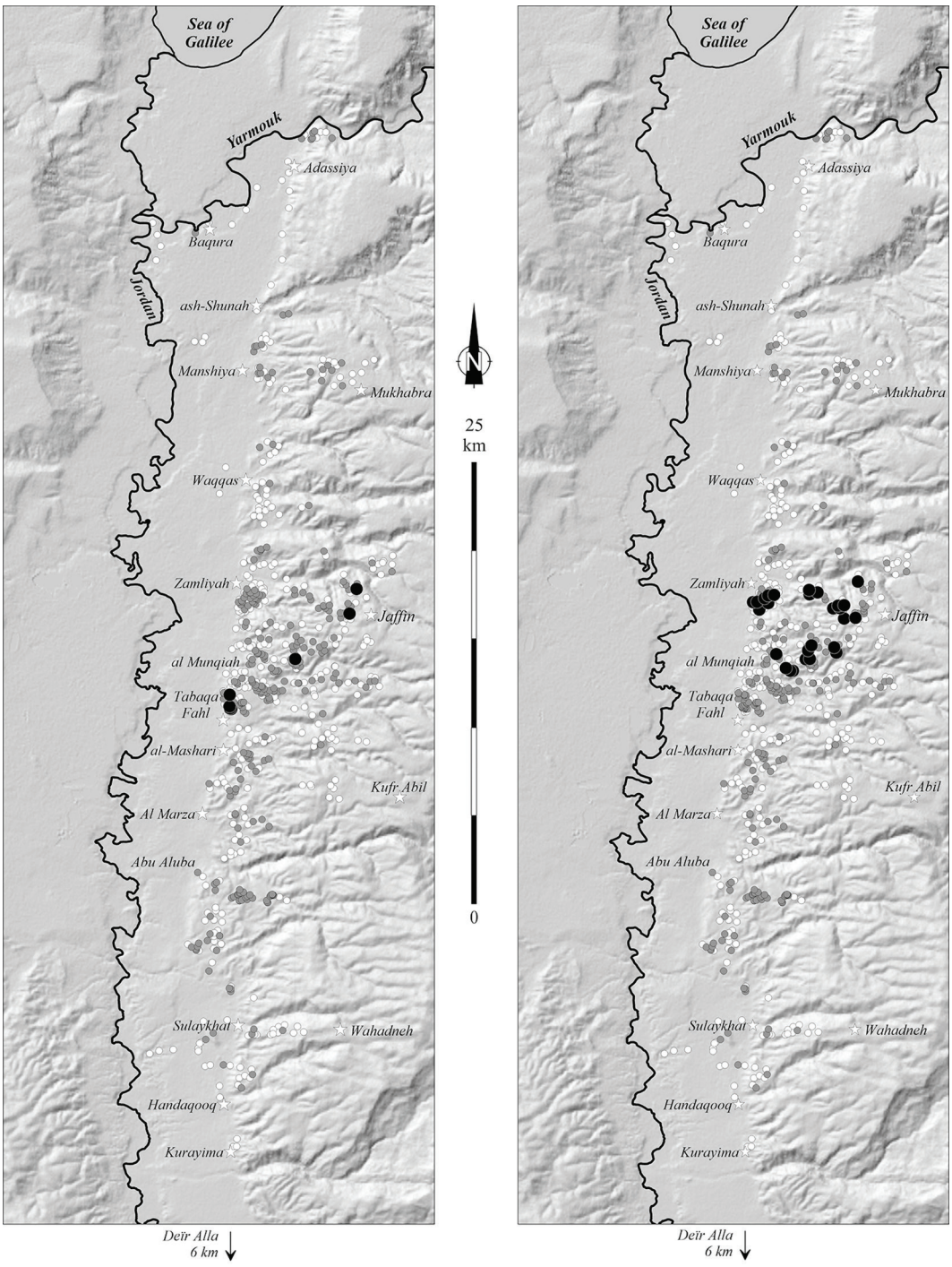
the important number of flakes produced from the curation of hand axes clearly demonstrates the importance of these tools in Ṭabaqa 21, which can be associated with the Levantine Upper Acheulean. In contrast, the Ṭabaqa 20 collection is clearly different, with a strong core and flake element, just a few hand axes, and no clear evidence of façonnage (*i.e.*, production) on the spot. The Ṭabaqa 20 material shows some affinities to the so-called non-hand-axe Acheulean of the Levant (Bar-Yosef 2006; Malinsky-Buller *et al.* 2016). However, this statement needs further confirmation.

The Yabrudian

The Yabrudian (dated *ca.* 320–240 ka) is best represented at the Ṭabaqat Fiḥl sites. Two sites (Ṭabaqa 4 and 5) are stratified and embedded in a massive travertine deposit whereas a third (Ṭabaqa 6), located just above the previous two, is exposed on the surface of the travertine plateau. The numbers and spectrum of artefacts qualify all three as major settlements (Fig. 7.1). On four occasions individual tools (*i.e.*, scrapers) of definite Yabrudian style were observed during the survey. An additional three less distinct artefacts of possible Yabrudian manufacture are not included here. These stray finds were located 3–7 km from sites in the Jaffin area of the Ṭabaqat Fiḥl, indicating the presence of Yabrudian people in an area of natural availability of flint, although it is a short-term presence.

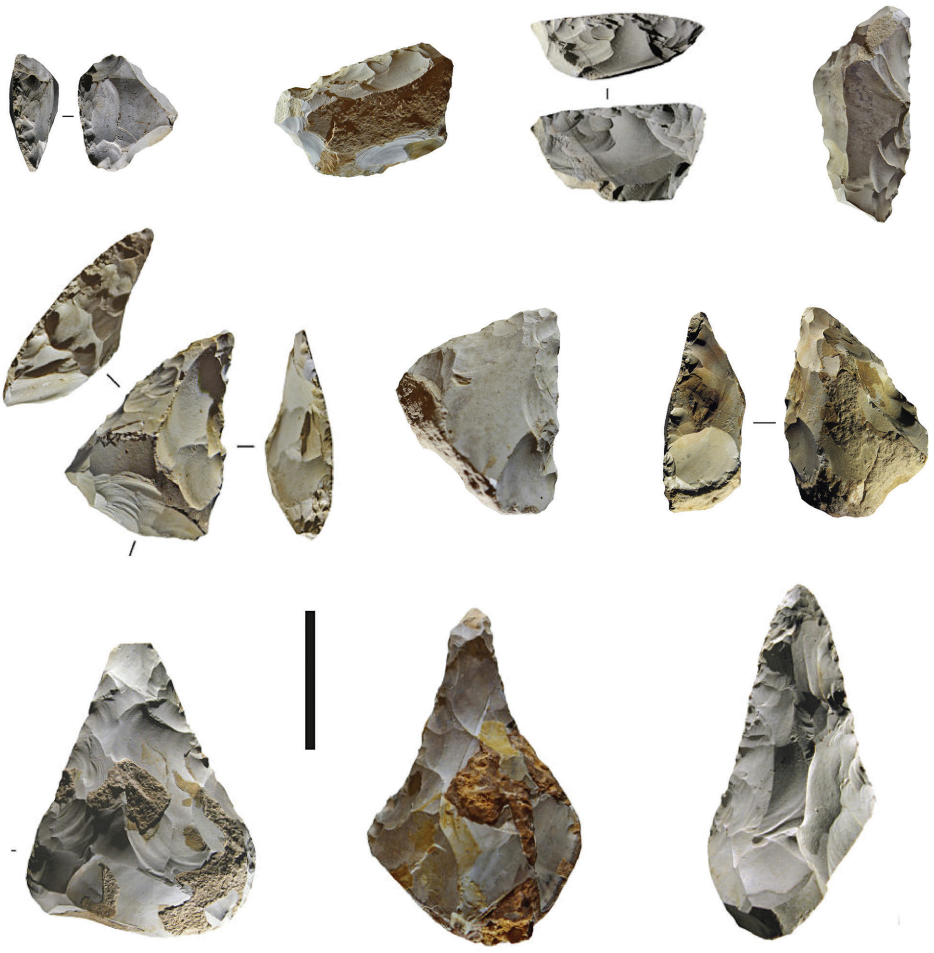
Characteristics of the Yabrudian

The Yabrudian shows a number of inherent characteristics with respect to technology, morphology, and style that distinguish it clearly from the preceding Acheulean. These include a new core reduction strategy, similar to the European Quina debitage to produce very thick flakes, including numerous transversal and offset blanks; a systematic production of side scrapers that subsequently underwent intensive stepped retouch and repeated resharpening; and a complex behaviour of curation, recycling and modification in



7.1. (Left) Location of Yabrudian sites (black dots). Only the discoveries at the Ṭabaqat Fiḥl are settlements, other observations are just isolated finds: surveyed places (white dots), locations with lithic artefacts (grey dots).

7.2. (Right) Distribution of Early Middle Palaeolithic blades sites (black dots): surveyed places (white dots), locations with lithic artefacts (grey dots).



8. Selection of Yabrudian tools from Ṭabaqa 6 site: on the top two rows are different types of scrapers with the typical Yabrudian step retouch and hand axes in the bottom row. Scale bar = 3 cm.

nearly all aspects of their lithic technology. Façonnage was only applied to a marginal extent. Levallois technology is non-existent in Yabrudian assemblages. The sum of these distinctive traits clearly separate the Yabrudian from the Acheulean.

The Ṭabaqat Fiḥl Yabrudian Sites (Ṭabaqa 4, 5, and 6)

The youngest site (Ṭabaqa 6) is located on top of the Ṭabaqat Fiḥl travertine formation. Its exact geological position is unknown, as the artefacts are exposed on a ploughed surface. Typical Yabrudian artefacts (Fig. 8), such as scrapers and hand axes, occur together with Levallois cores, flakes, and other flint implements. Part of the find area has been destroyed through historic buildings and fortifications from the 1967 six day war.

The main Yabrudian sites (Ṭabaqa 4 and 5) are located about 15 m below the surface of the Ṭabaqat Fiḥl plateau. Both sites are exposed along an outcrop of the travertine formation at its southern edge, along an erosional gully cutting through the deposits

and deep into the underlying bedrock. These sites were originally located in 1989 by Philipp Macumber (1992; Macumber and Edwards 1997). The presence of a number of hand axes resulted in the attribution to a late Acheulean date at the time of their discovery. Except for these preliminary observations, no further investigations were undertaken at that time. The 2015 and 2016 observations permitted the confirmation of an *in situ* site with artefacts still embedded in the isolated travertine blocks. However, the precise location of the layers containing the original site has yet to be established.

When rediscovered, artefacts were exposed by erosion on the steep slopes of the southern flank of the Ṭabaqat Fiḥl among outcrops and scattered blocks of travertine eroding from the exposed rim of the plateau. Artefacts occur in more or less dense clusters regularly dispersed over a distance of about 150 m and about 50 m along the slope. In a preliminary approach, the terrain was divided into two sectors (Ṭabaqa 4 [East] and 5 [West]), and artefact density is somewhat lower on the eastern side than on the western side.

The artefacts from both sectors are in nearly pristine condition, with only minor edge damage, and are moderately patinated. Apart from the rich flint material, no palaeontological material was observed despite special attention. In total, 3,340 artefacts, including a substantial number of small pieces (< 3 cm), were collected over the three field seasons.

Field observations indicate the presence of extensive Yabrudian living sites. The presence of fireplaces is demonstrated by a few heavily burnt flints recovered from Ṭabaqa 5. Among the lithic material, the complete production sequence is present in both areas and includes primary and secondary production. The finds from Ṭabaqa 4 and 5 show only minor differences in their composition, with proportionally fewer cores in Ṭabaqa 5, where a higher proportion of small flakes is present. Flake production is in a typical secant way with plain butts and open angles of debitage according to the Quina technology *sensu* Bourguinon (1997; Sanson 2012). The local procedure produced rather thick polymorphic flakes, consuming the volume of the raw material in a fast and rather opportunistic way. Cores are mostly completely exhausted and of small dimensions, in contrast to the many large flakes. A keen sense of a maximal exploitation of the raw material is visible. Many of the big flakes and scrapers have been reused as cores to produce small flakes just a few centimetres long in a basic approach. This leitmotiv of recycling, reuse, and modification of existing tools is also visible in the typical re-sharpening of flakes from step-retouched scrapers, which are present in substantial numbers. A similar curation is also visible on the hand axes.

Hand axes and façonnage are another, yet less frequent, element in the tool sets of the Ṭabaqat Fiḥl sites. Overall, shapes and sizes show a wide spectrum including quite a number of relatively small tools. The latter are not the result of intensive reshaping, but have been conceived as such from the very beginning, demonstrated by their sections. A minority of the hand axes shows an elongated tip with straight or slightly concave sides of typical Micoquian morphology. Additionally, there is also a number of distal fragments of these hand axes, but in contrast distally broken tools are absent. To what extent this terminal damage was accidental or intentional remains undetermined. The loss of the slender tip had an important impact on the functionality of the tools, which obviously were not discarded in this state, but underwent a reshaping of the distal part. Again the inherent spirit of transformation and reshaping is perceptible.

The intense exploitation of the raw material at different levels is one of the characteristics of the Ṭabaqa 4 and 5

material (but also present at Ṭabaqa 6). In contrast, raw material of good quality was plentiful within a two-hour walk of the site. In this respect, the constant recycling, curation, and transformation constitute an inherent cultural expression of the Ṭabaqa Yabrudian.

The Yabrudian in the Levant

The discovery of these Yabrudian open-air sites in the Jordan Valley is of great importance, as except in the Azraq region in the Eastern Jordan Desert, no Yabrudian site has ever been found in the country (Le Tensorer 2006; Al Nahar and Clark 2009; Al Qadi 2016). The new discoveries clearly demonstrate the presence of the Yabrudian at open-air sites outside of a desert environment (Azraq and El Kowm, Central Syria) but also in the western Levant, where cave and rock shelter sites until today were considered predominant (Rust 1950; Jelinek 1982; Gopher *et al*. 2017 and literature therein). The lack of open air sites is probably a taphonomic problem or a lack of suitable surveys rather than prehistoric reality. In fact, just nine out of the 23 known Yabrudian sites in the Levant are in caves or rock shelters.

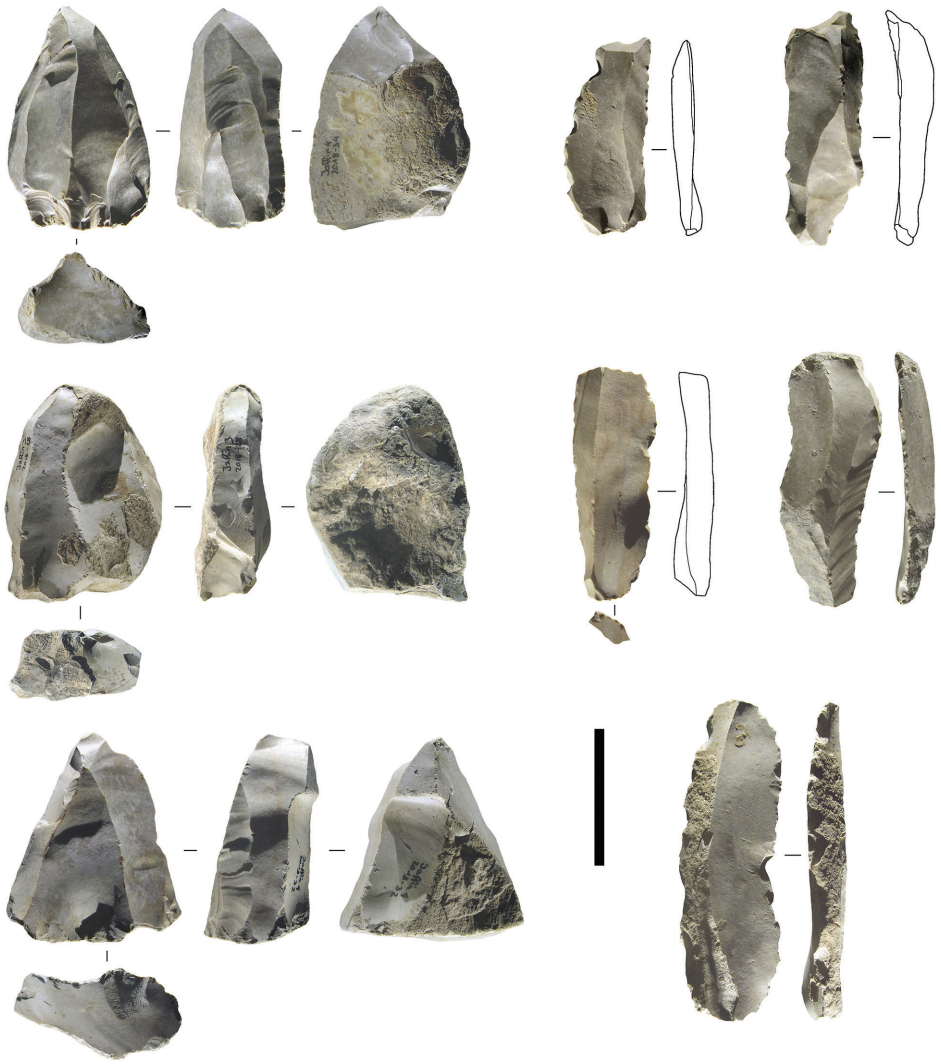
In the Levant, Yabrudian people occupied a wide range of ecological environments, from the coast to the mountains of the interior and deep into the open spaces of the Arabian desert. If the El Kowm cluster with its 11 sites of Yabrudian age is considered (Le Tensorer and Hours 1989; Jagher *et al*. 2015), more than half of the discoveries are located far from the ecologically favourable areas along the Mediterranean, demonstrating the adaptive capacities of the Yabrudian people. The history of the vast Middle Eastern deserts during the Pleistocene is still poorly understood. However, the oases of Azraq in Jordan and El Kowm in Syria clearly demonstrate a long human presence in the desert, not only during short favourable periods, but in a steady settlement pattern, coping perfectly well with this harsh environment.

The Middle Palaeolithic Blade Industries

The geographic location of sites attributed to the Middle Palaeolithic blade industries in the Jordan Valley is well outlined. All sites are located within a sector of roughly 4 x 4 km, the core of the az-Zumaylah-Jaffin area containing the best outcrops of raw material (see Fig. 7.2). Most of the sites are immediately adjacent to flint outcrops, and virtually all of them are located within just a few hundred metres of the next raw material zone. They were identified using a techno-typological approach. Wherever identifiable, locations with blade manufacturing are linked to a dominant element of characteristic blade production waste and with little evidence of blanks and retouched tools. In fact, none of these sites can be identified as a true settlement and are interpreted as factory sites for blade production. They are relatively frequent, 27 of the 140 Palaeolithic sites so far located show evidence of blade production. It seems that the blade makers exploited thoroughly the local raw material deposits to produce great numbers of blanks, ready to be shaped into tools of daily use. These were transferred to the yet unlocated settlements.

The lithic assemblages for blade production reveal no major differences overall. The knapping was aimed at producing elongated blanks regardless of their size and reduction strategy (Fig. 9). The common flaking technique was direct percussion with a hard hammer, as proven by a circular and well noticeable impact point, a convex bulb, and abundant radial defaults (Pelegrin 2000). The preliminary technological studies attest the simultaneous occurrence of a Laminar system of debitage with a particular core volume management, and also a Levallois debitage with the presence of cores and typical Levallois products.

However, sites which uncovered blade



9. Early Middle Palaeolithic blade industry, cores from the Jaffin area (left) and blades (right) from the Zamliya 6 site. Scale bar = 3 cm.

assemblages in the Jordan Valley are at the moment not directly dated and placing them within an exact cultural horizon is difficult, as we cannot use the full range of techno-typological features that usually describe lithic collections. Unfortunately, blanks and retouched pieces are rare in all collections. The assembled blades are often curved in profile and tend to be trapezoidal or triangular with a thick or slightly flattened section. The majority of blades are convergent and parallel. Many of them exhibit cortex on their dorsal surface. Their striking platforms are faceted, plain, or dihedral. The dorsal scar pattern indicates a prominent use of unidirectional debitage with random bipolar flaking including offset debitage, which is well known from the Hummalian industry (Wojtczak 2014; Wojtczak *et al.* 2014). The single platform reduction sequence present in all collections seems to have produced more blades than

flakes, as is observed on the debitage surface of most of the discarded cores. Core convexity was sustained using twisted and overshot blades or thick, ridged blades, but rarely crested blades. All these elements demonstrate that blade production is the main characteristic of all the collected assemblages. Through the study of core, by-product, and (sporadic) end-product characteristics, all blade collections appear to fit within the cultural variability of the Middle Palaeolithic. Foremost, many elements observed in assemblages from az-Zumaylah, Munqiah, and Jaffin combine in the Early Middle Palaeolithic blade assemblages where the Levallois and Laminar reduction strategies (including off-set debitage) together with their characteristic products, CTEs, and cores are present (Meignen 1998, 2007, 2011; Wojtczak 2011, 2014; Goder-Goldberger *et al*. 2012; Wojtczak *et al*. 2014). However, lithic assemblages from the Jaffin area seem somehow set apart from the az-Zumaylah-Munquiah collections. The principal variation is the proportions of the Levallois and Laminar elements within each collected assemblage. It seems that lithic assemblies from the Jaffin region could also represent the transitional industry from Boker Tachtit Levels 1–4 with hard hammer percussion where both the Levallois and Laminar reduction strategies were exercised on site and the use of crested blades has also been reported (Marks and Volkman 1983). Additionally, many cores collected from the Jaffin sites are pyramidal in shape, with a large platform and lateral edges converging towards the distal end. It seems that these cores had to result in triangular-shaped pieces, which could be mistaken for Levallois products. Such elements were also recognised in the assemblage from Level 4 in Boker Tachtit and Rosh Ein More (Goder-Goldberger and Bar-Matthews 2019) and could suggest affinities between the lithic collections from the Jaffin area and the late Middle Palaeolithic lithic assemblages from the Levant. Going forward these hypotheses need to be tested.

Land-Use Patterns in the Early Middle Palaeolithic of Jordan

The Early Middle Palaeolithic blade collections have seldom been observed in Jordan, and those here showed no relationship to the transitional industry from Boker Tachtit Levels 1–4. There are a few locations with the presence of a blade assemblage that claim to be related to the Early Middle Palaeolithic, namely in the region of Azraq (Rollefson *et al*. 1997; Wojtczak 2015), at Tall Khanāsirī (Dietl 2010), and at ʿAyn ad-Dufla (Ain Difla) (Clark *et al*. 1997).

The rock shelter site of ʿAyn ad-Dufla (WHS 634) located in the Waādī al Ḥasā area in the desertic marginal zones of Jordan, showed stratified *in situ* Middle Palaeolithic deposits and the earliest Levantine Mousterian assembly identified in Jordan. Small size of cores (mainly exhausted) in relation to the blanks, numerous fragments of cores and CTEs, numerous debris, and lithic specimens smaller than 3 cm suggest that some flaking activities were undertaken on site. The primary elements of reduction are missing, but it should not be forgotten that the excavated site represents only the small part of a much larger rock shelter. The toolkit is very small: the retouched pieces constitute only 2% of the assemblage and it exhibits a low proportion of tools to debris (Clark *et al*. 1997). Such archaeological inferences indicate intensive or successive occupations where tools were at least partially manufactured and maintained on site.

In the Azraq basin, where constant fresh water was accessible throughout the Middle Pleistocene, paleosettlement was constant (Macumber 2001). Middle Palaeolithic scatters and deposits have been detailed (Copeland and Hours 1989; Rollefson *et al*. 1997) including the existence of Early Middle

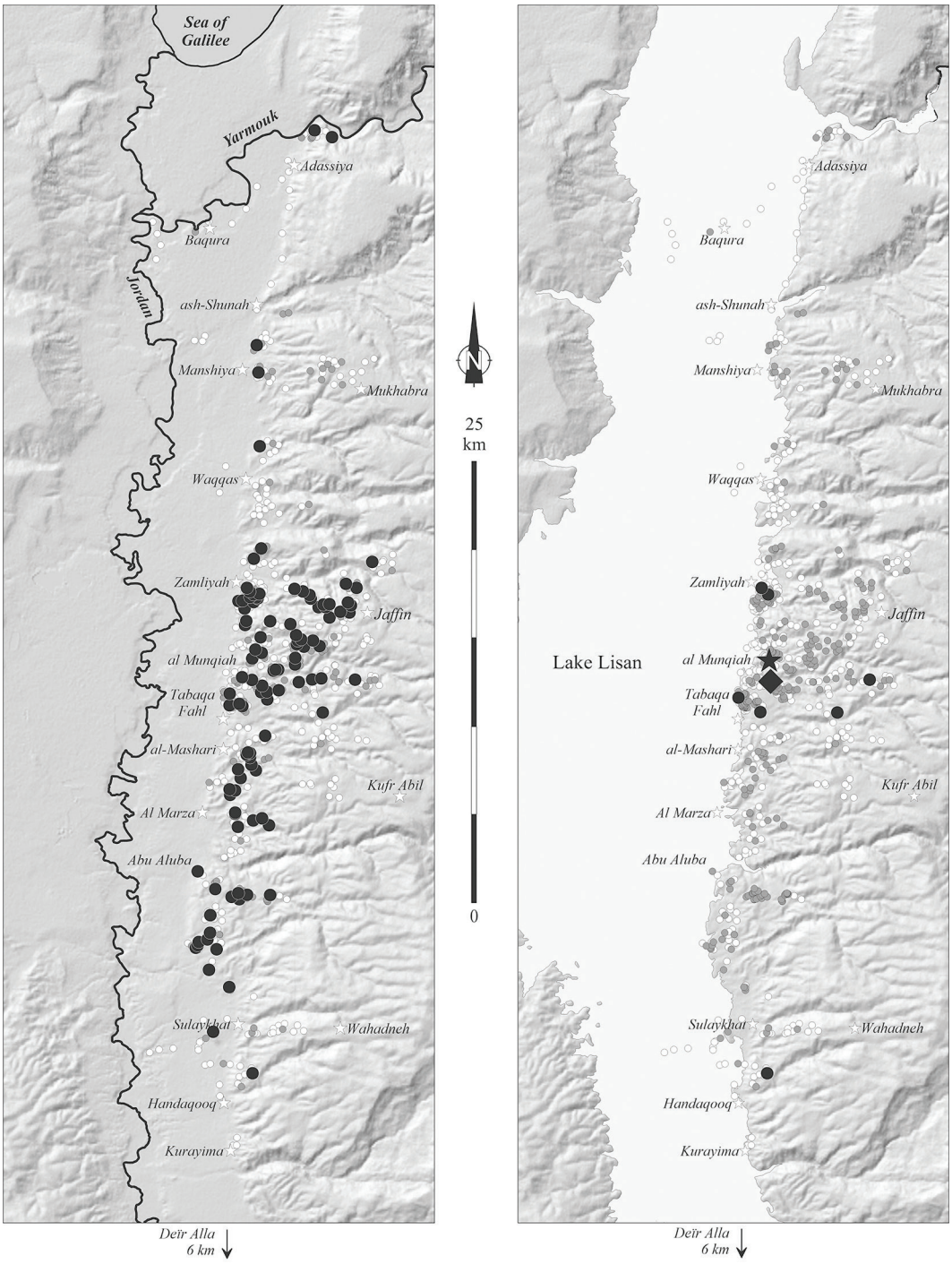
Palaeolithic lithic collections in the major spring of southern Azraq named Ayn Soda (Rollefson *et al.* 2004). These assemblages were examined by one of the authors (D.W.) thanks to the kind permission of Gary Rollefson. Primary investigation indicates a lack of cores and rare CTEs, abundant blank blades of different morphologies, and numerous blades modified by a regular retouch creating the elongated endpoints. All lithic pieces were manufactured by direct, hard hammer percussion and a few show the use of two off-set platforms during flaking. It appears that blanks were not produced on site but introduced from outside. Remarkably, the analyzed stone artefacts are very similar to the blanks and tools known from Hummalian sites from El Kowm (Wojtczak 2011, 2014) and similar industries (*e.g.*, Abu Sif; Hayonim, Misliya Cave). The site delivered a large, dense concentration of artefacts with no true stratigraphy, and it seems that due to post-depositional processes at the site, it is actually a palimpsest, representing a series of occupations.

More Early Middle Palaeolithic locations were recognised about 95 km north of Azraq in the area of Tall Khanāsirī near the Syrian border. The region was defined as a transitional area of the southern Levantine steppe zone and the majority of Palaeolithic sites were documented in connection to *wadis* and their surrounds, which provided water and raw material over a vast area. So, high mobility of human groups and ephemeral site occupation during Early Middle Palaeolithic was proposed (Dietl 2010: 112–6). Generally, the Early Middle Palaeolithic and Levalloiso-Mousterian occupations appeared to show similar settlement patterns, but the Early Middle Palaeolithic hominid groups visited the region of Khanasiri sporadically. Only 10 Early Middle Palaeolithic locations have been recognised, and from those mostly single artefacts, usually cores or retouched/unretouched end-products, were observed, which were possibly transported between places in anticipation of planned labour, worn out and then abandoned. In comparison, 113 Levalloiso-Mousterian sites were discovered, with either a single artefact or locations where at least a partial lithic reduction process took place.

The presented data, together with newly discovered sites from the Jordan Valley, advocates high residential mobility in the region throughout the Middle Palaeolithic, with the people relocating through the landscape with a restricted toolkit. It seems that hominids came to the Jordan Valley to provision themselves with raw material or to produce the blanks for tools and possibly remain for a while. They left behind numerous stone artefacts, which establishes a possible cultural relationship. It also ascertains that these groups traversed the Jordan Valley, a crossroads of the Mediterranean and the arid interior of the Levant. Furthermore, there is confirmation of previous research from other parts of the Near East of a more intensive land-use pattern in the region during the late part of the Middle Palaeolithic period, in contrast to the ephemeral landscape use throughout the Early Middle Palaeolithic (Bar-Yosef 1998; Hovers 2001, 2009; Speth 2004, 2006; Speth and Clark 2006; Meignen *et al.* 2006). However, more information is required to propose better defined settlement patterns during the Early and Middle Palaeolithic period in Jordan.

The Levalloiso-Mousterian

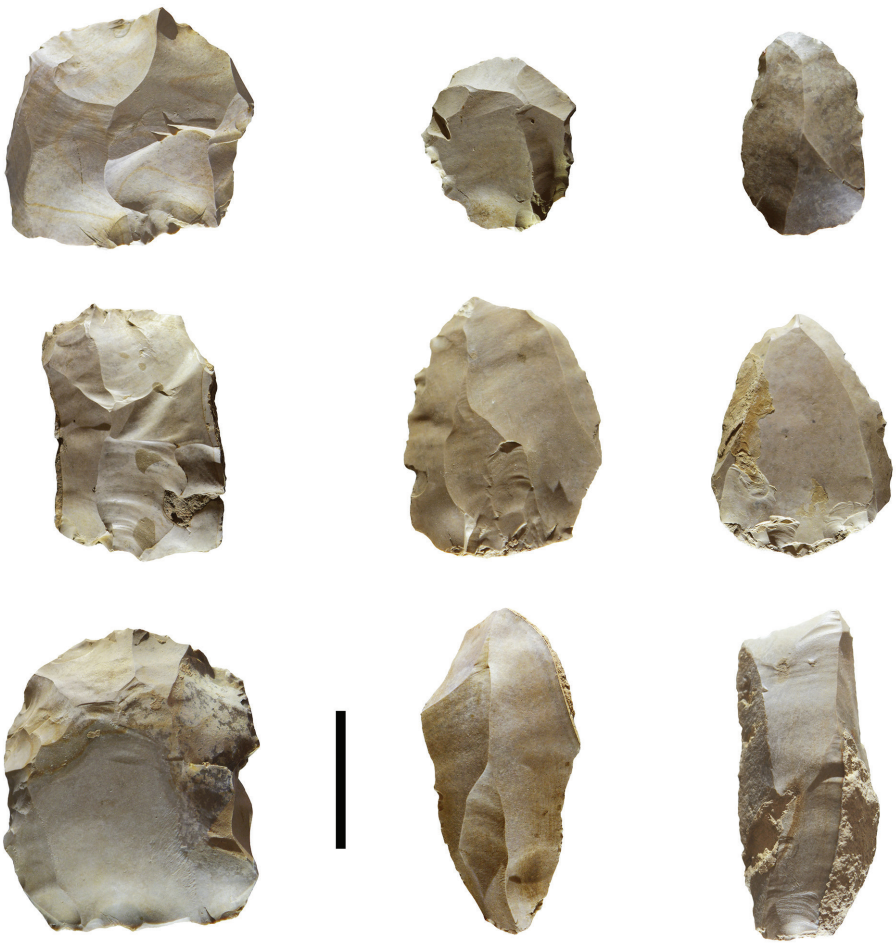
In the Jordan Valley, as almost everywhere in the Levant, the Levalloiso-Mousterian sites by far outnumber those from all previous periods (see Fig. 10.1). The reasons remain a mystery; a demographic increase, a change in land use or settlement patterns, and questions of taphonomy have all been proposed. Remarkably, most (two-thirds) of the Levalloiso-Mousterian sites



10.1. (Left) Distribution of Levalloiso-Mousterian sites (black dots): surveyed places (white dots), locations with lithic artefacts (grey dots).

10.2. (Right) Location of Upper Palaeolithic sites (black star) and Kebaran stray finds (black dots). A black diamond indicates the cluster of Kebaran settlements discovered by P. Macumber and his team. Additionally, the extent of Lake Lisān during the Upper and Late Palaeolithic periods is mapped: surveyed places (white dots), locations with lithic artefacts (grey dots).

in the Jordan Valley are surprisingly small and indicate short lived settlements. The sites are distributed throughout the whole area south of az-Zumaylah except for the southernmost sector at Sulaykhat. To the north, a conspicuously low density is visible. However, this area tends to be a less well documented part of the survey. Here it can be stated that raw material provisioning differed and probably occurred over longer distances than previously. More than half of the rich sites of the Levalloiso-Mousterian are clearly disassociated from the main sources of flint. Levallois cores are well represented in these sites, and point to a considerable processing of the distantly acquired raw material. The evidence so far points to a lack of specialised sites as seen in the Yabrudian or Hummalian. At the Levalloiso-Mousterian sites, a complete production sequence, cores, preparation, and target flakes are present (see Fig. 11). Comparable high-density sites, such as those observed in preceding cultures, are also not present in the Levalloiso-Mousterian.



11. Levallois cores (left) and Levallois flakes (right) from the Tabaqa 12 "Olive Grove" site, scale bar = 3 cm.

The Upper and Late Palaeolithic

The Upper Palaeolithic remains ephemeral in the Jordan valley. A single site, just north of the Ṭabaqat Fiḥl, indicates at least a human presence in the valley during the Levantine Aurignacian. In this period the valley was occupied by Lake Lisān, with the site close to its shores (Fig. 10.2). The barrier of Lake Lisān limited movement and in the broader scheme of human distribution as this location represented something of an impasse.

During the Late Palaeolithic or Kebaran period, Lake Lisān is still in place and the ecological situation close to that of the Aurignacian. The Jordan Valley Palaeolithic Survey observed only isolated finds of the Kebaran at seven locations. Most of these isolated finds are microliths—probably insets of arrows—which might have been lost during hunting. One isolated discovery is located deep in the south, whilst the other six are located within an area of roughly 5 x 5 km. Conversely to the data presented here, previous investigations in the Jordan Valley indicate a stronger human presence during the Kebaran (Edwards *et al.* 1997). At the northern margins of the Ṭabaqat Fiḥl along the Wādī al Ḥammah, a concentration of six substantial Kebaran sites indicate a major, but locally limited, presence of Late Palaeolithic hunters and gatherers in the area along the shores of Lake Lisān.

Conclusions

Three field seasons of the Jordan Valley Palaeolithic Survey by a joint team from the Universities of Basel, Jordan, and Yarmouk revealed a rich Palaeolithic legacy along the eastern foothills of the Jordan Valley, dating from at least the Middle Pleistocene, approximately 500,000 years, and possibly much earlier. This is the first time such a long and continuous human presence along the Jordan Valley has been confirmed. Due to the climate changes that occurred during the Pleistocene, the ecology and appearance of the landscape also evolved. A number of huge lakes covered the Jordan Valley floor at numerous times during the Middle and Upper Pleistocene, creating a completely different environment from that known today.

Human occupation during the Palaeolithic was not ubiquitous along the valley, but seems to be focused on particular areas. A main hotspot was the Ṭabaqa-az-Zumaylah-Jaffin sector with an exceptional density of sites; all known periods are present here. North and south of this area, the cultural variety drops sharply with only the Levalloiso-Mousterian sites mainly present.

The Early Middle Palaeolithic sites are rare and the presence of factory sites tends to suggest that during this period the Jordan Valley was inhabited by a small number of human groups who visited specific areas occasionally and briefly. Conversely, data from the following Late Middle Palaeolithic is well represented and could be considered as a period of lower residential mobility, where sites embody sequential occupations or task-specific localities. The long-term successful subsistence behaviour of Late Middle Palaeolithic groups may be associated with the adaptation to a variety of resources and consequently to diverse land-use. Using these premises, it is proposed that there was demographic increase and a shift in settlement pattern during the Late Middle Palaeolithic Mousterian, as has been observed in many other regions of the Levant.

The very early presence of humans about 1.5 million years ago in the Jordan Valley has yet to be confirmed on the left bank of the Jordan, although at ʻUbeidiya, 5 km north of the confluence of the Yarmouk and Jordan Rivers, evidence is found. A close examination of Abū Hābīl was unable to confirm the claims of early Palaeolithic sites at this location (Huckriede 1966; Muheisen 1988b) as definitive evidence is absent.

Results from Abū al-Khas (Villiers 1980, 1983) are difficult to corroborate and should be treated with caution unless new finds are discovered. Nevertheless, promising geological and archaeological observations indicate the possibility of very old sites on the eastern shores of the Jordan Valley (*i.e.*, Abū Hābīl, az-Zumaylah, and ʻAdassiyya), though future work is still needed.

The most important discoveries of the Jordan Valley Palaeolithic Survey were the recovery, at the Ṭabaqat Fiḥl, of Yabrudian sites after Azraq (Copeland and Hours 1989). Also, locations of numerous sites of the Early and later Middle Palaeolithic type blade industries, concentrated in an important agglomeration between Munqiah, az-Zumaylah, and Jaffin were identified. It is the most important cluster of discoveries for this period in the whole of the Levant. Less than two dozen sites throughout the Levant represent the Yabrudian, Hummalian, and transitional industries from the Middle Palaeolithic (type Bocher Tachtit). Therefore, these new discoveries add substantially to our knowledge and understanding of these periods in the region.

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