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EL KOWM, A KEY AREA FOR THE PALAEOLITHIC OF THE LEVANT IN CENTRAL SYRIA

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Introduction

The El Kowm oasis is located about 90 km north-east of Palmyra in the very centre of modern Syria, within the heartlands of the Fertile Crescent (fig. 1). The small area of about 25 by 25 km is characterised by an important cluster of perennial natural springs, within a greater area where natural springs are scarce and fickle. This precious natural resource attracted game in great numbers from afar. Since the Lower Pleistocene, humans have left their traces continuously in this region for over one million years (Le Tensorer 2009; Le Tensorer *et al.* 2011). The exceptional density of sites and their extraordinary preservation make this inconspicuous area one of the most prominent regions for understanding the human presence in the Levant throughout the whole Palaeolithic era. In fact nowhere else in the Fertile Crescent can human cultural evolution and behaviour be followed in such detail in such a small geographical area, and over a comparably long time span.

The region owes its name to the prominent tell of al Kowm, an impressive hill dominating the surrounding plains by about 20 metres. The tell, just 120 by 180 metres at its base, has an eye-catching cone-like structure and with its distinctive steep flanks it is a prominent landmark contrasting with the open, poorly structured landscape.

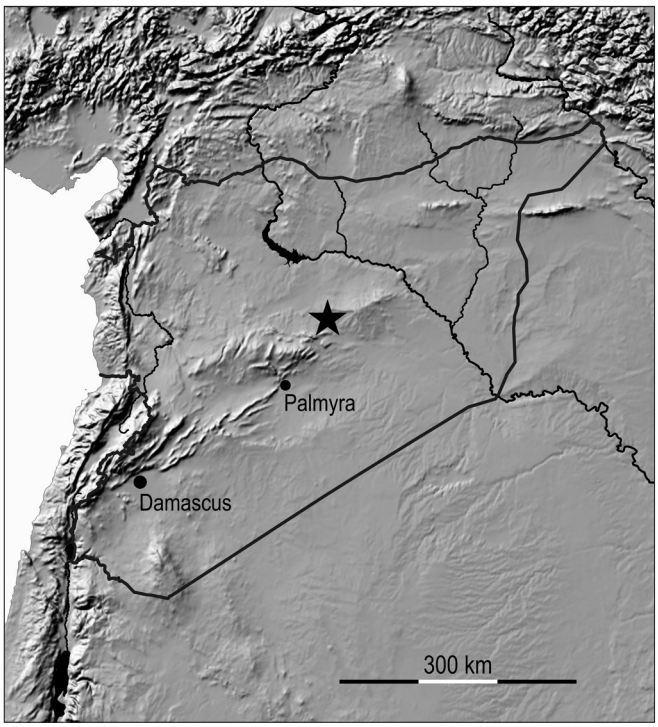

Figure 1 - Location of El Kowm area.

History of research

The area of El Kowm was completely unknown as a prehistoric location until the late 1960s. The first explorations undertaken by G. and M. K. Buccellati in the summer of 1966, and independently by I. Suzuki and I. Kobory during the winter of 1967/68, resulted in the discovery of the first Palaeolithic sites (Buccellati 1967; Akazawa *et al.* 1970). The results of Buccellati's survey led R. Dornemann to carry out the first excavations in the "tell" of El Kowm, revealing a substantial settlement of the aceramic Neolithic (Dornemann 1969, 1986).

In spite of these encouraging explorations, research almost completely ceased for a decade until 1978 (Bader & Tchoumakov 1977), when Jacques and Marie-Claire Cauvin began systematic investigations in this area, discerned for its excellent conditions of preservation for early agricultural cultures (Cauvin *et al.* 1979, Stordeur ed. 2000). Even during their initial field work, numerous Palaeolithic sites were again recognised. Subsequently in 1980 a systematic survey for Palaeolithic sites was launched under the auspices of Lorraine Copeland and Francis Hours, assisted by Sultan Muhesen. Within the core area of about 150 km² 72 Palaeolithic sites were recorded. Many of them had an incredible wealth of lithic artefacts and to a lesser extent associated Pleistocene fauna. At that stage, observations were limited to qualitative confirmation of the archaeological periods observed. Later field work until 2004 extended the area of interest, eventually producing 152 locations with pre-Neolithic discoveries. Interim syntheses of these observations outlined the importance of the region for the Palaeolithic of the Levant (e.g. Le Tensorer & Hours 1989; Le Tensorer *et al.* 2001, 2007).

From 1981 to 1988 investigations on Palaeolithic sites focused less on surveys, but concentrated on the stratigraphy and Quaternary geology of selected sites, especially the large well of Hummal (Copeland 1985) and the unassuming site of Nadaouiyeh Aïn Askar (Hours *et al.* 1983). At the same time an extensive geomorphological survey permitted a basic understanding of the natural setting of Palaeolithic sites in Al Kowm area (Besançon & Sanlaville 1991). During this first period, preliminary studies were carried out on the newly discovered Hummalian industry (e.g. Hours 1982; Bergman & Ohnuma 1983; Copeland 1985) and focused on the Yabrudian (Copeland & Hours 1983; Le Tensorer 2004). In the same period additional field work was carried out on the late Palaeolithic site (Geometric Kebaran) of Nadaouyeh-2 (Cauvin & Coqueuniot 1989).

With the beginning of systematic excavations at Nadaouiyeh Aïn Askar from 1989 until 2003 (Jagher 2000; Jagher 2011; Reynaud 2011) as a joint venture of the Universities of Basel and Damascus, the Palaeolithic period again became a focus of archaeological research in the El Kowm area. Since 1991 comprehensive excavations have been conducted at Umm El Tlel by Eric Boëda and Sultan Muhesen in a Syrian-French joint venture concerning Middle and Upper Palaeolithic settlements (e.g. Boëda *et al.* 2001, 2008). In 1997 the still ongoing archaeological investigations were resumed in Hummal as a Syrian-Swiss cooperation (Hauck 2011; Le Tensorer *et al.* 2011; Richter *et al.* 2011, Schumann 2011; Wegmüller 2011; Wojtczak 2011).

The combined stratigraphies of Hummal, Nadaouiyeh and Umm El Tlel cover the complete Palaeolithic record known in the El Kowm area, from Oldowan-like core and flakes industries to the latest Palaeolithic. Additionally to these main excavations, smaller explorations were carried out at three Acheulean sites; in 1989 at Juwal Aïn Zarqa and 1991 in Qdeïr Aïn Ojbeh, both by the Syrian-Swiss team, and from 1996 to 1998 in El Meïrah under the responsibility of E. Boëda and S. Muhesen (Boëda *et al.* 2004). In the late 1990s a number of soundings were carried out on several Aurignacian surface sites by M. Taha (Ploux & Soriano 2003) within the scope of the Mission Archéologique Umm El Tlel-El Meirah directed by Eric Boëda, Sultan Muhesen and Heba Al Sakhel.

Topography

The immediate surroundings of El Kowm are shaped by low hills about 450–500 m above sea level that hardly rise from the landscape. Along its southern margins, the El Kowm lowlands are dominated by the eastern foothills of the Palmyrides, dominating the plains by 400 to 600 m. To the northeast of the region rises the broad dome of the Djebel Al Bishri. The area of El Kowm is best described as a broad gap about 20 km wide, cut into the Central Syrian range, that stretches from the Anti-Lebanon Mountains in the west to the Euphrates river in the east, dividing northern Syria from the plains of the Arabian Desert in the south. The El Kowm area occupies the centre of several morphologically different landscapes, offering a variety of ecologically diverse hinterlands within a short distance.

In the arid environment of central Syria, the several dozens of perennial springs played a pivotal role for the survival of animals and humans. The next safe waterholes are located either about 75–100 km to the north along the oasis of the Euphrates or 90 km to the southwest at the oasis of Palmyra. The strategic setting of the El Kowm springs within a natural passage certainly had an effect on wandering animals. Less than a century ago, this opening in the mountain range offered a preferential route for passing herds, as is still indicated by well preserved remains of many desert kites, the extensive traps used for hunting gazelles since antiquity.

The centre of the El Kowm area is composed of several distinct topographic structures, which are faintly visible in the terrain to the untrained eye. Even a few metres of difference in elevation has a considerable influence on the drainage pattern. One of these features is the El Kowm platform, a low, more or less flat rise of roughly 5 by 5 km, overlooking the surrounding wadis by about 15–20 m. This structure is the main divider in the drainage for the Sabkha Al Kowm, a temporary shallow salt lake that today spreads over 4 km². About two-thirds of the waterholes of the area are located within the confines of the El Kowm platform. The most prominent feature in the area is the Al Qdeïr plateau, a rectangular tabular rise of approximatively 5 by 13 km rising 35–40 m above the adjacent wadis draining the area on its western slopes to the Sabkha Al Kowm and its southern and eastern margins to the southeast in the direction of Qasr Al Hair Ash Sharqi. Within the wider surroundings of the actual village of El Kowm, a number of distinct round hills rise a few tens of metres over the landscape among them the most prominent, the eponymous tell of El Kowm.

Geology

The geological setting of the region is basically visible from the surface structures which determine the topography. Available geological maps are unsatisfactorily straitened having just a limited resolution. The Palmyrides limiting the area to the south are a range of strongly faulted formations of Lower and Middle Cretaceous rocks, while the Al Bishri anticline is a huge dome of Tertiary sediments. The lowlands between the mountains are made up of soft chalk and marl from the Late Cretaceous and Early Tertiary.

The Lower Eocene deposits are of particular interest for prehistory, as they contain first-rate flint nodules of substantial dimensions and unlimited quantity (Medvedev 1966; Oufland 1966). Extensive outcrops of these deposits are easily accessible within 10–20 km from the Palaeolithic sites in the north, east and south of El Kowm (fig. 2). The quality and productivity of these deposits is poorest in the north and richest in the east, located somewhat farther away. However, blocs of fine grained flint of several tens of centimetres across are readily available at most outcrops. The Lower Eocene flint deposits are exposed within the Palmyrides for more than 200 km, with El Kowm at its eastern end. Over the entire area of distribution, the Lower Eocene flint material is virtually the same and its precise place of origin cannot be determined (Diethelm 1996; Julig & Long 2001). This character of the Lower Eocene flint impedes the identification of raw material circulation in Palaeolithic sites in the El Kowm area, where almost exclusively Lower Eocene flint has been processed.

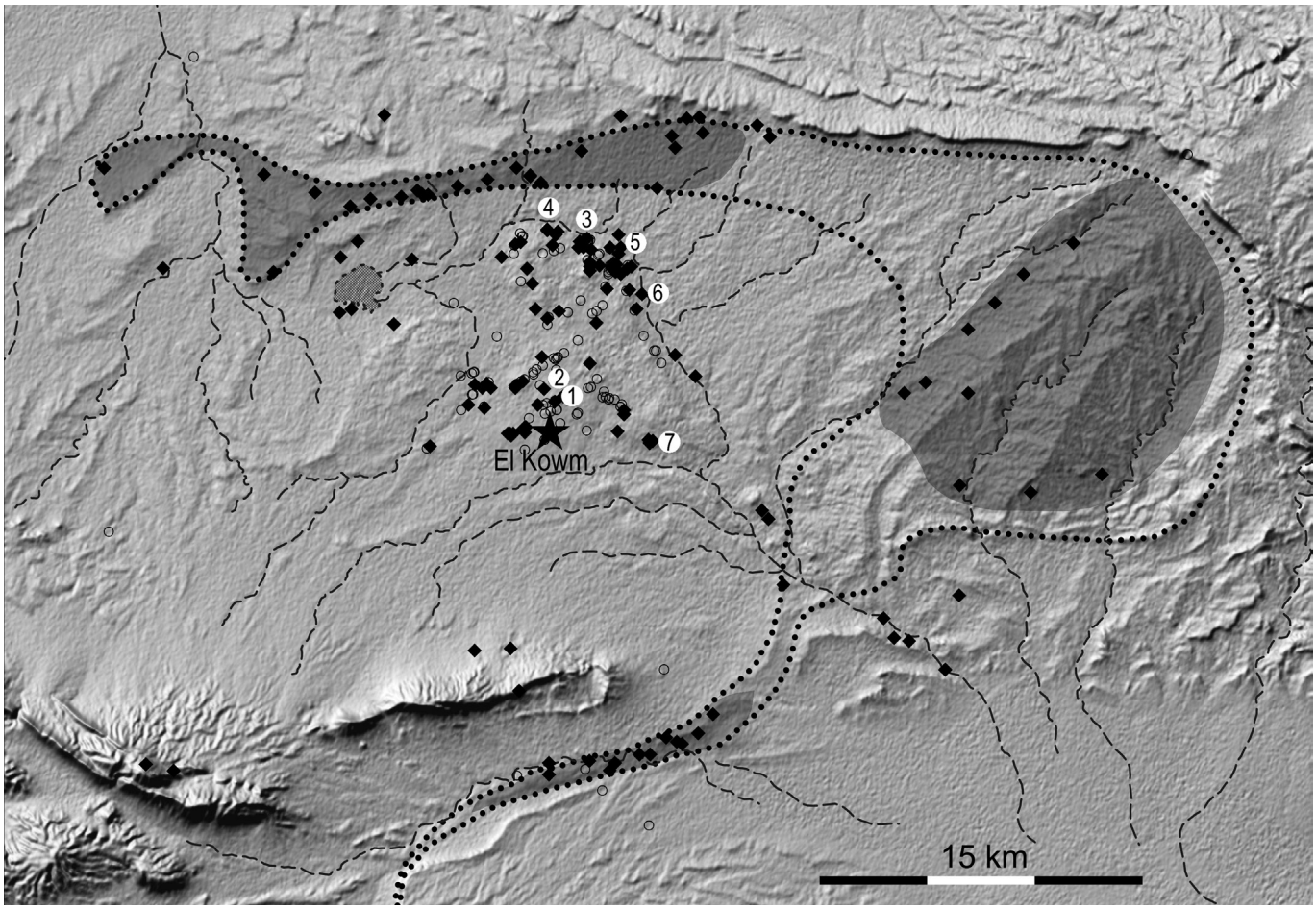

Figure 2 - Topographic map of El Kowm region. Black diamonds show Palaeolithic sites, circles natrual or drilled wells. Grey shaded areas indicate major outcrops of raw material (the dashed line indicates the potential extent of the flint bearing strata). Sites mentionend in the text: 1 Hummal, 2 Aïn Al Fil, 3 Nadaouiyeh Aïn Askar, 4 Qdeïr Aïn Ojbeh, 5 Umm El Tlel, 6 Juwal Aïn Zarqa, 7 Meirah.

Tectonically the El Kowm Gap occupies the interface of two major structural units, the Bilas block to the west and the Bishri block to the east (Brew *et al.* 2001). The complex engagement of orogenic activity and continental collision has produced an intricate tectonic situation. Along the Al Bishri fault, stress was released, resulting in a flower structure within the core of the Al Bishri anticline (Pümpin 2003). This structure is clearly visible on the surface as the Al Qdeïr plateau. The drainage along its eastern and southern rim (e.g. Wadi Fatayah) shows the typical asymmetrical cross-section of a tectonic rise. The exposed bedrocks are soft calcareous marls that are prone to rapid erosion. As the margins of the structure show few signs of degradation, the age of that rise must be quite young and uplifting is probably still going on.

Hydrology

The local hydrological system today is characterised by a mere 120 mm of annual precipitation on average. Considering the geographical situation of the region, annual rainfall patterns over inland parts in the Middle East basically did not change throughout the Pleistocene (Wirth 1971; Enzel *et al.* 2008). The climate is and was dominated by intermittent rains in winter and long dry summers. Cooler temperatures during the Pleistocene, however, slowed evaporation, leaving more water available to vegetation permitting a substantial extension of a rich steppe flora in nowadays desertified areas (Haude 1969). The poorly developed desert soils have no capacity to store water and most of the scarce water coming through precipitation is quickly drained off through the wadis into local saltpans (sabkhas) or disappears into the plains. Infiltration into the local aquifer is also limited by the nature of the bedrock. Drinkable surface water is only available at the bottom of the wadis for short time after heavy rains. Perennial sources of potable water are only found in the springs around El Kowm which thus permit a continuous survival in the desert steppe for man and animals.

The local hydrology depends on a number of particularities demonstrating the complexity of the system. The natural springs of the region are epithermal artesian wells, saturated with mineral salts, flowing out at temperatures of 26–31°C. The uniformly composed mineral load, of 1.75–2.75 g/l in the mean, consists in the essential of sulphates (~60%) and carbonates (~30%) (Margueron 1998). The consistent properties of the groundwater throughout the whole area point to a common aquifer. A precise mapping of all active or decommissioned wells, together with the unsuccessful attempts to hit the water table, revealed a surprising pattern: Positive wells are aligned like pearls on a string along an orthogonal system running northeast–southwest and southeast–northwest. Dozens of drillings sunk in the 1990 set only slightly off these axes for a few of tens metres, remained dry. Obviously the local aquifer is not present

as an extensive groundwater lake, but wells up along a system of faults running along the main tectonical structures within the Djebel Bishri anticline (Pümpin & Jagher 2005). Such faulting is positively confirmed at the site of Nadaouiyeh Aïn Askar by geophysical prospection (Turberg 1999), its orientation fitting perfectly with the regional scheme. The thermal gradient of the groundwater and the imposed trajectory along the faults, point to a fast ascent from considerable depth. Hence, a purely regional recharge of the aquifer through precipitation absorbed by the surrounding mountains can be ruled out (Besançon & Sanlaville 1991; Margueron 1998). Furthermore the nature of the bedrocks and their tectonic structure excludes simple gravity to build up artesian pressure. Obviously the aquifer of El Kowm depends on a much wider system, comprising a huge catchment, that is still poorly understood.

Another particularity of the El Kowm wells are the spring-mounds of different sizes from a few dozen metres up to several hundred metres across, where windblown detritus was consolidated by vegetation and cemented by mineral precipitations from the groundwater. Unlike previous investigations (Besançon & Sanlaville 1991), spring mounds are only present on the El Kowm platform (i.e., in the southern part of the area), concentrated within a sector of a few square kilometres (Pümpin & Jagher 2005). The most prominent of these features is the Tell El Kowm, mistaken by earlier archaeologists for an artificial structure. However, its suspicious shape of a perfect cone about 125–150 m across, rising more than 20 m above the landscape, conspicuously resembles a mud volcano by its typical shape. Archaeological evidence at the base and on the top shows that this structure came into being during a short spell between the geometric Kebaran and the PPNB at the very end of the Pleistocene or the beginning of the Holocene (e.g. Cauvin & Coqueugniot 1988). Such mud volcanoes occur on artesian wells with a particularly high pressure, usually depending on natural gas seeps. Today, less than 15 km to the north of Tell El Kowm, natural gas fields are developed from shallow wells. Such intermittent activity could have occurred also for the much more massive structures of Tell Arida or the hill of Aïn Hummal.

El Kowm today

Despite its abundance of water, the El Kowm area has only been permanently settled since the beginning of the twentieth century, when the Osmanian army established regular control of the steppe areas to contain the Bedouin tribes. Armed transgressions of the nomads on the farmers only ended with the establishment of a permanent police station by the French Mandate authorities in the 1930s (pers. comm. A. Taha, Palymra). From that time onwards, the oasis of El Kowm continuously prospered.

The settlements in the proximity of El Kowm all depend on irrigated farming with motor-pumps operating the water wells. Due to increasing access to improved technologies, the extent of the irrigated areas considerably increased during the second half of the past century. This led to a dispersion of settlements and dissolution of traditional agglomerations, with numerous small hamlets and farms growing over the countryside (fig. 3).

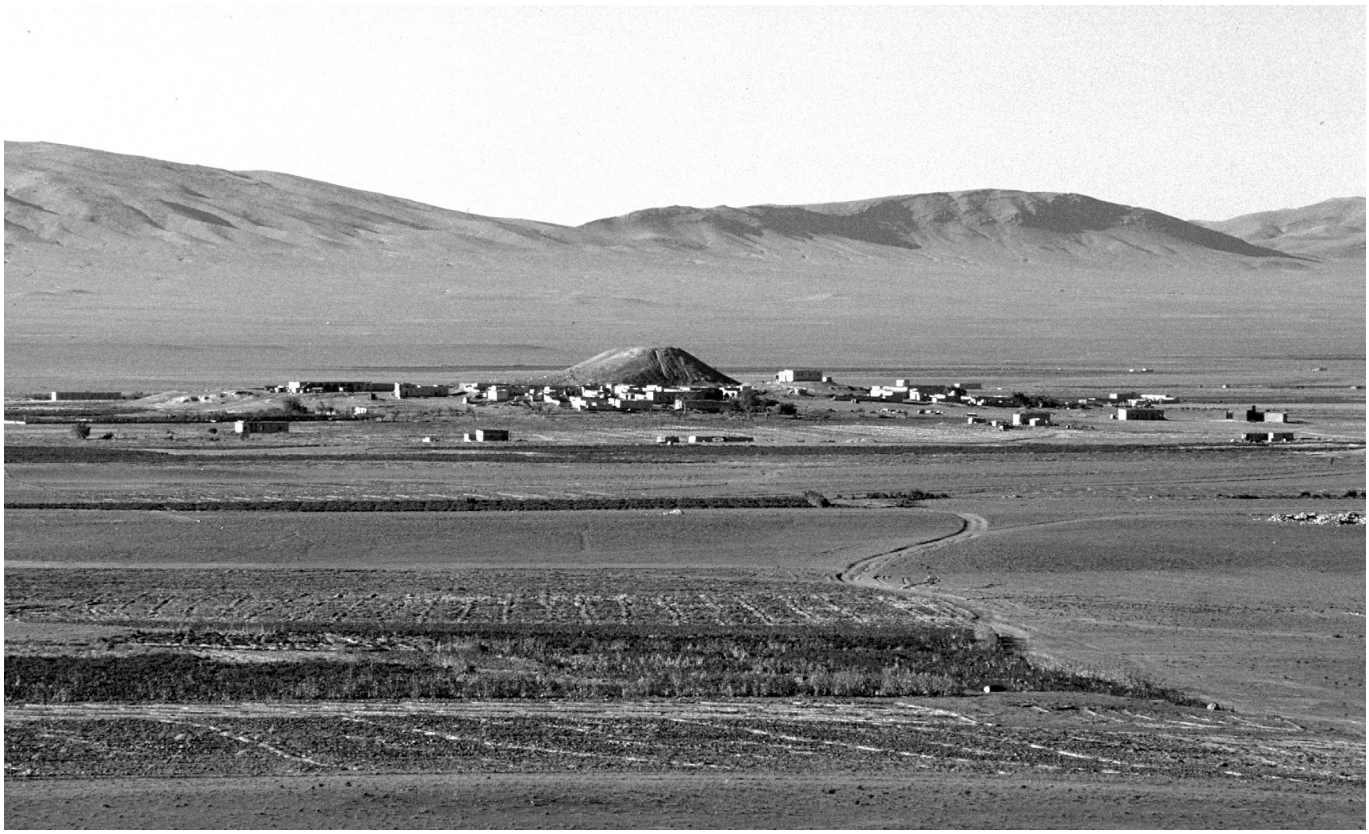

Figure 3 - The landscape of El Kowm the low topographical features are dominated by the impressive tell. Natural vegetation nearly completely disappered through overexploitation by livestock and intensive landuse through agriculture.

Today settlements are clustered on the El Kowm platform comprising most of the actual farming homesteads. The village of Al Qdeïr, a main Bedouin winter camp with permanent houses, is located at the northern end of the Al Qdeïr Plateau. Additional humble settlements are concentrated around the northeastern corner of this plateau.

The accelerated expansion of cultivated areas during the last decades of the twentieth century resulted in a massive depletion of the water resources. At the height of farming, about one hundred pumps were working around the clock from April to October. On average, water has to be lifted from a depth of between 40 and 75 m from wells, where 15 to 20 years before, water was found at less than 10 to 15 m. To mitigate the effects of excessive irrigation, the Syrian government established an acreage restriction in 2000 and in 2001 imposed an almost complete moratorium on agriculture, allowing only the cultivation of limited areas for self supply or the practice of more sophisticated irrigation techniques curbing the waste of water.

Vegetation

The vegetation cover within the El Kowm area today, as for the majority of the Syrian Badia, is severely impoverished due to overgrazing by mixed flocks of sheep and goats. The present monotonous vegetation of the Syrian steppe is the result of a widespread overexploitation by sheep and goat herders (Wirth 1971). In contrast to the traditional land use, moving the animals from waterhole to waterhole, today water is brought to the animals by cisterns for a longer grazing of the pastures. The once opulent and rich plant communities, which formed a relatively high plant cover, nowadays have almost completely disappeared, with the exception of a limited number of locations (Pabot 1956; Assad 1982). The stunning potential of the Badia in this part of Syria is dramatically demonstrated in the Talila reserve near Palmyra, where the long-term impact of land use and restoration are well documented (Batello n.d.).

Fauna

The current state of the local fauna is even more critical than the condition of the local vegetation (Harrison & Bates 1991). Almost all larger indigenous mammals have been wiped out, persecuted for their assumed competition with sheep and goats. Thus, gazelles have been eradicated almost completely. Larger grazers like antelopes and wild asses totally disappeared from the Syrian Badia a long time. Only a few individuals of the larger predators, such as wolf and hyena, could more or less evade the extensive hunting and still survive in small numbers. However, their future is bleak too. Wild birds face the same fate as wild mammals. Falcons, two decades ago omnipresent in the El Kowm area, were heavily poached almost to extinction to be sold to falconers.

For these reasons, knowledge of larger animal species that might have been important for Palaeolithic man must be sought from historical sources. However, the accuracy of such information is often meagre and it is not clear, for instance, how big reported herds of gazelles, "counting several thousand heads", were in fact (pers. comm. A. Taha, Palmyra).

In conclusion, the actual landscape with its depleted botanical and zoological resources gives no clues about the natural potential of the Syrian Badia under the actual climatic conditions. Thus it is all the more difficult to reconstruct the past. Nevertheless it can be stated that the natural potential of these landscapes is much higher than we might suspect today, and the resources for hunters and gatherers were plentiful even under severe climatic conditions (fig. 4).

Palaeoecology

The reconstruction of the palaeoecology within the El Kowm area rests essentially on the sites of Hummal, Nadaouiyeh and Umm El Tlel whose combined stratigraphies cover the periods from the Lower Pleistocene to Holocene, i.e., more than one million years. Available results from geoarchaeological investigations (e.g. Le Tensorer *et al.* 2007 (and literature therein); Boëda *et al.* 2004), palaeontological analysis of animal bones (e.g. Morel 1996; Reynaud & Morel 2005; Griggo 2000,) and pollen (Renault Miskovsky 1998; Emery-Barbier 1998) indicate for all periods the prevalence of an arid to semi-arid environment. Short-lived periods of better climatic conditions never produced a higher vegetation cover such as extensive woodlands.

The steppe environment is also reflected by the faunal assemblages attesting some fluctuation within semi-arid conditions and only a few short-lived periods with increased precipitation. The presence of large predators, like lions and hyenas, indicates a substantial stock of grazing animals. Human subsistence depended basically on the hunting of steppe animals such as gazelles, antelopes, equids of different kinds and especially camelids (Morel 1996; Le Tensorer *et al.* 1997; Griggo 2000; Reynaud 2011). Gathering activities are demonstrated through ostrich eggs and carapaces of tortoises. Big game like camels was regularly hunted from the earliest periods. In most of the Palaeolithic levels in the El Kowm area studied so far, hunting activities covered a wide array of different species, demonstrating the versatility of ancient humans and their excellent know-

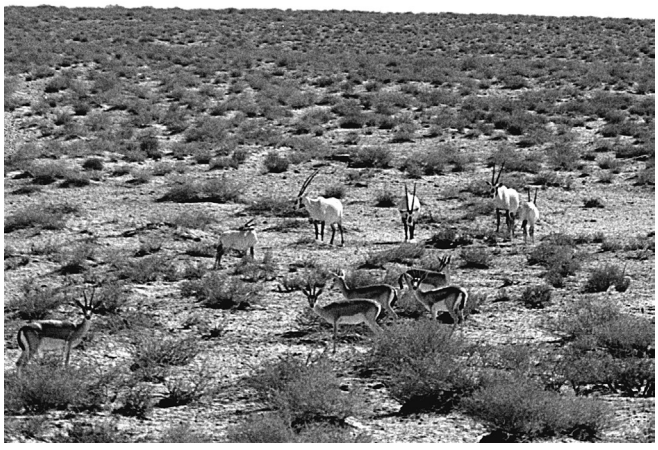

Figure 4 - Arabian oryx and gazelles in Talila natural reserve near Palmyra. This picture gives a good impression of the natural potential of El Kowm area when overgrazing and competition by domesticated aminals is excluded.

ledge of animal behaviour, essential for successfully slaying wild animals. Even in cases where there appears to be a preference for a particular kind if prey (e.g. camelids, equids or gazelles), an important variety in hunting is visible.

Absolute chronology

Since the beginnings of Palaeolithic investigations in the El Kowm area, efforts have been made to date the archaeological sites. Early attempts made (Hennig & Hours 1982; Oxford Laboratory 1988) on different sites produced no reliable dates as the different parameters (e.g. background radiation) were difficult to get under control. Of all the Middle Palaeolithic and older sites in the El Kowm area, only the upper part of the Umm El Tlel stratigraphy is well dated (Boëda *et al.* 1996, 2008). Ongoing studies on the Hummal stratigraphy revealed promising results, but need further confirmation (Richter *et al.* 2011).

For all age estimations beyond the end of the Middle Palaeolithic in the region of El Kowm we depend on analogies from other sites in the Levant. In this respect, the stratigraphy of Tabun is one of the pivotal cornerstones. The chronological framework is established on an extensive base of TL datings (Mercier *et al.* 1993, 2000; Mercier & Valladas 2003) and forms the background for the chronology actually adopted in our research of the Palaeolithic in El Kowm (fig. 5).

In this age model, the beginning of the classical Levantine Middle Palaeolithic (Levalloiso-Mousterian s.l.) can be placed around 170 ka. For the preceding Hummalian, analoguous to the Tabun-D complex, an age between 170 and roughly 250 ka is adopted. Similar ages, with a somewhat younger onset, have been proposed for layers of Hayonim cave (Mercier *et al.* 2007) showing a strong affinity to the Hummalian.

For the Yabrudian and the transition from the Acheulean, the situation is less clear. For this study, an age between ±250 and ±350 ka is proposed. Older claims for the Yabrudian (Barkai *et al.* 2003; Rink *et al.* 2004) need further confirmation before being taken into account. When correlating these ages with the marine oxygen isotope stages, the resolution of the underlying TL dates has to be respected.

For the Upper Acheulean there are, for the time being, no absolute age determinations available. However geological observations on the Nadaouiyeh Aïn Askar stratigraphy permit us to pinpoint the maximum cooling of MIS 12, dated to about 435 ka. Above this level a substantial stratigraphy of 8 m is present, comprising 15 distinct Acheulean levels. Palaeoecological data for the oldest levels of this site indicate a moderate climate associated with MIS 13, beginning at 533 ka (Lisiecki & Raymo 2005). An age of 525 ka for these levels is also consistent with geological considerations (Jagher 2011). The complete Acheulean stratigraphy of Nadaouiyeh belongs to the Upper Acheulean.

For the Middle Acheulean chronological data are scarce and its transition to the Upper Acheulean can only be estimated. The Middle Acheulean is certainly present at the Brunhes Matuyama boundary (e.g. Gesher Benot Ya'akov: Goren-Inbar *et al.* 2000; Meirah: Boëda *et al.* 2004) but there are barely any clues about its beginning or end.

Pleistocene Geology

Investigations concerning the Quaternary geology of the El Kowm area date back to the very beginnings of systematic Palaeolithic research. They were organised along two complementary approaches, i.e., the local study of stratigraphies at selected Palaeolithic sites and a regional survey. In 1980 Jacques Besançon and Paul Sanlaville (1991) conducted systematic geomorphological investigations covering the central area of the El Kowm gap.

This fundamental research permitted the essential understanding the Quaternary history in the El Kowm area. In the subsequent decades, Quaternary geology focussed mainly on understanding the formation processes of Palaeolithic sites under excavation. Growing experience challenged more and more the basic concepts of landscape history during the Pleistocene. The original concept of a fluvial evolution leaving distinct terrace systems can be ruled out. With new topographic data at hand today, it can be said that the local wadis did not have the capacity and necessary catchment to build up a classical fluvial system. The only references to competent rivers are some few scattered observations of more or less well rounded pebbles of micritic limestone and flint directly overlying the local bedrock. The age of these formations remains unknown. The accessibility to this formation today is limited to two outcrops, but the archaeological evidence from different sites clearly shows that such deposits have again and again been exploited as a source for raw materials (e.g. Wegmüller 2011), suggesting that these formations are more widespread than one might suppose today.

The basic processes shaping the landscape of El Kowm during the Pleistocene are erosion, hydrology and aeolian processes. Besides the draining of surface waters, fluvial activity was intermittent and left no systematic record. Erosion and deflation steadily shaped the surfaces. This is clearly shown by the preservation of surface sites, where settlements prior to the Levantine Aurignacian are badly affected by erosion. The farther back into the past the stronger this impact becomes (Jagher 2011).

Aeolian deposits are found at many places throughout the area in different settings. Most of the aeolian deposits consist of extended sheets, covering considerable tracts of the landscape and they may reach a thickness of several metres (Pümpin & Jagher 2005). In a topographical setting with low elevations, as is the case of El Kowm, such insignificant deposits may alter the landscape considerably. Aeolian sediments occur in distinct facies corresponding to different depositional episodes. The low degree of consolidation indicates a quite young age, which is also supported by archaeological observations. In the long term, aeolian sediments had only a limited impact on the landscape history. True dunes are rare. The most prominent is the fossil one at Umn el Tlel (Boëda *et al.* 1994; Muhesen *et al.* 1996) that developed during the terminal millennia of the Pleistocene. Active (diminutive) dunes are restricted to a small area just north of Hummal. In all the Palaeolithic sites excavated so far, there are clear traces of aeolian deposits, but they always

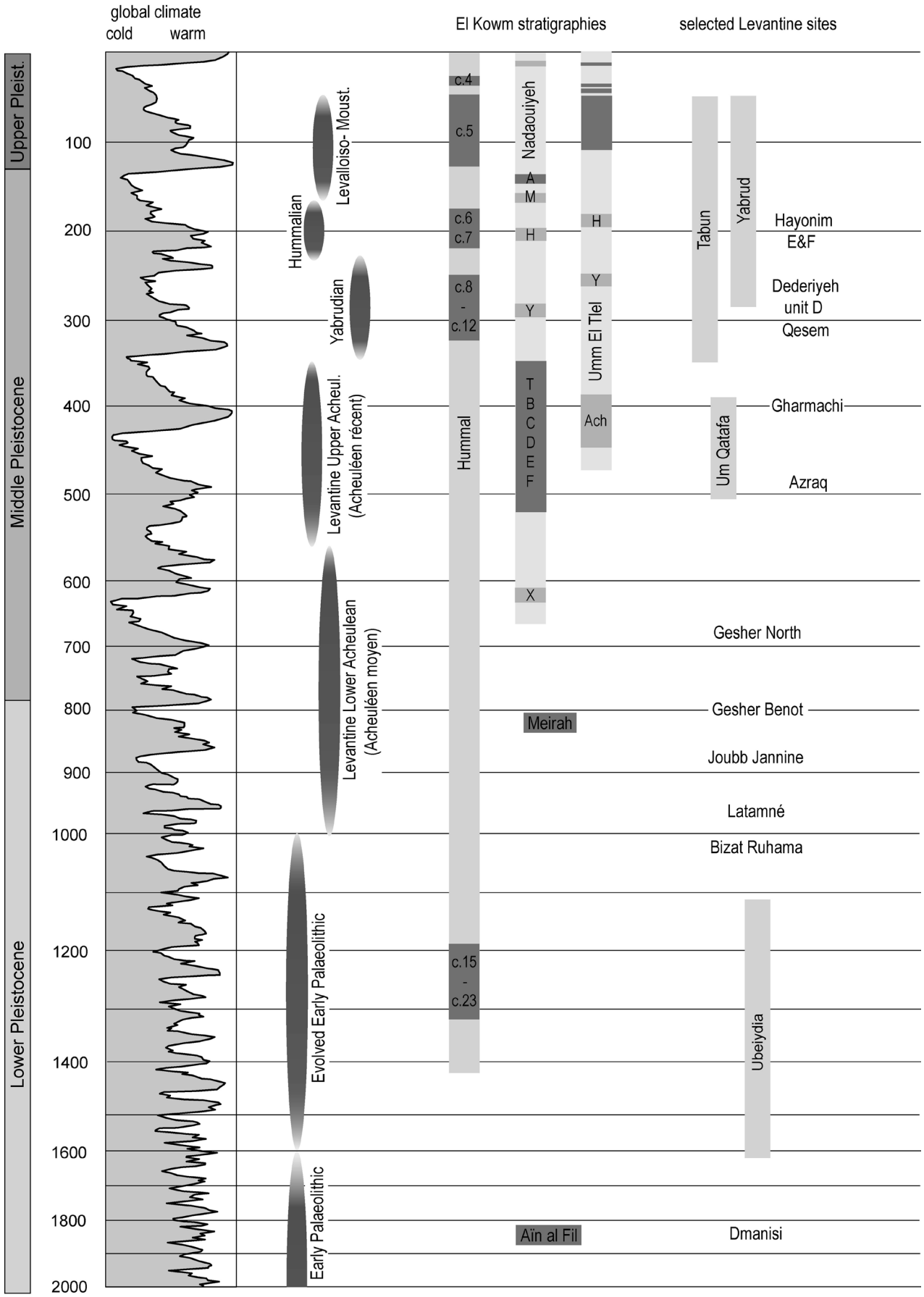

Figure 5 - Tentative chronological framework of the Levant; global palaeoclimate changes after Lisiecki & Raymo (2005); dating of archaeological entities based on TL dates for the last 350 ka, earlier age estimations are made with different methods. Light shaded sections in the Nadaouiyeh and Umm El Tlel stratigraphies identify archaeological periods only observed in secondary geological context. "Selected Levantine sites" are those mentioned in the text.

had just a limited impact on the overall sedimentation. This and surface observations clearly indicate that aeolian deposits, almost as easily as they accumulated, were remobilised. They succumbed to erosion leaving little evidence of their presence and no memory about their original impact on the topography.

Hydrological deposits are limited to the closer precincts around still active or fossil springs. The most characteristic type of these sediments are travertines, which resist exposure and erosion well. Mineralisations like these permitted the preservation of Palaeolithic sites at many places. Travertines stretch out at such points just for a few tens of metres. Extended formations of travertine covering huge tracts occur just once in the El Kowm area, at the north-western rim of the Al Qdeir plateau, where they extend over several hectares. Limnic sediments are limited to the immediate precincts of the springs that could sustain substantial water bodies such as the pond at Umm El Tlel measuring more than 60 m across (E. Boëda pers. comm.). Most of the runoff washed into the actual saltpan of the Sabkah El Kowm is deflated by aeolian erosion. In fact there are no notable lacustrine deposits in the whole area that originate from extended water bodies fed by surface drainage. However, the presence of a perennial water body at the Sabkha El Kowm in the not too distant past is reflected by a few waterfowl regularly visiting the dry sabkha during annual migrations from Central Asia to the south.

Cultural History – from Oldowan to Kebaran

Human presence in El Kowm is reaching back to the very beginnings of human history in the Levant. Recent discoveries at Aïn al Fil revealed a considerable settlement dating back to the very early Pleistocene (Le Tensorer 2009). Preliminary palaeontological investigations, confirm the presence of an archaic equid clearly older than the Ubeidiya fauna (pers. comm. Vera Eisenmann). The associated lithic artefacts can be identified as an archaic pebble-tool dominated core and flake industry. Comparable Oldowan-like industries also are under excavation in the site of Hummal (Wegmüller 2011). Chronometric observations indicate however a clearly younger age than the Aïn al Fil discoveries. Sparse, still to be confirmed observations hint at further sites of the archaic Palaeolithic within the El Kowm area. Within regional prehistory, the El Kowm findings belong to the first wave of human settlers in the Middle East. Their geographic position clearly in the interior of the continent adds a new aspect to the meaning of the "Levantine-corridor" and potential routes for the human dispersal out of Africa.

For the subsequent periods, information from el Kowm is sparse. However there is a clear presence during the Lower Levantine Acheulean (i.e. Acheuléen moyen). Best known from the Meirah site (Boëda *et al.* 2004), traces of this period are known from Nadaouiyeh Aïn Askar (Jagher 2011). The discovery of isolated hand axes fashioned in an archaic technology hint at a wider distribution of this period in the region. After about 550 ka ago more and more informations are available. Key site, understanding the Upper Levantine Acheulean (i.e. Acheuléen récent) is the site of Nadaouiyeh that permitted for the first time in the Middle East to trace a history of that period. The results of the Nadaouiyeh excavations shed a completely new light on that period. In fact, a number of long standing archaeological concepts became obsolete (Muhesen & Jagher 2011). Instead of a linear evolution, a much more differentiated picture emerged of a surprisingly versatile cultural entity, with individual groups marked by distinguished tool-sets clearly showing strong individual traits and profound conceptual changes throughout the Upper Acheulean. In El Kowm this period is furthermore present in a considerable number of sites. However our knowledge about them is limited, as most of them succumbed to natural phenomena or still await further investigation.

About half of the known Yabrudian sites in the Levant are located within the El Kowm area. All of these were open air sites contrary to the situation in the coastal regions, where all such discoveries are associated with caves and rock shelters. Unfortunately most of the eleven Yabrudian sites around el Kowm produced little more information than the presence of that period, as at most places the discoveries were made in the backdirt of artificial wells. Excavated sites contributed little more information. At Nadaouiyeh Aïn Askar and Umm El Tlel the geologic situation prevents any further diagnostics. The excavations at Hummal revealed a high stratigraphic resolution but a low number of artefacts (Schuhmann 2011), however the excellent preservation of bones permits a good understanding of the subsistence of the Yabrudians.

The beginnings of the Middle Palaeolithic are marked by a substantial shift in lithic technology. The Hummalian tradition is characterised by the use of multiple technological approaches for producing blanks (Wojtczak 2011). Additionally to the classical elongates blades of all kind, a clearly Levallois component is present. The hallmark of the Hummalian, the pointed tools and big blades are much less common than suggested in earlier research (Bergman & Ohnuma 1983; Copeland 1988). Aside from the eponymous site, the Hummalian has been recognised at 4 more places around El Kowm. The excavations at Nadaouiyeh Aïn Askar and Umm El Tlel produced this blade industry only in secondary positions. Despite the low numbers of Hummalian sites in El Kowm, this cultural entity shows a respectable geographic distribution from the Levantine coast (Abu Sif and Hayonim: Neuville 1951; Meignen 1998) to the Zagros Mountains (Hazar Merd: Garrod 1930) and until the foothills of the Caucasus (Djruchula cave: Meignen & Tushabramishvili 2006)

Compared to the preceding periods the number of sites of the Levantine Mousterian rises considerably. A total of 58 locations are actually known in the area. This increase is probably due to taphonomic phenomena. For the first time sites exposed to the sky since ever, contribute to more than half of the discoveries. About half of the find spots can be considered as factory sites located at outcrops of a first grade flint raw-material. It is the first time in the El Kowm area that a clear division between factory sites and settlements can be drawn. Similar comportments for earlier periods can be suggested, but lack direct evidence. Main sites, actually under excavation are Umm El Tlel and Hummal. Both sites feature very rich stratigraphies with many dozens of archaeological levels each. The former covers particularly the later phase of the Levantine Mousterian and its transition to the early Upper Palaeolithic (Bourguignon 1998). The Hummal Mousterian sequence for its part reaches further

into the past, showing clearly an inherent evolution (Hauck 2011). The El Kowm Mousterian falls well into the mainstream of the Levantine Levalloiso-Mousterian, preferring in an earlier phase rather broad Levallois flakes and in the subsequent phase favouring triangular Levallois points.

The transition to the Upper Palaeolithic is especially well documented at Umm El Tlel (Soriano & Ploux 2003). Despite quite an impressive number in comparison of the area (i.e. 13 sites), the Upper Palaeolithic in El Kowm is far from understood. Generally labelled as "Aurignacian" these discoveries need further investigation. However it looks like the distinctive more progressive Aurignacian tools are absent in the region. Strikingly this ostensible hiatus is emphasised by the prevalent Geometric Kebaran sites. What triggered these apparent shifts in peopling the area remains open. Either climatic or simply cultural constraints are possible. At the threshold to a more sedentary livelihood, the El Kowm area was less appealing to humans as only four Natoufian sites are known and during the PPNA the area seemed to be completely abandoned. However, in the late pre-pottery Neolithic natural resources around El Kowm were again inviting for settlement as is evinced by far more than a dozen PPNB sites.

Land use during the Palaeolithic

Within the El Kowm area only open-air sites are known as the local geology impedes the development of substantial caves and rockshelters. Among the Palaeolithic sites, two basic types can be distinguished. On the one hand there are stratified sites embedded in Pleistocene deposits that are usually associated with former or still active wells. These stratigraphies (with just a few exceptions in natural outcrops) are basically revealed in the open shafts of historic wells dug by the local farmers decades ago. These impressive operations reached depths of 10 to 15 m or more, and with a similar diameter they permit a good observation of the uncovered sediments (fig. 6). Out of 58 potential artificial outcrops in wells, only 32 produced Palaeolithic finds. One-third of them are stratigraphies comprising three or more distinct periods, usually with a multitude of archaeological levels. In the few natural cuts along wadis only on exceptional occasions are Palaeolithic finds exposed.

On the other hand, there are the classic open-air sites with artefact scatters visible on the surface. Surprisingly only a small minority of these sites shows a palimpsest of different periods. Except for taphonomic problems concerning the Acheulean and early Middle Palaeolithic (Jagher 2011), the open-air sites around El Kowm are dated to the Upper Pleistocene. Unprotected sites older than MIS 5 with rare exceptions succumbed to erosional processes completely remodelling the surfaces of the entire area. Therefore our knowledge about land use is limited to buried sites coincidentally exposed in modern wells. This constricted database hampers detailed reflection on how Lower and Early Middle Palaeolithic people organised their lives within this landscape.

The seeming preference for spring-related settlements for the early periods is rather a taphonomic problem than a real human choice. If we take into account the well established Acheulean

Figure 6 - The well at Atham Hautman is one of the last existing huge shafts typical for El Kowm. Such impressive installations permitted the discovery of burried Palaeolithic stratigraphies.

sites only (excluding isolated discoveries of hand axes), from the Lower Palaeolithic to the Early Middle Palaeolithic (i.e., Yabrudian and Hummalian), all of the 28 sites are stratified (i.e., covered and hence protected by sediments). With just four exceptions, all are associated with a spring. The fact that none of these discoveries is an open-air site in the classic sense, clearly suggest the presence of taphonomic processes responsible for the conservation for Middle and Lower Pleistocene settlements.

Among the open-air sites two categories can be distinguished; settlements per se and factory or workshop sites. The latter are directly located at or next to the outcrops of flint on the immediate periphery of the El Kowm area. Where raw material is plentiful and well exposed, such factories can stretch out over several hundred metres. Despite the susceptibility to palimpsests, essentially three- quarters of these work shops comprise just one single archaeological period.

Considering the land use during the younger Pleistocene, surprising shifts in occupation patterns become apparent. For the Levalloiso-Mousterian there was a clear preference for settlements associated with springs (22 sites). Open-air camps with no reference to a well were chosen on much rarer occasions (n=11). In contrast to this, the presence of the Levalloiso-

Mousterian connected to outcrops of flint is considerable. At least 25 places can be designated as workshops where Levallois production was carried out, in many cases to a substantial extent. The Levalloiso-Mousterian accounts for more than half of all workshop sites located during surveys. For the Upper Palaeolithic (Levantine Aurignacian), there is just an opposite trend with a clearly lesser importance of sites related to springs. Out of 13 locations, nine are plain open-air sites. For the Kebaran the situation is more or less the same with just 12 sites out 37 located directly at a spring. Kebaran workshops at the outcrops of flint were only noticed twice. The conspicuous difference between Neanderthals and modern humans is difficult to explain, as no reasonable palaeoecological data for the younger periods are currently available from the El Kowm area. The observed difference could simply be cultural without any direct environmental constraint.

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