Tempora
Annales d'histoire et d'archéologie
Université Saint-Joseph, Beyrouth
Vol. 20-21, 2011-2012, ISSN 1729-6927

MICHMICHE GOUFFRE – A MEYROUBIAN SITE IN MOUNT LEBANON

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Introduction

Michmiche Gouffre is one of 35 so called "Meyroubian" sites that are characterized as Late Middle Palaeolithic (LMP) sites in Mount Lebanon containing either intermissions of later Upper Palaeolithic origin or Upper Palaeolithic elements that indeed belong to the LMP occupation (Fleisch 1954, 1965; Prüfer & Baldwin 1957; Hours 1965, 1973; Copeland & Wescombe 1965).

Michmiche Gouffre is a surface finds site located on a plateau, some 20km east of Beirut, 3km E of the village of Mrouje, 1.5km N of Jebel Mchaymche on ca. 1500m asl (map 1). The assemblage deposited on the plateau (Copeland & Wescombe 1966: pl. 6) was discovered by the Fattal brothers and shown to Fathers Doherty, Murphy and Mahan in 1937. The site was published in two previous articles (Prüfer & Baldwin 1957; Hours 1965) dealing with but a share of the current assemblage housed in the *Musée de Préhistoire libanaise*. The assemblage contains lithic finds only. Unfortunately, the site seems to be destroyed nowadays[1].

From February to May 2011 a re-evaluation of the assemblage housed in *Musée de Préhistoire libanaise* was conducted by the author as part of my PhD at University of Cologne (Leder 2013).

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[1] Personal communication, Lévon Nordiguian, February 2011.

The lithic assemblage

As a first step in order to evaluate the assemblage, all 6887 artefacts were categorised and counted (tab. 1). Of all these artefacts, 520 blanks and tools were sampled for attribute analyses (tab. 2). Tools were processed twice in tools and blanks respectively. Also, all 1197 cores of Michmiche Gouffre were categorised and quantified (tab. 3).

Raw material

The raw material present in Michmiche Gouffre exclusively is local Cretaceous and Jurassic flint of variable quality, outcropping just a few hundred metres below the site (Fleisch 1954: 565; Copeland & Yazbeck 2002: 75). Raw nodules were obtained from primary as much as secondary sources judging from cortex remnants and natural surfaces on cores and blanks. Flint nodules are mostly of round shape. To a lesser degree slabs and elongated round pebbles were used for core reduction. Judging from the size of blanks and cores, obtained nodules rarely exceed lengths greater than 10cm and average sizes of 5-8cm. The majority of artefacts bears a thick patina today only occurring on opaque raw material whereas translucent varieties remain unpatinated[2].

Blanks

Flakes and Levallois flakes clearly dominate the assemblage (tab.1) while blades and Levallois blades play a minor but relevant role yielding a laminar index of 23.3 (Ilam, fig. 1). 55 Levallois points produced an index of levallois points of only 2.79 (ILPt, calculated from all Levallois blanks). They are accompanied by 120 further sub- triangular flakes. The triangular shape of Levallois points is achieved by different reduction methods sometimes employing semi-centripetal preparation, sometimes recurrent convergent flaking and often a mix of both (Boëda 1982). A somewhat curious feature is the presence of some crested blanks which is in line with the presence of a few blade/let cores following an Upper Palaeolithic reduction scheme (see section: *Cores*) along with some non-Levallois blades and a few bladelets (pl. III. 6,7).

[2] A phenomenon already noticed by the author in Ksar Akil XXV & XXII collections in the British Museum, London. Hence, translucent artefacts in Michmiche Gouffre cannot simply be considered as later intrusions.

Flakes and Levallois flakes are mostly of squad and angular shape. Non-Levallois flakes are in average 49.2mm long, 35.8 and 8.1mm thick. Lengths and widths values for Levallois flakes are slightly lower but they are thicker than non-Levallois flakes.

Levallois blades have a mean length of 61.4mm, mean width of 24.8mm and thickness of 6.9mm. They are substantially bigger than non-Levallois blades (L=51.1/ W=20.4/ Th= 6.8) whereas their L/W ratios correspond to one another (2.5 vs. 2.6).

Levallois points are mostly short-broad but also a few elongated pieces do exist. Their mean values are L=47.6, W=33.6, Th=7.8 and L/W= 1.44 and thus stand in between flakes and Levallois flakes.

Butt types of blanks are faceted in over 75% of all cases with 10% higher values in Levallois blanks compared to their non-Levallois counterparts (fig. 2). 92% of all Levallois points have faceted butts. The second biggest group are plain butts with only <13%. Values for non-Levallois blanks are around 10% higher than in Levallois blanks. An interesting feature is the <5% value for é*squillement du bulbe* (Pelegrin 2000) in non-Levallois blades that is mostly seen in smaller blades and some bladelets.

Scar patterns on debitage are predominantly unipolar and unipolar-crossed (fig. 3) followed by bipolar and bipolar-crossed ones. Crossed patterns by definition occur more often on Levallois blanks rather than non-Levallois blanks. All crossed and centripetal scar patterns should indicate the blanks origin from Levallois concepts whereas blanks with simple unipolar and bipolar parallel scar patterns originated more likely from either along-axis cores[3] or volumetric blade cores. Excluding Levallois points, scar patterns present on blanks would relate 42% of all blanks to non-Levallois concepts which is clearly contradicted by the distribution seen in cores (tab. 3).

Leaving aside flaking directions, 19% of all blanks show remnants of convergent flaking while nearly half of them were produced by parallel production and 1/3 by other methods respectively[4] (fig. 4). Convergent flaking occurs double as frequent in Levallois products as it does in non-Levallois blanks where parallel flaking is predominant. Levallois blanks carry more diversified scar patterns.

Most blanks have pronounced bulbs with percussion angles between 90 and 75 degrees.

In general, a mix of different technological concepts can be recognized from blank attributes. Levallois and non-Levallois concepts were employed

[3] For description and discussion see L. Copeland 1975, 1983; L. Meignen 1995).

[4] The sample taken of the entire assemblage was partially selective including almost all Levallois points, thus, for this calculation Levallois points were only considered proportionately (n=8).

likewise and produced Levallois flakes and points, Levallois and non-Levallois blades and a few bladelets. Parallel flaking (Levallois/ along-axis and volumetric) and preferential flaking (Levallois) are dominant flaking methods accompanied by some centripetal (Levallois) and convergent flaking (Levallois). Blade technology in Michmiche Gouffre is rather good for a late Middle Palaeolithic assemblage. Blades often have sub-parallel edges and there is more than double as many non-Levallois blades than Levallois blades (tab. 1). Blades were extracted by means of different concepts (Levallois/ along-axis and volumetric) and different methods (along-axis, with preparation from core edges, unipolar, bipolar). Besides Levallois and non-Levallois blades produced by hard hammer percussion there is a small amount of rather narrow blades and bladelets that are most likely detached with soft hammer stone as indicated by their diffuse bulbs and tiny butts among other features (pl. III. 5-7; Pelegrin 2000). Evidence for an Upper Palaeolithic blade/let production system is also substantiated by the presence of bladelet cores and some "narrow blade" cores (pl. IV. 5-7).

Cores

The core assemblage of Michmiche Gouffre is characterised by a genuine mix of different core concepts (tab. 3) where Levallois cores clearly prevail before along axis cores (see footnote 4), Upper Palaeolithic core types plus some undiagnostic cores. Among Levallois cores, Levallois unipolar preferential and unipolar recurrent methods are predominant before centripetal cores[5] (pl. III. 9). Many of the latter ones were produced on Levallois cores that were previously exploited following a different method. A minor share among Levallois cores is occupied by Levallois recurrent bipolar and Levallois point cores (pls. III. 8, IV.1). The majority of Levallois cores is only 4-6cm big with some of them smaller than 3cm.

The majority of Upper Palaeolithic blade cores are of prismatic shape and exploited with unipolar flaking (pl. IV. 6). Of further notice is the abundance of sub-pyramidal and bladelet cores (pl. IV. 5, 7). A few of these have two parallel core surfaces adjoining one another. Bladelet cores are somewhat surprising in a Middle Palaeolithic context and their presence can only be explained by either regional variation in comparison to other Middle Eastern sites or by intrusion from later occupations (see discussion below). Furthermore, multi-platform cores are abundant among volumetric cores and attest a maximum exploitation strategy conducted in Michmiche Gouffre (Williams & Shea 2006). Most of the volumetric cores are only 4-6cm big with a few smaller 3 cm.

[5] For definition and description see E. Boëda 1994.

Among along-axis cores three different methods were applied by Palaeolithic flint knappers. Most cores follow a simple unipolar parallel scheme (pl. IV. 2, 4) but there are also some bipolar examples. An important category is those cores exploited by unipolar recurrent convergent flaking. Although they might be considered Levallois cores instead in my opinion the concept is much closer to along-axis cores rather than to Levallois cores in having no or only minor preparation on the core's sides and the lower surface (Meignen 1995). Those cores produce Levallois points accompanied by sub-triangular flakes (Meignen 1995). Even combined with "classic/preferential" Levallois point cores, only 6.4% of all cores in Michmiche Gouffre aimed primarily for a production of Levallois points and triangular flakes which is in line with the small amount of Levallois points and triangular flakes but contradicts the much higher amount of convergent flaking (fig. 4). Hence, an export of Levallois points and Levallois points cores seems the obvious cause of the discrepancy.

Another interesting core group consists of truncated-faceted flake cores (Schroeder 1969; Solecki & Solecki 1970; Nishaki 1985; Dibble & McPherson 2007). For the analysis only those specimens were considered that were clearly used as cores excluding many tools with a truncated base. Most such cores were exploited unipolar but some bipolar and multi-platform cores do exist as well (tab. 3).

Among the great amount of cores there are many undiagnostic or opportunistic cores that do not seem to follow any particular exploitation strategy but only aim to detach as many flakes as possible (often not more than 2-4) from nodules of mostly irregular shape. This again attests a maximum exploitation strategy (Williams & Shea 2006).

Tools

More than a quarter of all tools are sidescrapers of different types (tab. 4). Simple sidescrapers prevail followed by some double and convergent sidescrapers respectively (pl. I. 1, 2). In many cases the retouch is rather discontinuous and little invasive (pl. I. 2) which frequently causes these specimens to grade into retouched pieces that are also numerous. However, a bigger share of sidescrapers is clearly defined by a neat invasive retouch (compare pl. I. 1, 2). Sidescrapers are almost exclusively manufactured on Levallois blanks only two are produced on non-Levallois blanks and four more are produced on others. Almost 1/3 of all employed blanks are of blade proportion.

Among points, Mousterian points are the most numerous ones; they are present in different shapes and sizes (pl. II. 3, 4). Some of them have a thinned base achieved by bulb removal (pls. II. 4, III.4) a technological treatment that in its origin is probably related to truncated-faceted-flakes and foreshadows a similar procedure in Emireh points of the Transitional era as seen in Abou Halka (Haller 1946; Azoury 1986), Emireh and El-Wad (Garrod 1955) and Boker Tachtit (Marks 1983) but they are also present in some Middle Palaeolithic sites (Copeland 2000; Volkman & Kaufman 1983). In previous articles, 2 Emireh-like points from Michmiche Gouffre are mentioned and depicted (Copeland & Wescombe 1966: fig. LI.20; Copeland 2000: fig. 4.6.). Both are illustrated on plate 3 in this article plus a Mousterian point that received the same treatment (pl. III. 4). The first one is a typical Emireh point (pl. III. 2) whereas nos. 3 and 4 (pl. III) are atypical variations.

Levallois points are a frequent point type (pl. I. 5, 6). They are rarely retouched and vary greatly in size. They are mostly of the typical short-broad type with a mean L/W ratio of 1.44.

The Upper Palaeolithic tool group (some 14% of all tools) is dominated by truncated pieces, endscrapers and burins, all present in comparable amount (pl. II. 1-6). Endscrapers are often atypical and tend to grade into truncated pieces as they have a steep rather than a half-steep tool retouch. On the other hand, truncations often have very thick tool retouches which gives them a rather endscraper like appearance. Endscrapers and truncations are manufactured on Levallois and non-Levallois blanks alike but Levallois products are clearly dominant. An interesting occurrence in truncations is that they are just as often produced on blades as on flakes. This stands in stark contrast to endscrapers and burins where flake blanks are clearly preferred. Among burins, all types are present including 2-3 atypical carinated burins. The same holds true for endscrapers.

Of all burins and endscrapers there are 10 pieces each which must be considered secondary tools i.e. their unpatinated tool ends truncate through their patinated blanks. This proves at least one later occupation at the site that left a minor but noticeable imprint on the assemblage's diagenesis. Needless to say, they were excluded from any attribute analyses and calculations.

A new tool-type was detected in Michmiche Gouffre which I would like to call "ventral truncation" (pl. III. 1). This type has retouch on the ventro-distal end that can be either flat or half steep. This tool type occurs predominantly on blades. The same technique is occasionally used on end scrapers and convex/convergent scrapers where flat retouch was carried out (pl. I. 1). Here it probably the purpose of tool re-sharpening. The 22 "ventral truncations" were subsumed under "truncations" (tab. 4).

A few, often atypical, sometimes questionable chamfered pieces are present in the assemblage. Two rather typical pieces are depicted on plate II. 6, 7. They were produced on either flakes or artificial chunks. The importance of chamfered pieces in Middle Palaeolithic assemblages is owed to the fact that they are a hallmark of transitional assemblages in Lebanon and Southern Turkey reported from Abou Halka IVf-IVe (Haller 1946; Azoury 1986), Antelias VII-V (Copeland 1970) and Ksar Akil XXV-XXII (Azoury 1986; Ohnuma 1988; Iovita 2001) where they are dominant tool types. In Űçağızlı Cave, Southern Turkey, they occur in low numbers only (Kuhn *et al*. 2009). Individual pieces were also reported from a Middle Palaeolithic contexts like Ksar Akil (Marks & Volkman 1986) and Keoue Cave (Nishaki & Copeland 1992), both in Lebanon.

As it is typical in most Middle Palaeolithic sites in the Levant there is an abundance of notched and denticulated pieces as well as retouched pieces in Michmiche Gouffre. In fact, retouched pieces are nearly as numerous as sidescrapers while notches form the third biggest tool group.

Composite tools amount for some 5.5% of all tools (tab. 4). On 41 sampled tool blanks 85 tool ends and edges were identified most of them are retouched edges and endscrapers respectively. There are also composite tools present carrying burins, truncations, notches, denticulates and chamfered pieces. The high amount of Upper Palaeolithic tool types in composite tools pushes the Group IIIe index from previously ca. 15% to now 20% (fig. 5).

In general, the tool spectrum of Michmiche Gouffre must be considered as diverse and incorporates numerous types and sub-types suggesting a broad functional spectrum for the site.

Assemblage characterisation

Michmiche Gouffre is a formidable example for the "Meyroubian" sites of Mount Lebanon. Typologically, Middle Palaeolithic tool types such as sidescarpers, notches, denticulates and Mousterian points prevail but also endscarpers, burins and truncations are abundant and represent almost 15% of all tools. Retouched pieces are very numerous and Levallois points are present in noteworthy number as well. All tool types show a diversity of sub-types and have variation in shape and size. Endscrapers and burins are mostly produced on flakes, sidescrapers slightly more often on blades while these dominate in truncations. Upper Palaeolithic tool types are frequently manufactured on Levallois blanks but also on non-Levallois products whereas sidescrapers almost exclusively make use of Levallois blanks. One typical and two atypical Emireh points are present in the assemblage. While basal thinning is typical

for Emireh points, in Michmiche Gouffre the same treatment is found on some Mousterian points and sidescrapers.

The mixture of Middle Palaeolithic and Upper Palaeolithic elements is also reflected in technological concepts. Although Levallois technology clearly predominates, along-axis cores occur frequently as do prismatic and pyramidal blade cores. There also is a minor component of bladelet production as seen on cores and from a presence of narrow blades and bladelets. Most narrow blades and bladelets were likely produced with soft hammer stone. Blades were extracted by means of different concepts (Levallois/ along-axis and volumetric) and different methods (along one axis, semi-centripetal preparation, unipolar, bipolar). Blade technology in general seems rather good for a Late Middle Palaeolithic site.

The Levallois reduction scheme is very diverse and features preferential, recurrent and centripetal flaking employing different methods. This diversity is likewise reflected in Levallois point production where semi-centripetal preparation occurs next to recurrent convergent flaking and also blends of both methods yielding different preparation strategies in order to obtain triangular flakes and Levallois points. Convergent flaking is important as signalized by scar patterns on blanks. Its value remained below 20% though. More important are recurrent parallel (<50%) and preferential/centripetal flaking. Unipolar flaking is much more prominent than bipolar flaking.

Comparison with London collection

A previous study on 270 artefacts from Michmiche Gouffre was published by O. Prüfer and

E. Baldwin in 1957. The studied collection was first brought to Boston by Father Doherty and remained with the Boston University College. Later, the collection was transferred to the Peabody Museum, Harvard University. Thereafter, presumably all artefacts were transferred to P. Waechter of the London Institute of Archaeology where it was studied by O. Prüfer and E. Balwin. In 1988, 211 pieces were transferred to the British Museum[6].

In general, the overall character of the collection is in line with results presented above. Levallois technology is present in form of Levallois cores accompanied by some Upper Palaeolithic blade cores including two pyramidal ones (Prüfer & Baldwin 1957: fig. III. 24, 26). Typical Mousterian tools dominate over Upper Palaeolithic ones that are present in significant number.

[6] Personal communication, Dr. Rachel Sparks, Keeper of Collections of the Institute of Archaeology, London.

Characteristics in the manufacture of Mousterian points, sidescrapers and endscrapers are in synchronization with results presented above. In detail though, there are deviations.

They can be partially explained by the selective nature of the original collection made by Father Doherty who left much of the "unattractive" debitage behind (Prüfer & Baldwin 1957: 62) and the non-representative scope of the small London collection.

Mousterian points in that collection are far more abundant than sidescrapers. This could be partially explained with the rather light/less invasive retouch on sidescrapers which means that sidescrapers may have been considered as retouched pieces instead (Prüfer & Baldwin 1957: 65). Even then, all sidescrapers and retouched pieces combined would not even the dominance of Mousterian points over sidescrapers. It is possible that during the collection process in 1937 pieces with light retouch were overlooked and simply left on site (Prüfer & Baldwin 1957: 62).

Another discrepancy is the relative abundance of Levallois points which in the London collection are just as numerous as in the collection of the *Musée de Préhistoire libanaise,* 54 compared to 55. This again might be due to the selective nature of the collection.

O. Prüfer and E. Baldwin also provide figures for butt treatment. The "strict faceting index" (IFs) in both collections is in agreement with each other when tools from the London collection are included (fig. 2). However, when individual blank types are considered the only concordance is found in Levallois points wherein >90% have faceted butts while non-retouched flakes and blades bear 1/3 plain butts which is in contrast to previous results. Unless the authors applied a different method to determine faceted platforms, this discrepancy cannot be explained properly. However, leaving aside quantitative deviations, the general character of both collections is essentially the same.

Despite a high amount of Mousterian and Levallois points respectively, the impact on the combined tool kit is relatively moderate (tab. 5). Values for Mousterian points and Levallois points increase by 4% each on the expanse of sidescrapers (-2.5%) and other tools (-5%) whereas values for Upper Palaeolithic tools remain stable. As a result, sidescrapers still dominate before retouched pieces, Mousterian points, notches and Levallois points in that order. Upper Palaeolithic tool types remain as significant as before.

The 28 cores of the London collection also have a negligible effect on previous results obtained from nearly 1200 cores (tab. 3). The same holds true for blanks (tab. 1).

The only noteworthy change is related to the higher amount of Levallois points in the London collection. The "index of Levallois points" (ILPt), would

nearly double and hold c. 5.5% now, depending on how many flakes and blades published by O. Prüfer and E. Baldwin are actual Levallois blanks. Even more so, it could explain the discrepancy of a rather high value in convergent flaking (fig. 4) and the previous lack of Levallois points that now is somewhat more moderate.

Michmiche Gouffre : « Mélange ou industrie de transition ? »[7]

Ever since the discovery of "Meyroubian" sites one question of primary concern emerged, are those assemblages merely diachronic mixtures, or, did indeed Middle Palaeolithic people produced Upper Palaeolithic tools and blades in significant number (Fleisch 1954, 1965; Prüfer & Baldwin 1957; Hours 1965, 1973; Copeland & Wescombe 1965; Copeland & Yazbeck 2002).

All Meyroubian sites known thus far are surface collections with potential exposure to later admixture. Most researchers concluded that the assemblages are to a great deal integer and that later impacts must be considered minor. For Michmiche Gouffre in particular this question was addressed by F. Hours (Hours 1965). He concluded that the assemblage indeed belonged to only one occupational horizon. However, conclusions back then were based on a much smaller assemblage than it was available for this study. The following discussion will address the essential question of the assemblage's integrity with references to evidence collected from other Middle Palaeolithic and "transitional" sites in the Levant.

Upper Palaeolithic tool types and blade cores existed throughout the Middle Palaeolithic and even in the late Lower Palaeolithic as reported from e.g. Yabrud 15 (Rust 1950) and Qesem Cave (Shimelmitz *et al*. 2011). Surprisingly, they are rather uncommon in late Middle Palaeolithic contexts such as Amud B, Kebara V-XII, Ksar Akil XXVI, Keoue Cave and Hummal 5AII-5g among many others[8]. Here, assemblages are almost exclusively dominated by Levallois technology, Levallois points and sidescrapers. The only sites that show a prominent mixture of Middle Palaeolithic and Upper Palaeolithic elements are El-Wad F and Emireh cave in Mount Carmel (Garrod & Bate 1937; Garrod 1951, 1955; Sarel 2004).

Narrow blades and bladelets also occur in small numbers in Amud (Hovers *et al*. 2011), Kebara (Bar-Yosef *et al*. 1992, 1996), and El-Wad F&G (Sarel

[7] Title from F. Hour's article (1965).

[8] K. Ohuma 1992, E. Hovers 1998 for Amud, O. Bar-Yosef et al. 1992, 1996 for Kebara, A.E. Marks & P. Volkman 1986 for Ksar Akil, Y. Nishaki & L. Copeland 1992 for Keoue Cave, T.C. Hauck 2011 for Hummal.

2004: 58, tab. IV. 3) although it is not clear if in any case bladelet cores were present as well. Bladelets and bladelet cores are indeed a much overlooked feature in Middle Palaeolithic research of the Middle East.

A few carinated endscrapers and carinated burins (2-3 each in Michmiche Gouffre), both typical tool types of the Aurignacian, also did occur in Emireh and El Wad F (Garrod 1951, 1955).

Chamfered pieces, one of the hallmarks of the transitional era in Lebanon, of which three typical ones and 10 atypical/debatable ones are present in Michmiche Gouffre (pl. II.6, 7), also appeared in Keoue Cave (Nishaki & Copeland 1992: 116, fig. 8.4.6) and Ksar Akil XXVIIIA, XXVIB (Marks & Volkman 1986: 15). Only one piece per assemblage was discovered though.

A further tool type that, for a long time was considered a type fossil of the transitional era, is the Emireh point (Copeland 2000). They were discovered in Emireh, El-Wad F, Ksar Akil XXV, Abou Halka and Boker Tachtit 1-3 but also surfaced frequently in Middle Palaeolithic contexts such as El-Wad G (Garrod 1951), Shubbabiq C (Binford 1966: fig. 6.H, I), Sables de Beyrouth/ Sands of Beirut and many "Meyroubian" sites (Copeland 2000). One atypical point was found in Keoue Cave (Copeland 2000: 80, fig. 6.9). As shown earlier, one typical and 2 atypical Emireh points were discovered in Michmiche Gouffre (pl. III. 2-4). Bringing together the evidence collected by L. Copeland and P.W. Volkman and D. Kaufman (Volkman & Kaufman 1983) it is apparent that Emireh points, typical and atypical, occurred well before the Transitional industries in Middle Palaeolihtic and "Meyroubian" assemblages and had a rather long period of circulation.

Considering all the evidence gathered, Michmiche Gouffre must be considered an integer Late Middle Palaeolithic assemblage, leaving aside only 20 secondary tools (10 endscrapers and 10 burins) where unpatinated tool modifications truncate through patinated blanks. Among tools no guide fossils in any unexpected amount or appearance are present that are not known from other Middle Palaeolithic sites in the Middle East. Typical tool types of the transitional era like Emireh points and chamfered pieces also occur in low numbers in other Middle Palaeolithic sites as do bladelets and carinated pieces. Further guide fossils such as El-Wad points, an abundance of carinated pieces or backed pieces are absent from Michmiche Gouffre.

This leaves us with a typical Middle Palaeolithic site holding a significant amount of Upper Palaeolithic tool types and blade cores, a typical feature of all "Meyroubian" sites (Copeland & Wescombe 1965: 40, 41) that must now be considered a genuine regional variation of the Levantine Late Middle Palaeolithic.

Michmiche Gouffre in context of the Levantine Middle Palaeolithic and Transitional era

Michmiche Gouffre naturally finds its closest resemblance in other "Meyroubian" sites in Mount Lebanon. During my research in the *Musée de Préhistoire libanaise* I was able to study two further assemblages of this region, namely Baskinta and Mazraat Kfardebiane (Leder 2013). In principle those two assemblages also show a mix of Levallois and Upper Palaeolithic technology and typology. Unlike Michmiche Gouffre though, there is a greater abundance in volumetric cores of 30-35% (including some bladelet cores) and a higher Group IIIe index, ca. 20-25%. Levallois points are nearly absent from these two sites and Mousterian points were not recognized at all.

In comparison to the nearest stratified Middle Palaeolithic assemblages of Ksar Akil, Michmiche Gouffre would be most comparable to layers XXVIA to XXVIIB but here the dominant core reduction method is Levallois centripetal whereas Upper Palaeolithic cores are nearly absent[9]. Also, apart from layer XXVIB, Levallois points are (nearly) absent from these layers (Marks & Volkman 1983).

Keoue Cave in Northern Lebanon shares some features with Michmiche Gouffre but is set apart by its lack of volumetric cores and an abundance of Levallois points and convergent flaking. Only layers I and III have a Group IIIe index similar to Michmiche Gouffre (Nishaki & Copeland 1992). Further assemblages of excavated Middle Palaeolithic sites in Lebanon such as Ras El-Kelb, Nahr Ibrahim, Naame and Bezez B[10] do not show enough similarities with Michmiche Gouffre that any connections could be claimed. Crossing the Lebanese borders, the only assemblage showing striking similarities are the one of El-Wad F and to a lesser degree El-Wad G. (Garrod 1951, 1955; Sarel 2004: 56-70).

Comparison with the material published of El-Wad is hindered by 4 factors:

1) Investigations in D.A.E. Garrod and D.M.A. Bate 1937, and D.A.E. Garrod 1951, 1955 are restricted to tools whereas characteristics of blanks and cores are barely addressed.
2) Terminology used in D.A.E. Garrod and D.M.A. Bate 1937, and D.A.E. Garrod 1951, 1955 originated in a pre-Bordesian era and is thus difficult to translate to modern terminology.

[9] Personal communication Marina Paglia, September 2012

[10] L. Copeland & N. Moloney 1998 for Ras El-Kelb, R. Solecki. 1969 for Nahr Ibrahim, H. Fleisch 1971 for Naamee, Roe 1983 for Bezez B.

3) In J. Sarel 2004 only 250 lithic artefacts were studied from F and G respectively in comparison to the original publications dealing with c. 1,500 lithics each.
4) J. Sarel only re-evaluated lithic material of El-Wad F2 after D.A.E. Garrod and D.M.A. Bate 1937 that merely contains the Middle Palaeolithic component of Transitional layer F while F1 contains most Upper Palaeolithic elements (Garrod 1951: 127).

Taken into account these obstacles the assemblages' major characteristics still shimmer through clearly enough. El-Wad F in particular represents a mix of different Levallois concepts (Boëda 1994) along with a substantial amount in volumetric cores that constitute nearly 1/3 of all cores. Volumetric cores in layer G only reach some 10% (Garrod 1951: 125-126; Sarel 2004: 58) comparing quite well to the <12% value for Michmiche Gouffre (tab. 3). Blade production is important but not dominant. Some bladelets are present in both layers (Sarel 2004: 58). Blade cores in F follow a diversity of reduction methods wherein bipolar exploitation prevails (Sarel 2004: 61-62). Blade technology in El-Wad F was certainly better than in Michmiche Gouffre as indicated by many more narrow and delicate blades bearing plain butts (Garrod 1951: 125, pls. I.4, 7-10, II.1, 2). Convergent flaking is evident in 1/3 of all Levallois flakes similar to Michmiche Gouffre with 25% (Sarel 2004: 65, tab. 14). Considering all debitage and cores though, this method merely co-existed alongside other exploitation systems.

From a typological point of view, sidescrapers dominate in El-Wad F over endscrapers, Mousterian points and Levallois points while burins, notches and retouched pieces are present in noteworthy number as well. While some of D.A.E. Garrod's blunted-back blades rather seem to be blades with edge damage or in best case denticulated blades, others indeed seem to have retouched backs (Garrod 1951:125, pl. I. 4, 7-10). In comparison to Michmiche Gouffre, Group IIIe (c.30%) is much stronger developed but all tool types mentioned are significant in both sites. Sidescrapers often have a non-invasive/ light retouch just like Michmiche Gouffre (Garrod 1951: pl. IV.1-3, 5-9). Levallois points are predominantly broad based and big as in Michmiche Gouffre but some have blade proportions (Garrod 1951: pls. I. 2, 11, III. 9-11; Sarel 2004: 58). Endscarpers and burins are often atypical. In general though, El-Wad F seems more advanced than Michmiche Gouffre with a higher proportion of volumetric blade cores and Upper Palaeolithic tools making it rather comparable to Baskinta and Mazraat Kfardebiane (see above). Compared to El-Wad G (Garrod 1951; Sarel 2004), elements mentioned for Michmiche Gouffre are present here as well but the former one clearly shows a

stronger Upper Palaeolithic tendency in particular in its typology. Concluding from the above it is evident that Michmiche Gouffre chronologically belongs in between El-Wad F and G and thus can be considered a Late Middle Palaeolithic/ Pre-Transitional assemblage (fig. 6).

Conclusion

The majority of the lithic material of Michmiche Gouffre certainly belongs to the Late Middle Palaeolithic occupation (leaving aside only 20 secondary tools). Although, there is an abundance of rather atypical elements such as endscrapers, burins, bladelets produced by soft hammer and blade cores, there is no conclusive argument for an exclusion of those elements from the Late Middle Palaeolithic assemblage.

On the other hand, the vast amount of material as well as the diversity of raw material varieties points towards a palimpsestic character for the site's diagenesis in a sense of repeated occupations during late Middle Palaeolithic times.

Michmiche Gouffre can be considered a formidable example of "Meyroubian" sites with a dominance in Levallois technology and Middle Palaeolithic tool types but also with an indigenous production of Upper Palaeolithic elements.

Some features that are characteristic for the Upper Palaeolithic were already established:

1) Non- Levallois blade concepts, unipolar and bipolar.
2) Narrow blade and bladelets produced by soft stone hammer.
3) Ventral bulb truncation on different tools, similar to treatment in Emireh points.
4) Presence of Upper Palaeolithic tools such as endscrapers, burins and chamfered pieces though in minor amount and often atypical; frequently made on Levallois blanks.

On a regional scale Michmiche Gouffre is best comparable to other "Meyroubian" sites in Mount Lebanon but at least two of them, Baskinta and Mazraat Kfardebiane, bear differing characteristics and are clearly younger (Leder 2013). Inter-regionally, Michmiche Gouffre finds its closest resemblance in the Middle Palaeolithic of El-Wad G and the Transitional layer of El-Wad F. In terms of relative chronology, Michmiche Gouffre must be positioned in between those two undated layers.

Acknowledgements

I would like to thank Prof. Jürgen Richter who made this dissertation possible in the first place and was of splendid support throughout. Likewise my gratitude goes to Monsieur le Directeur Lévon Nordiguian for granting me access to collections of Musée de Préhistoire libanaise and for helpful advice and comments. Many thanks are also due to Dr. Maya Haïdar-Boustani for her support on application procedures and guidance with the collections. Furthermore, my gratitude goes to Nelly Abboud, Daniel Schyle and Thomas Hauck for support and many helpful discussions. Finally I would like to say thank you to my wife, Laila Aghasi, for being there and being awesome.

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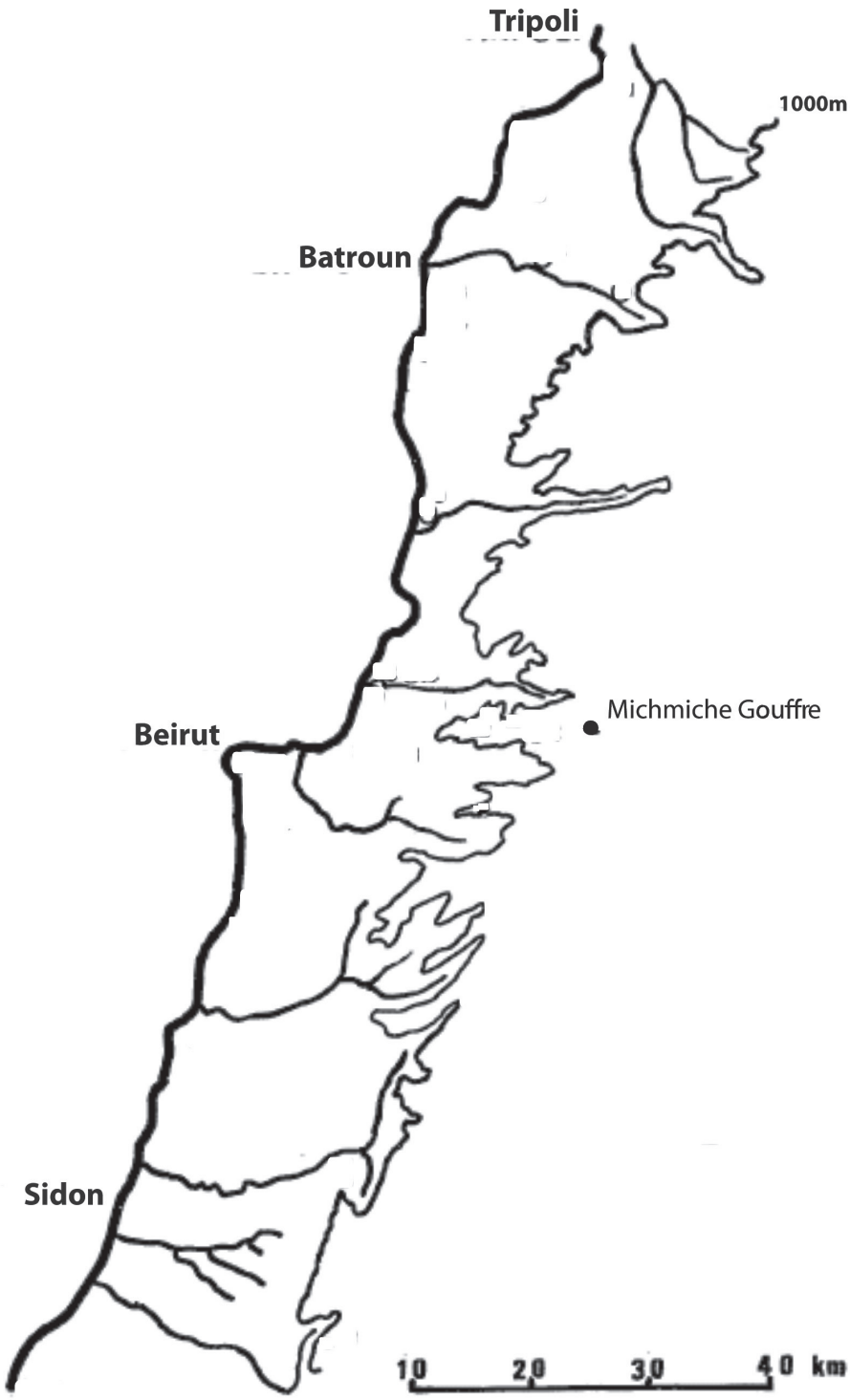


Map 1 - Location of Michmiche Gouffre (changed after F. Hours 1973: fig. 2).

	% of total	% in sub-group	n=
Levallois	**28.62**	**100**	**1971**
Levallois flakes	23.39	81.74	1611
Levallois blades	4.43	15.47	305
Levallois pointss	0.80	2.79	55
non-Levallois	**39.32**	**100.00**	**2708**
non-Levallois flakes	26.46	67.28	1822
non-Levallois blades	10.85	27.58	747
bladelets	0.28	0.70	19
triangular blank	1.74	4.43	120
crested blanks	**0.52**	**100.00**	**36**
prim. crested blade	0.20	38.89	14
sec. crested blade	0.07	13.89	5
prim. crested flake	0.07	13.89	5
sec. crested flake	0.03	5.56	2
eclat dbd.	0.15	27.78	10
others	**31.54**	**100**	**2172**
pseudo LP	0.13	0.41	9
couteaux à dos	0.35	1.10	24
TF-flakes	0.97	3.08	67
cores	16.41	52.03	1130
broken/others	7.16	22.70	493
chippage (<2cm)	4.75	15.06	327
core trimming elem.	1.77	5.62	122
total	***100***		***6887***

Table 1- All lithic artefacts.

	% of total	% in sub-group	n=
Levallois	**51.92**	**100**	**270**
Levallois flakes	30.00	57.78	156
Levallois blades	12.31	23.70	64
Levallois points	9.62	18.52	50
non-Levallois	**38.08**	**100.00**	**198**
non-Levallois flakes	11.15	29.29	58
non-Levallois blades	20.19	53.03	105
triangular blank	6.73	17.68	35
crested blanks	**2.50**	**100.00**	**13**
prim. crested blade	0.77	30.77	4
sec. crested blade	0.58	23.08	3
prim. crested flake	0.19	7.69	1
sec. crested flake	0.38	15.38	2
éclat débordant	0.58	23.08	3
others	**7.50**	**100**	**39**
pseudo LP	0.19	2.56	1
couteaux à dos	2.88	38.46	15
TF-flakes	3.46	46.15	18
broken/others	0.96	12.82	5
total	***100***		***520***

Table 2 - Artefacts sampled for attribute analyses.

	% of total	% in sub-group	n=
Levallois cores	**45.70**	**100**	**547**
unipolar prefer.	18.88	41.32	226
unipolar rec.	11.28	24.68	135
bipolar pref.	0.75	1.65	9
bipolar rec.	3.01	6.58	36
centripetal	8.60	18.83	103
point cores	3.17	6.95	38
volumetric cores prismatic	**11.86**	**100**	**142**
unip. prism. unip. 2	5.10	42.96	61
faces prism. bipolar	0.84	7.04	10
pyramidial unipolar	0.75	6.34	9
pyramidal bipolar	1.25	10.56	15
blade/ bladelet	0.17	1.41	2
multi plf./ globular	1.09	9.15	13
along-axis cores	2.67	22.54	32
unipolar	**15.54**	**100**	**186**
bipolar	9.77	62.90	117
unip. convergent	2.51	16.13	30
TF-flake cores	3.26	20.97	39
unipolar	**5.60**	**100**	**67**
bipolar	4.09	73.13	49
multi platf.	1.09	19.40	13
others	0.42	7.46	5
cores on flake	**21.30**	**100**	**255**
opportun./undiagn.	0.42	1.96	5
tested blocks	12.87	60.39	154
core fragments	4.43	20.78	53
	3.59	16.86	43
total	***100***		***1197***

Table 3 - All cores.

	% of total	%in sub-group	n=
sidescrapers	**25.16**	**100.00**	**230**
simple straight	11.27	44.78	103
simple convex	6.56	26.09	60
simple concave	1.20	4.78	11
double	3.06	12.17	28
convergent	2.30	9.13	21
off-set	0.77	3.04	7
points	**16.74**	**100.00**	**145**
straight edge	0.11	0.65	1
convex edges	7.33	43.79	67
assymetric edges	1.86	11.11	17
levallois points	6.02	35.95	55
retouched LPs	1.31	7.84	4
Emireh point	0.11	0.65	1
UP tool types	**14.00**	**100.00**	**128**
chamfrein	0.77	5.47	7
endscraper	4.05	28.91	37
burin	3.50	25.00	32
truncations	5.03	35.94	46
backed piece	0.22	1.56	2
pierces	0.44	3.13	4
others	**44.09**	**100.00**	**403**
notches	13.79	31.27	126
denticulates	6.89	15.63	63
retouched pieces	17.94	40.69	164
combination tools	5.47	12.41	50
total	***100.00***		***906***
excluding 10 secondary endsrapers and burins respectively			

Table 4 - All tools.

	1957	%	2011	%	total	
sidescrapers	**12**	**7.79**	**230**	**25.14**	**242**	**22.64**
points	**117**	**75.97**	**154**	**16.83**	**271**	**25.35**
Levallois points	54	35.06	55	6.01	109	10.20
Mousterian points	63	40.91	96	10.49	159	14.87
Emireh point	0	0.00	3	0.33	3	0.28
UP tool types	**14**	**9.09**	**128**	**13.99**	**142**	**13.28**
chamfrein	0	0.00	7	0.77	7	0.65
endscraper	11	7.14	37	4.04	48	4.49
burin	3	1.95	32	3.50	35	3.27
truncations	0	0.00	46	5.03	46	4.30
backed piece	0	0.00	2	0.22	2	0.19
pierces	0	0.00	4	0.44	4	0.37
others	**11**	**7.14**	**403**	**44.04**	**414**	**38.73**
notches	2	1.30	126	13.77	128	11.97
denticulates	0	0.00	63	6.89	63	5.89
retouched pieces	9	5.84	164	17.92	173	16.18
composite tools	0	0.00	50	5.46	50	4.68
sum	***154***	***100***	***915***	***100***	***1069***	***100***

Table 5 - Tool kit, London and Musée de Préhistoire Libanaise (Lebanon) collections combined.

ILF	81.74
ILB	15.47
ILPt	2.79
Ilam	23.25
IL	34.24
IF	82.64
IFs	75.31

Figure 1 - Bordesian indices.

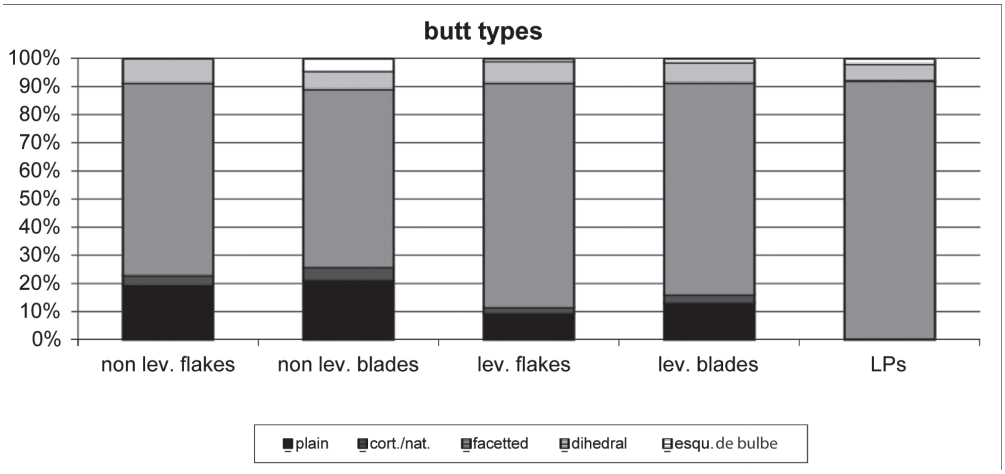


Figure 2 - Butt treatment on blanks.

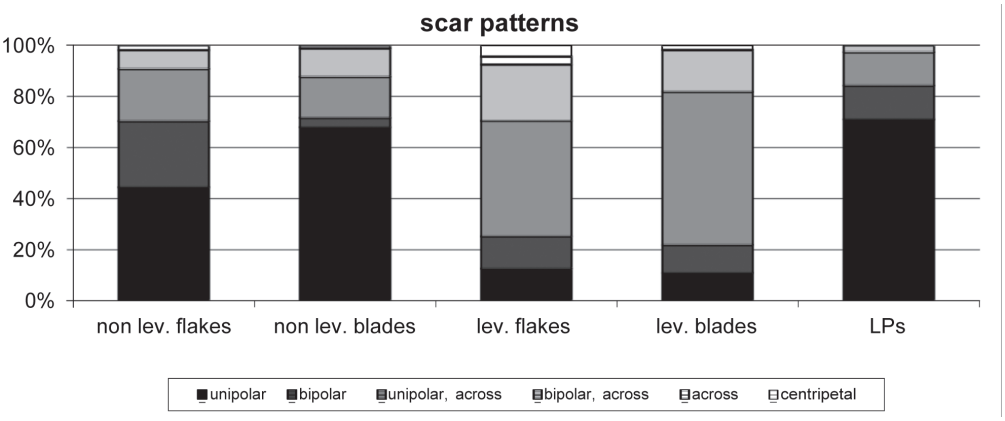
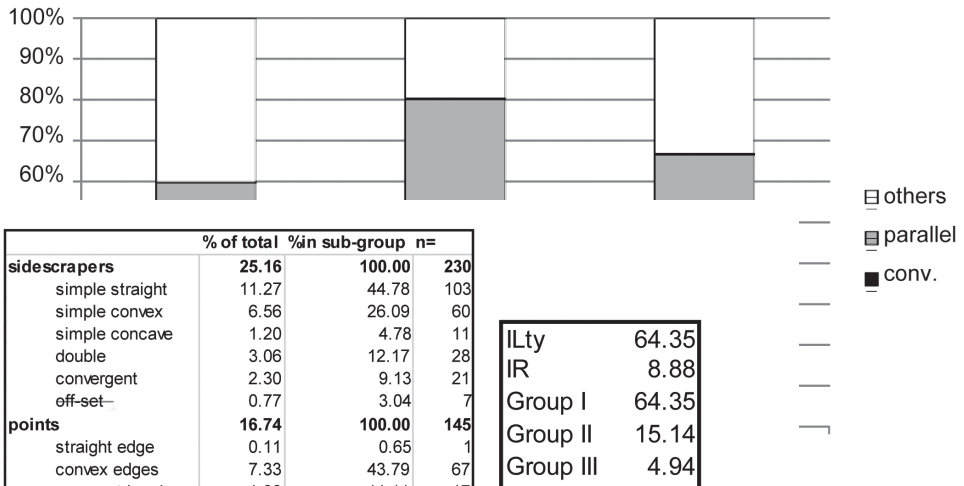


Figure 3 - Scar patterns on debitage.



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simple convex	6.56	26.09	60
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convergent	2.30	9.13	21
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straight edge	0.11	0.65	1
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retouched LPs	1.31	7.84	4
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UP tool types	**14.00**	**100.00**	**128**
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endscraper	4.05	28.91	37
burin	3.50	25.00	32
truncations	5.03	35.94	46
backed piece	0.22	1.56	2
pierces	0.44	3.13	4
others	**44.09**	**100.00**	**403**
notches	13.79	31.27	126
denticulates	6.89	15.63	63
retouched pieces	17.94	40.69	164
combination tools	5.47	12.41	50
total	***100.00***		***906***

excluding 10 secondary endsrapers and burins respectively

Table 4 - All tools.

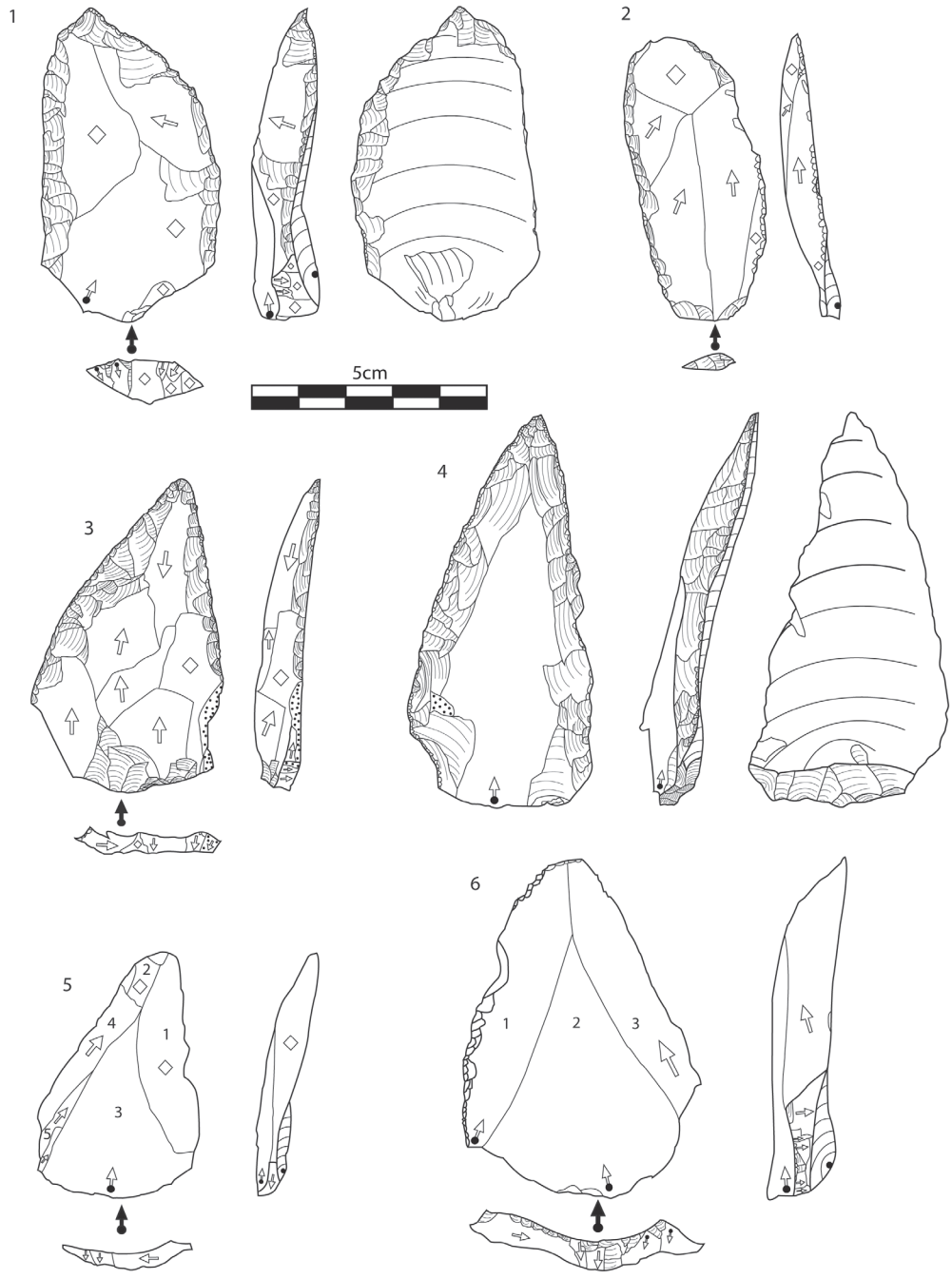
ILty	64.35
IR	8.88
Group I	64.35
Group II	15.14
Group III	4.94
Group IV	7.30
IRe	26.78
Group IIe	38.82
Group IIIe	14.90
Group IVe	22.00

Figure 5 - Bordesian indices.

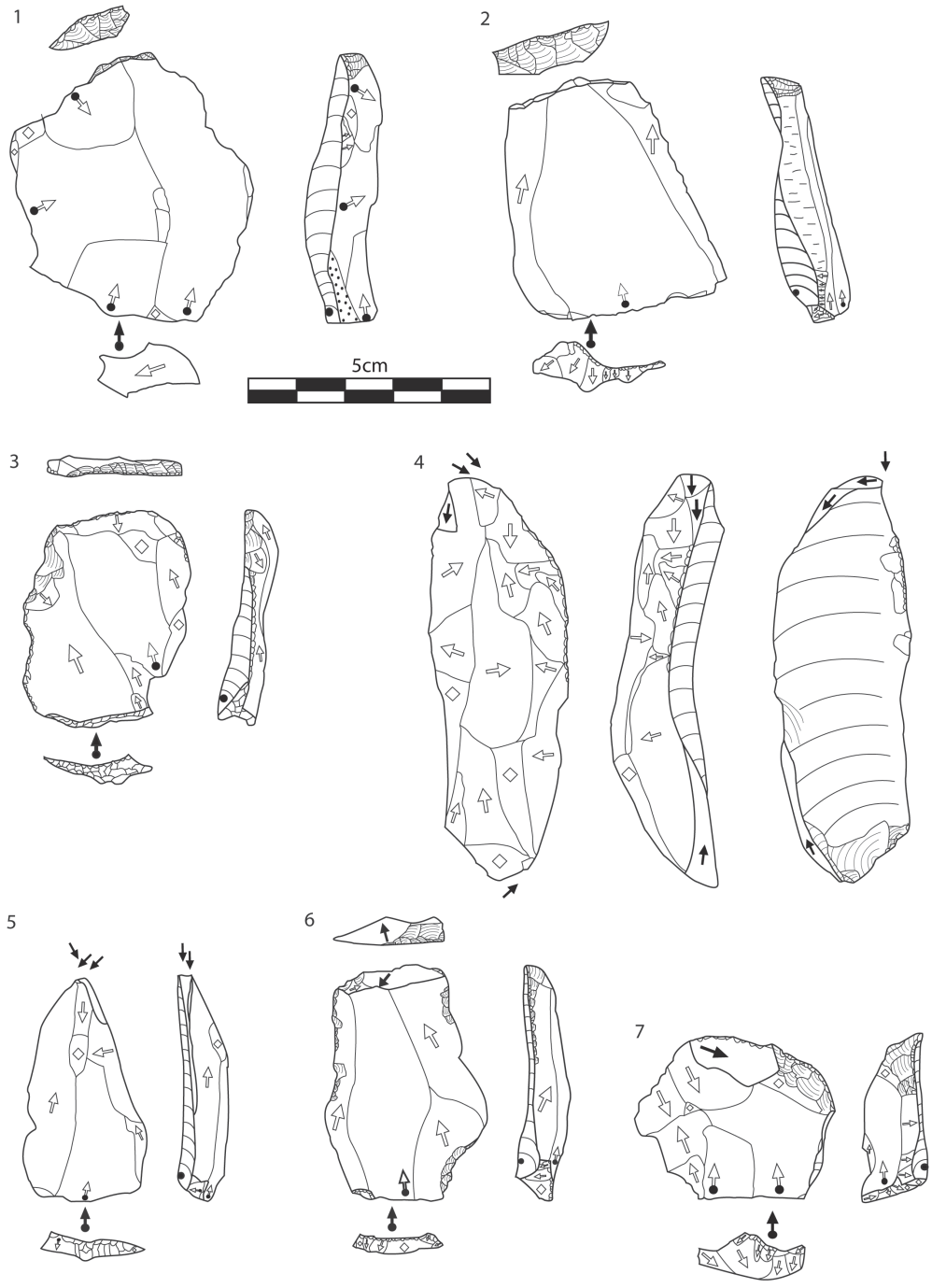
Figure 5 - Bordesian indices.

N-Israel	Mount Lebanon
Emireh	
El-Wad F	Mazraat Kfardebiane
	Baskinta
	Michmiche Gouffre
El-Wad G	

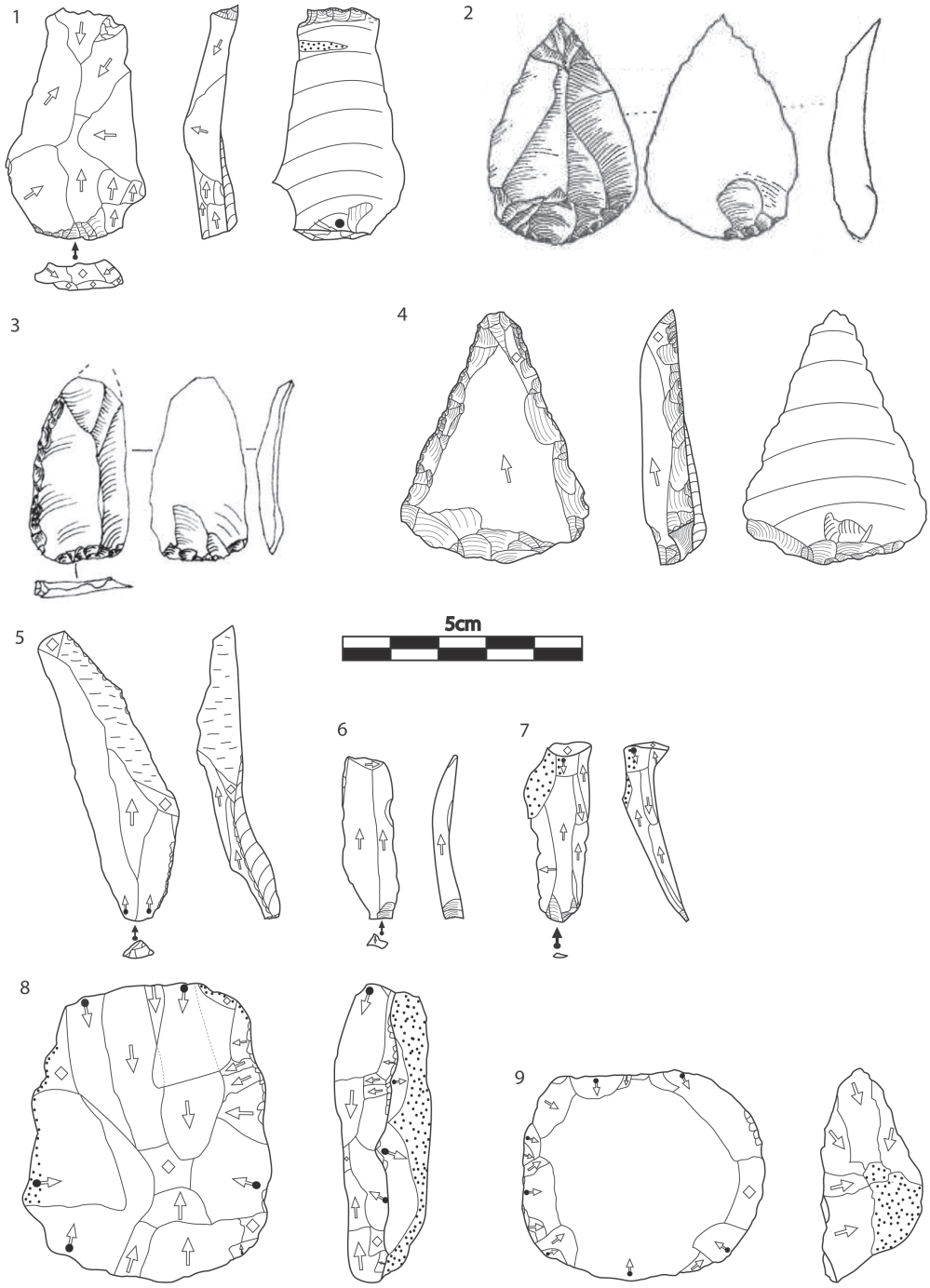
Figure 6 - Chronological succession in Northern Israel and Mount Lebanon.



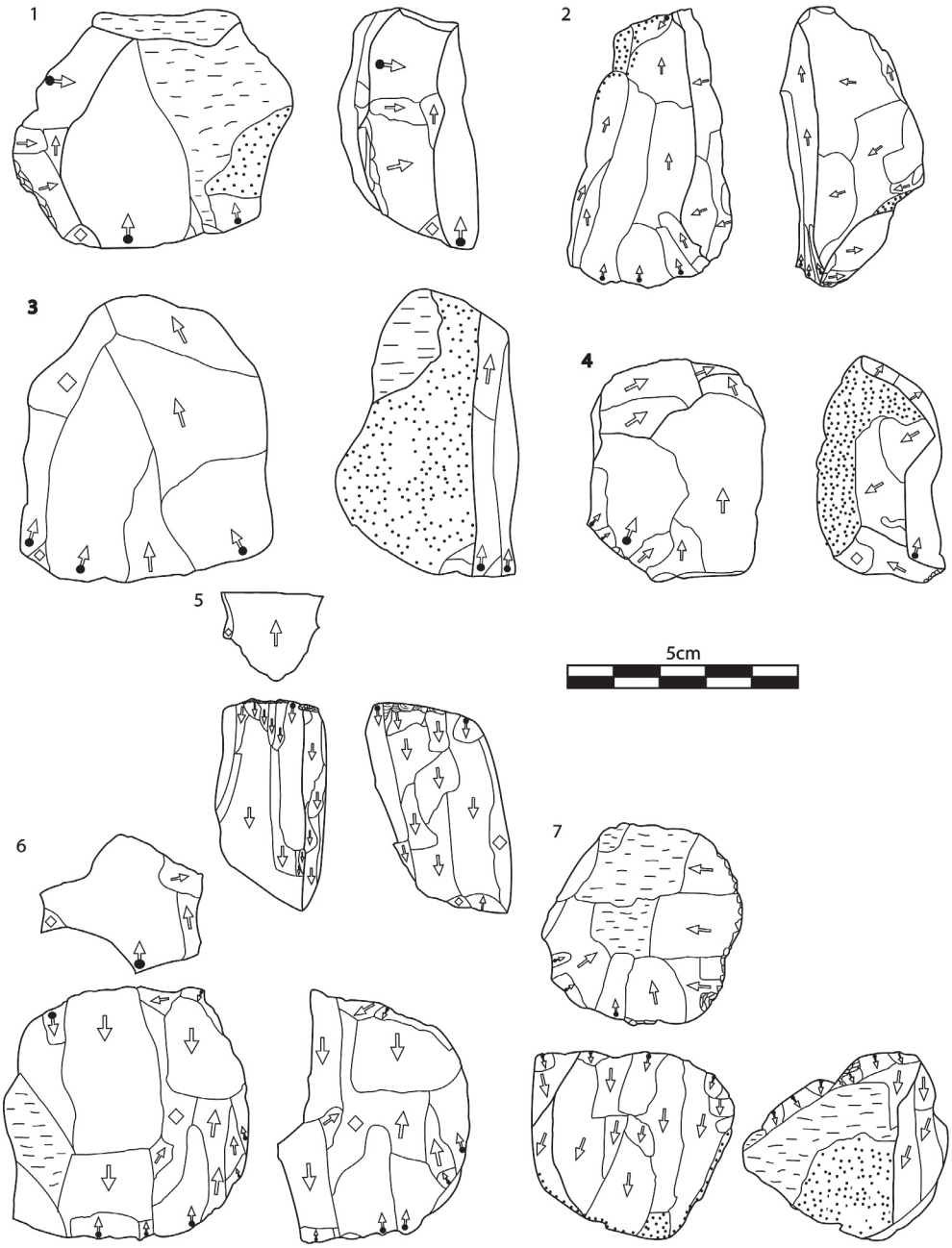
1 straight-convex sidescraper, 2 straight sidescraper on blade, 3-4 Mousterian points (4 with removed bulb)
5-6 Levallois points
PLATE I



1-2 endscrapers on Levallois flakes; 3 truncation, 4-5 burins, 6-7 chamfered pieces
PLATE II



1 ventral truncation, 2 Emireh point, 3-4 proto-Emireh points, 5-7 non-Levallois blade/lets,
8 bipolar Levallois core transformed into centripetal core, 9 preferential Levallois core
No.2 after Copeland & Wescombe 1966: pl. LI.20; No.3 after Copeland 2000: fig. 4.6
PLATE III



1 Levallois point core, 2 & 4 unipolar along-axis cores, 3 recurrent convergent Levallois core,
5 bladelet core, 6 bipolar blade/flake-blade core, 7 unipolar blade/let core
PLATE IV