The Yabrudian industry of Dederiyeh Cave, Northwest Syria.

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Abstract

Yabrudian lithic assemblages, defined with materials from the late Lower Palaeolithic sites of the Central Levant, have rarely been found in the Northern Levant. This paper reports the discovery of comparable lithic assemblages at the Dederiyeh Cave, northwest Syria. A techno-typological analysis of the materials from the 2005 season's excavations revealed their strong affinities with the Yabrudian of the Central Levant, indicating the distribution of this industry up to the northern end of the Levant. This finding provides a regional perspective to help interpret the variability of the Acheulo-Yabrudian Cultural Complex encompassing Yabrudian, as well as the Yabrudian industry itself.

Introduction

The Yabrudian represents one of the three major lithic industries (facies) characterizing the latest part of the Levantine Lower Palaeolithic (Ronen and Weinstein-Evron 2000; Shea 2013). It is distinguished from Acheulean and Amudian by different frequencies of the specific lithic techno-typological elements: Yabrudian is typified by the abundant production of sidescrapers on thick flake blanks often using Quina-type retouch, Acheulean by the manufacturing of handaxes and a small number of flake tools, and Amudian by the prominent production of tools on blade blanks. The occurrences of these distinct lithic industries within a relatively short period (ca. 415-250 ka) markedly contrast with the situations in the preceding and succeeding periods, the meaning of which has long been a subject of discussion from varied viewpoints, including differences in functional, anthropological, and culture-historic terms (e.g. Garrod 1956; Jelinek 1982; Copeland 2000; Le Tensorer 2005; Parush *et al.* 2016; Chazan 2016).

In its long history of research starting in the 1920s (Garrod and Bate 1937; Rust 1950; Gisis and bar-Yosef 1974), the discovery of Yabrudian assemblages had until recently been mostly limited to cave sites in the Central Levant (Garrod and Kirkbride 1961; Skinner 1970; Copeland 1983; Zaidner *et al.* 2005; Parush *et al.* 2016; Zaidner and Weinstein-Evron 2016). Recent investigations in inland Syria demonstrated their occurrences at open-air sites of the steppe in the northern Levant (Copeland and Hours 1983; Le Tensorer 2005; Al Qadi 2011), providing new insights into the functional or geographic variability of the Yabrudian industry.

In this paper, we refer to the new data from Dederiyeh Cave in northwest Syria, which yielded the northernmost example of this industry thus far known (Nishiaki *et al.* 2011a). On the basis of the assemblages from the 2005 season, their techno-typological characteristics are presented. The analysis focuses in particular on the blank production technology, for which detailed data has recently become available for the Yabrudian of the Central Levant (Shimelmitz *et al.* 2014; Zaidner and Weinstein-Evron 2016; Parush *et al.* 2016), so as to examine whether a comparable technology was maintained at the northern end of the Levant.

The Lower and Middle Palaeolithic stratigraphy at Dederiyeh Cave

Dederiyeh Cave is a large Palaeolithic cave site situated approximately 60 km north of Aleppo, Syria, measuring about 60 m long, 10 to 20 m wide and 10 m high (Akazawa and Nishiaki 2017 and references therein). Located on the left bank of Wadi Dederiyeh running into the Afrin Valley, the cave has two openings, one deep at the end of the cave (chimney) and the other facing the wadi (main entrance). A series of excavations by a Syria-Japan archaeological mission between 1989 and 2011 revealed two different occupational sequences in the areas close to these two openings respectively. While the chimney area yielded late Middle Palaeolithic levels alone, which contained Neanderthal fossil remains (Nishiaki *et al.* 2012), the main entrance area produced a much longer sequence, starting at least from the late Lower Palaeolithic and ending with the late Epipalaeolithic (Nishiaki *et al.* 2011a). Yabrudian assemblages were recovered from the lowest layers of the entrance area.

The entrance area corresponds to the first chamber of the cave, covering an area 10 m wide and 15 m long. The excavations revealed well-

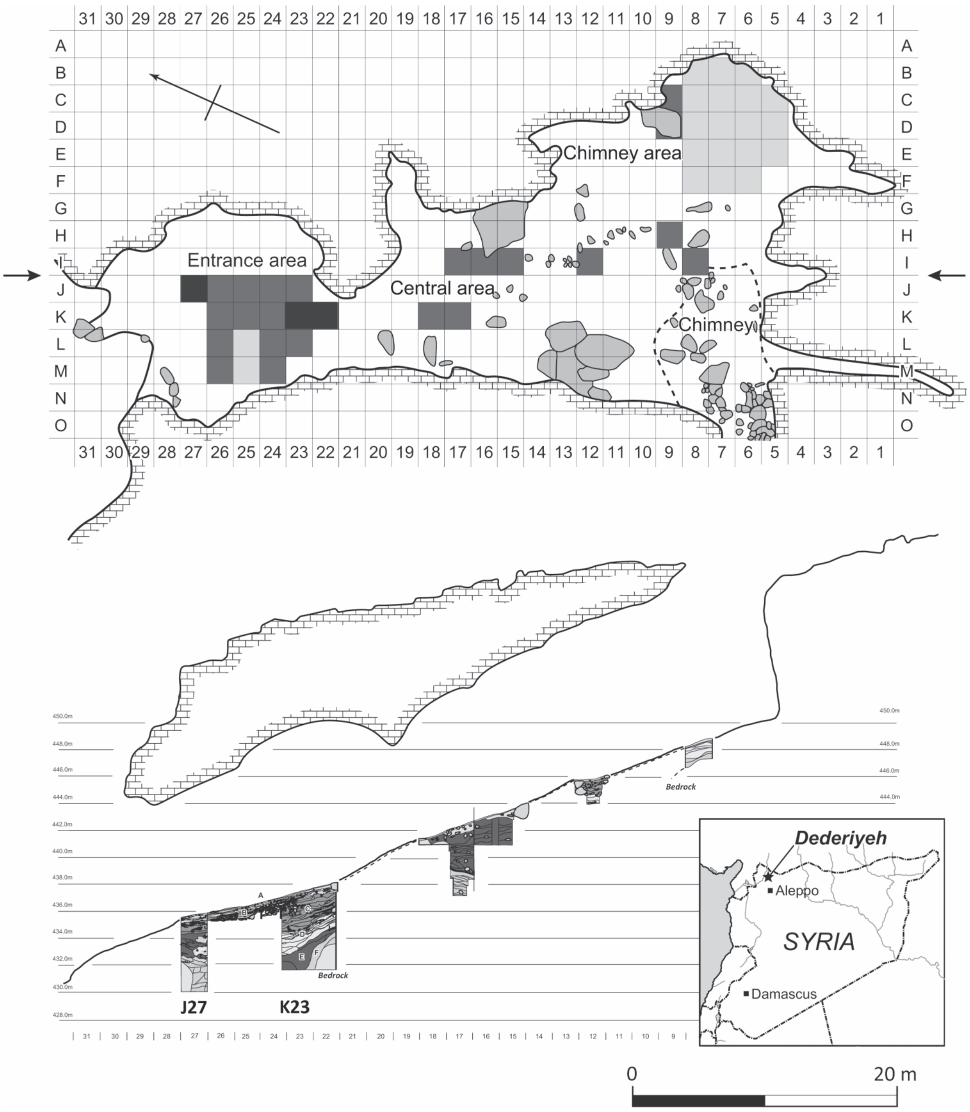

Figure 1: *Plan and stratigraphy of Dederiyeh Cave.*

preserved Natufian stone constructions in its central part, which included a burnt semi-subterranean dwelling (Nishiaki *et al.* 2011b). Having avoided these Natufian constructions, which were preserved for research and education in the future, deep excavations for the earlier Palaeolithic deposits were carried out in two isolated pits, K22/23 (2 x 4 m) and J27 (2 x 2 m) (Fig. 1). K22/23 was dug down to a point of 5.5 m from the cave surface, and J27 to 6.5 m. Most of the excavated deposits of these pits, 6 m apart from each other, consisted of the Middle Palaeolithic. Yabrudian deposits (Unit F) were recovered immediately below Early Levantine Mousterian layers (Unit E; Nishiaki *et al.* 2011a). The Yabrudian layers of K22/23 and J27 were approximately 1.5 m and 2 m in thickness respectively, both consisting of yellowish-gray calcareous sediments. The time period represented by these pits may not have been the same, although precise stratigraphic correlation has not been possible. The Yabrudian layers of K22/23 are well separated from the early Levantine Mousterian layers, which exhibit a grayish-brown color and contain a series of ashy layers. Therefore, a stratigraphic gap might have existed in between. On the other hand, the stratigraphic distinction between the Yabrudian and the Early Levantine Mousterian layers was less conspicuous in J27. The Yabrudian layers of both pits were heavily tilted towards the central part of the entrance area, at the edges of which parts of the bedrock were exposed. This finding suggests that no substantial amount of cultural deposits earlier than the Yabrudian existed in this part of the cave.

The excavations of the Yabrudian deposits were conducted in 2003-2005 and 2007-2009, and the resultant lithic materials amounted to more than 1000 artifacts. The material dealt with in this paper is that excavated from an upper part of the Yabrudian deposits of K23 and J27 in the 2005 season. Although small in sample size (127 pieces in total), they comprise the material that has been most intensively studied to date.

The Yabrudian lithic assemblages from the 2005 season at Dederiyeh Cave

The general inventory of the 2005 collection is shown in Table 1. The principal compositions of the two assemblages are similar. Cores comprise about 15% of the total, while debitage and retouched tools occupy almost equal proportions, about 40 to 45% respectively. Despite the careful material recovery through dry sieving (2.5 mm mesh) in the field, chips constitute a very small portion of the total. The primary flint knapping was probably carried out outside the area of the excavations.

The raw material used for the Yabrudian artifacts at Dederiyeh is considered local. Our survey shows that the nearest flint outcrops are located in the valley of Wadi Dederiyeh within a range of 2 kilometers upstream of the cave. Oblong nodules with calcareous cortex, relatively small (5 to 15 cm in diameter and 15 to 20 cm long), are available even today. The cortex, texture, and color of the Yabrudian lithic artifacts closely resemble those of the locally available flint.

Tool typology

The general inventory of the retouched tools from the two pits is also shown in Table 1. As at other Yabrudian sites, sidescrapers are very common (Fig. 2: 1-7), occupying as much as 57.9% of the tool assemblage from K22 (22/38) and, though at a lower proportion, 27.8% at J27 (5/18). The other tools consisted of burins (Fig. 2: 8), notches/denticulates, miscellaneous retouched flakes, and an unidentifiable tool fragment. All of the burins are of the angle type, characterized by a single or two burin blows on break. The blows include slanted ones onto the dorsal or ventral surface (Fig. 2: 8). The tool assemblages from the 2005 season did not yield any handaxes. However, the occurrences of biface thinning flakes (Tab. 1) suggest that manufacturing of bifaces was conducted in the excavated levels. The typological features of the handaxes can be inferred from the examples discovered in other seasons' excavations at Dederiyeh. Their proportion in the tool assemblages hardly exceeds 5%. When present, they tend to be quite small, with an average size of less than 10 cm (Nishiaki *et al.* 2009).

Detailed typological information on the sidescrapers from K22 is shown in Table 2. More than half of them retain a single scraping edge (54.5% or 12/22; Fig. 2: 1, 2), followed by those with double (18.2% or 4/22; Fig. 2: 3), transverse and dejete (both 9.1% or 2/22; Fig. 2: 5, 6), and convergent edges (4.5% or 1/22; Fig. 2: 4). The sidescrapers manufactured on bifacial blanks make up about one-fifth of the total (22.7% or 5/22; Fig. 2: 7). The much smaller sidescraper collection from J27, 5 pieces only, displays a similar typological composition: single sidescrapers are most common (60% or 3/5), followed by dejete and convergent ones (both 20% or 1/5). One of these scrapers was manufactured on a bifacially flaked blank (20% or 1/5).

Square	K23	J27	Total
Cores	12 (14.8%)	8 (17.4%)	20 (15.7%)
Semi-flaked	1	0	1
One working surface group			
Single-platform	6	1	7
Opposed-platform	1	0	1
Two-working surface group			
Working surface-platform	2	2	4
Dual working-surface (OR)	1	2	3
Dual working-surface (OP)	0	2	2
Core fragment	1	1	2
Debitage	31 (38.3%)	20 (43.4)	51 (40.2%)
Core-edge elements	7	0	7
Cortex flakes	6	8	14
Part-cortex flakes	3	2	5
Naturally backed flakes	5	0	5
Part-cortex blades	2	1	3
Naturally backed blades	0	3	3
Thinning flakes	0	3	3
Kombewa flakes	0	1	1
Flakes	2	1	3
Blades	0	0	0
Chips	6	1	7
Retouched tools	38 (46.9)	18 (39.1)	56 (44.1%)
Scrapers	22	5	27
Retouched flakes	8	10	18
Burins	4	0	4
Notch	1	0	1
Denticulates	3	2	5
Tool fragment	0	1	1
Total	81	46	127 -

Table 1: *Inventory of Yabrudian lithic artifacts from Dederiyeh Cave (2005 season).*

Table 2 also tabulates the retouch types for the sidescrapers from K22. The frequencies of the Quina, semi-Quina, and normal retouch types are more or less equal to each other. In other words, two-thirds of the sidescrapers from K22 exhibit Quina or semi-Quina type retouches. The common use of Quina (3/5) or semi-Quina (1/5) retouches is noted at J27 as well. Accordingly, although the proportions of sidescrapers in the tool assemblages greatly differ, their typological features are quite similar between the K23 and J27 assemblages.

Scraper type	Quina	Demi-Quina	Normal	Total
Single, straight		1	1	2 (9.1)
Single, straight (ventral)	1	1		2 (9.1)
Single, convex	1	1	2	4 (18.2)
Single, convex (ventral)		2		2 (9.1)
Single, convex, on biface			2	2 (9.1)
Double, convex			1	1 (4.5)
Double, convex-straight		1	1	2 (9.1)
Double, convex-straight, on biface		1		1 (4.5)
Convergent, convex, on biface	1		1	2 (9.1)
Transverse, convex		2		2 (9.1)
Dejete	2			2 (9.1)
Total	5 (22.7)	9 (40.9)	8 (36.4)	22 (100.0)

Table 2: *Typology and retouch types of Yabrudian sidescrapers from K23 of Dederiyeh Cave (2005 season).*

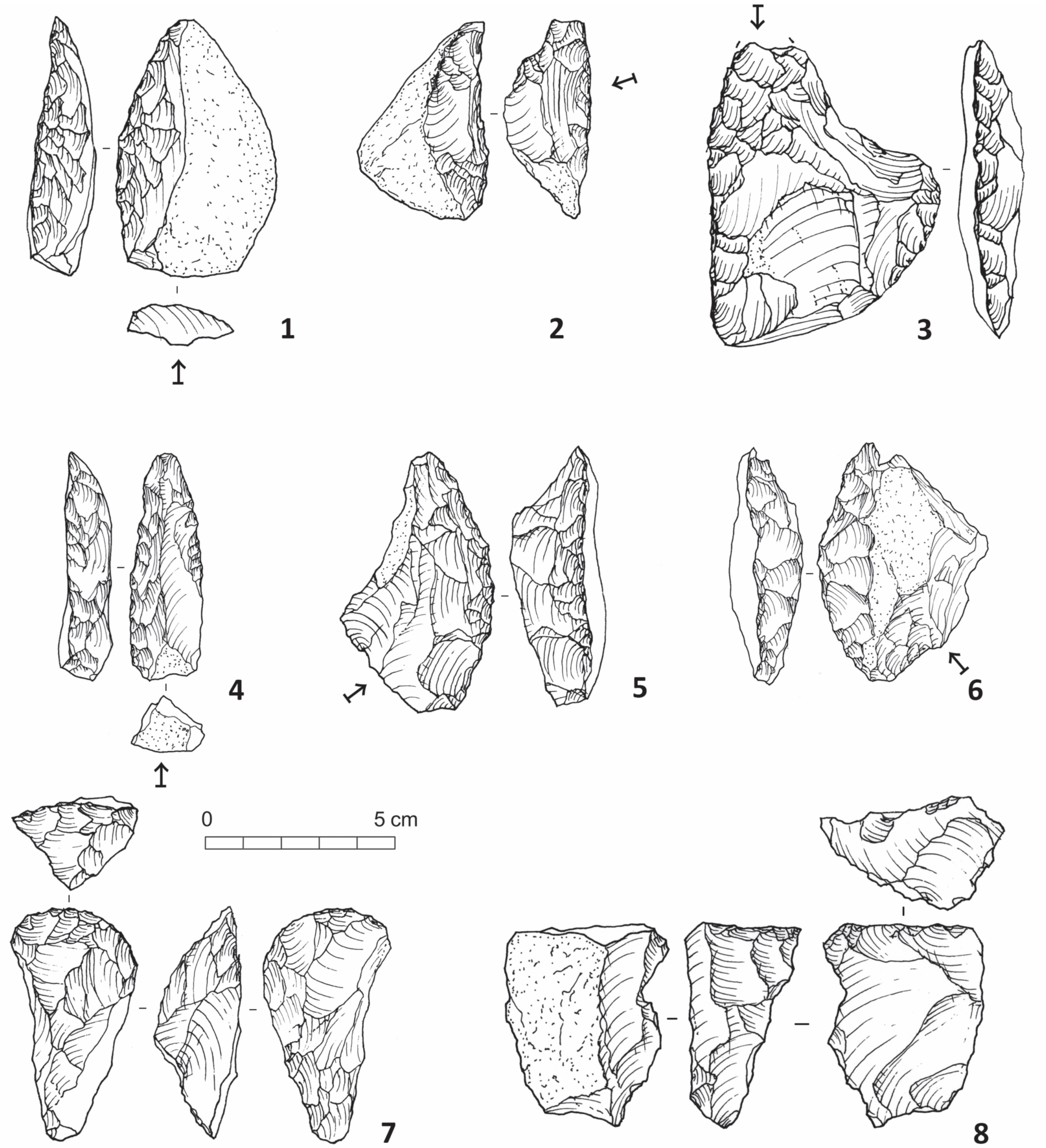

Figure 2: *Yabrudian retouched tools from Dederiyeh Cave (2005 season).*

Core reduction technology

There are 20 cores in the study collection, which includes a semi-flaked core and two thermally damaged fragments (Tab. 1). The remaining 17 cores provide useful information about the reduction technology. All of these are non-Levallois cores for flake production, without traces of systematic manufacturing of elongated blanks. Also characteristic is the frequent use of flakes as core blanks. Many of those cores exhibit a remnant of the positive bulbar surface (13/17; Fig. 3: 1-3, 5, 6), indicating that the core blanks were thick flakes. Considering that the bulbar surface of on-flake cores is often invisible due to subsequent flake removals, the original proportion of its occurrence must be even higher. The presence of cores with rather flat surfaces at both ends and cortex along the sides (Fig. 3: 6, 7) indicates that the core blanks include splits struck from oblong flint nodules. Their diameter seems to have been relatively small, mostly less than 10 cm, matching the local flint nodules available at the nearest sources.

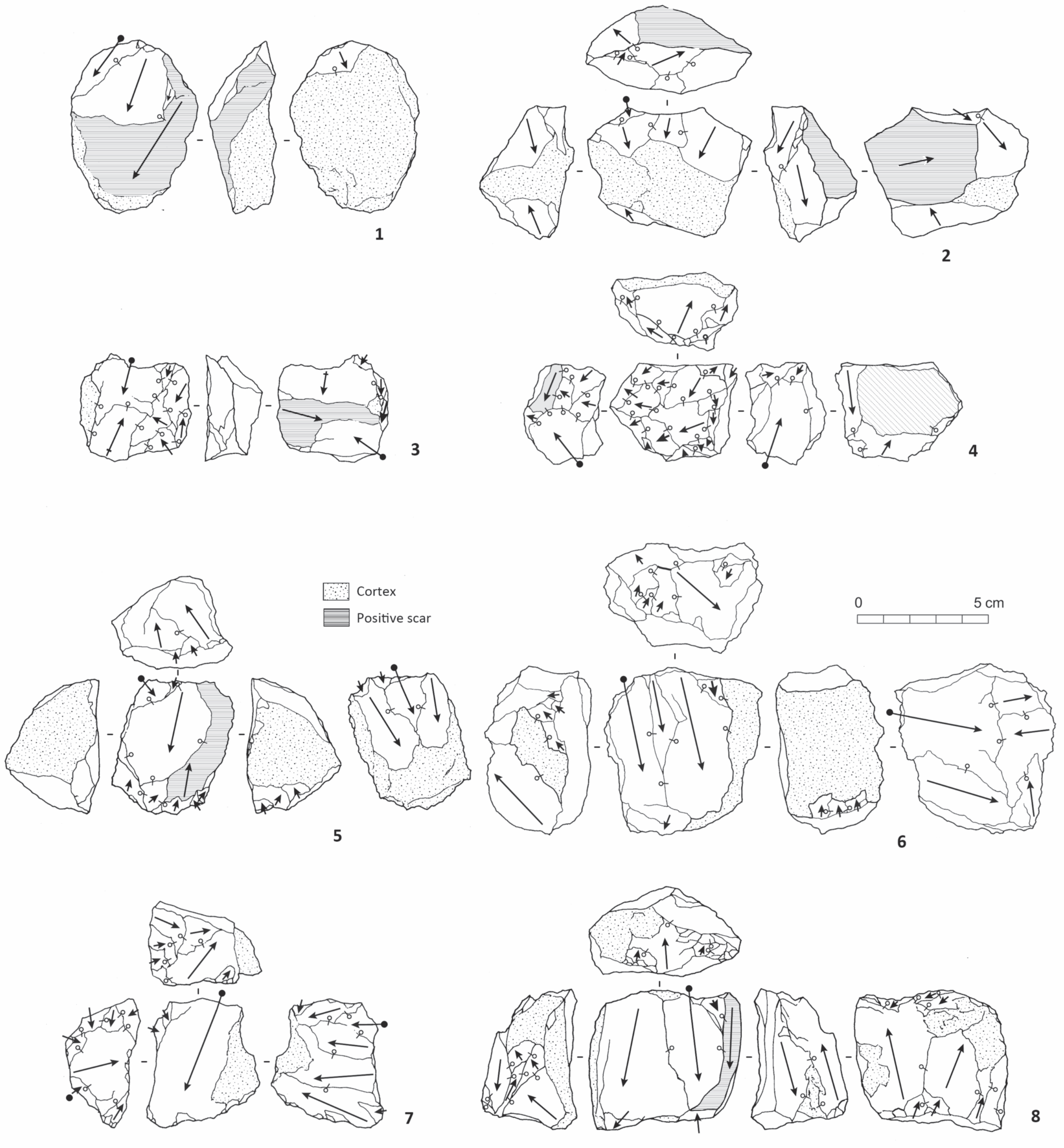

Figure 3: *Yabrudian cores from Dederiyeh Cave (2005 season). The arrows indicate the flaking directions. The open circle denotes the scar younger than the one truncated by the short bar attached to the circle. For details of the scar pattern analysis, see Nishiaki (1994).*

According to the different configurations of the working surfaces (debitage surfaces), the cores are classified into two major groups: those with one working surface and with two working surfaces (Tab. 1). Cores of the one-working-surface group can be further divided according to the number and position of the striking platforms: single- (Fig. 3: 1, 2) and opposed-platform types (Fig. 3: 3). As for cores of the two-working-surface group, two types of striking platforms were recognized for the second working surfaces. One is the use of the first working surface as the striking platform (working-surface platform type; Fig. 3: 4-7), and the other one is where a new striking platform was prepared for the second working surface (dual-working-surface type; Fig. 3: 8). The two working surfaces were not necessarily reduced from the same directions. They were struck from the opposite sides (Fig. 3: 8) or orthogonal sides (Tab. 1).

This classification scheme reveals that cores from K23 are dominated by the one-working-surface group, while those of J27 by the dual-working-sur-

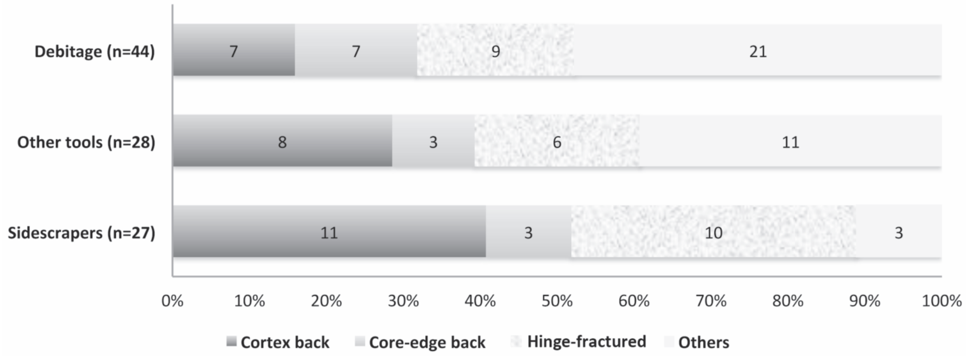

Figure 4: *Blank types for Yabrudian debitage, retouched tools, and sidescrapers from Dederiyeh Cave (2005 season). Data from J27 and K23 are combined.*

face group (Tab. 1). This contrast may reflect the different core reduction intensity between these two excavation areas, since two working-surface cores can be regarded as a more reduced version of one working-surface cores. At the same time, it may relate to a chronological difference between these two assemblages whose stratigraphic relationships have not been determined. In either case, the cores from these pits share the important technological features: the prevalent employment of thick nodule splits as core blanks and the almost exclusive production of flake blanks using non-Levallois technology. In addition, the way of manufacturing striking platforms, that is, one or two single blows rather than faceting, was also shared (Fig. 3). As a result, most of the tool blanks and debitage exhibit non-faceted cortical or plain butts (Fig. 2: 2): 77.2% in K22 (34/44) and 81.8% in J27 (27/33).

These technological features are quite comparable to those known for the Yabrudian industry in the Central Levant (Shifroni and Ronen 2000; Zaidner and Weinstein-Evron 2016; Parush *et al.* 2016). Apart from them, a recent study of the assemblages from Tabun Cave, Israel, has revealed a unique aspect of the Yabrudian core reduction technology (Shimelmitz *et al.* 2014). Flake blanks with naturally backed edges, either in the form of cortex, core-edge, striking platform, or even hinge-fractured edges, appear to have been produced intentionally so that the resultant backed edges served as the hand grip for tools made on those blanks. Consequently, this technology can be regarded as involving a sort of "predetermination" of the tool blank shape on the cores. Unlike the well-known predetermination technology of Levallois, for which the shape of a target blank was determined through careful core preparation, the Yabrudian predetermination was accomplished through careful selection of the percussion point on the cores.

The Dederiyeh assemblages were analyzed to see whether this technology was employed. First of all, a scar pattern analysis was performed for the cores (Fig. 3). Flake removal scars on the core working surfaces include those left at different stages of core reduction. In this analysis, the final flake scar on each working surface, which is considered likely to correspond to the negative for the removal of a target blank, was examined to see if it overflowed to a cortical surface or to an edge of the core. The ten one-working-surface and seven two-working-surface cores (Tab. 1) possess a total of 24 working surfaces. The scar pattern analysis revealed that 14 of them exhibit an overflow of the final flake removal to a cortical surface (Fig. 3: 1, 3, 5, 6, 8), and 7 to a core edge (Fig. 3: 4, 7). It leads to the conclusion that the vast majority of the supposedly target flakes detached at the final stage of the core reduction were either naturally backed or core-edge flakes (*debordant*) (87.5% or 21/24).

Second, the blank choice patterns were compared between sidescrapers, other retouched tools, and debitage. As shown in Fig. 4, the patterns are markedly different by these artifact categories. Blanks with cortex backs were significantly more favored for sidescrapers, while less so for retouched tools and debitage in this order. Sidescraper blanks without natural backs often retain hinge-fractured ends, which might have provided comparable backed ends. This result strongly supports an idea that blanks with at least one blunt edge were favored for tools, especially sidescrapers (Shimelmitz *et al.* 2014). At the same time, it should be noted that, although the proportion is comparatively low, more than half of the debitage, i.e., unretouched flakes that were not selected for tool blanks, also retain such blunt edges (52.3%; 23/44). This fact suggests that backed flakes indeed constitute target blanks. The Yabrudian tool manufacturers at Dederiyeh Cave apparently chose suitable blanks from their target blanks with backed edges, probably taking into consideration other features such as the general shape and the size (Tab. 3).

K23	Length	Width	Thickness
Debitage (n=26)	44.19 (14.683)	34.94 (11.145)	14.15 (5.778)
Tools (n=16)	53.68 (17.382)	46.344 (8.301)	18.11 (7.774)
Scrapers (n=22)	56.38 (14.163)	43.95 (10.063)	18.12 (5.824)
J27	Length	Width	Thickness
Debitage (n=19)	44.99 (20.395)	31.83 (12.194)	13.47 (8.769)
Tools (n=19)	44.84 (15.858)	38.21 (14.339)	16.13 (7.715)
Scrapers (n=5)	50.16 (21.048)	37.02 (11.020)	21.24 (7.962)

Table 3: *Blank size of Yabrudian debitage, retouched tools, and sidescrapers from K23 of Dederiyeh Cave (2005 season).*

The Dederiyeh Yabrudian in a regional context

The assemblages from the 2015 season consist of a large number of cores and retouched tools for the amount of debitage. Although this trend should be a reflection of particular activities performed in the excavated areas, it should also be related to the smaller number of flakes detached from each core. It is not uncommon that high percentages of cores and retouched tools are noted for Yabrudian assemblages (Shea 2013: 78), for example, at certain beds of Tabun (Shifroni and Ronen 2000). The high frequency of retouched tools seems related to the high success rate of production of suitable blanks for tools because of the employment of predetermination technology as noted above.

In addition, the overall characteristics of the assemblages also have a number of specific parallels in the Yabrudian of the Central Levant. In terms of the typological aspect, the predominance of sidescrapers, especially the single type, and their manufacture on thick flakes, often with Quina retouch, comprise the hallmark of the Yabrudian (Copeland 2000). Typical dejete and transverse scrapers are also present as at other Yabrudian sites. Bifaces are absent from the 2005 collection, but this is probably due to the small sample size. The other seasons' excavations show the existence of small bifaces at Dederiyeh, less than 10 cm in length, matching those from other Yabrudian sites (e.g. Gisis and Ronen 2006; Zaidner *et al.* 2006). Furthermore, the presence of sidescrapers made on bifaces is also important. It has been known in Yabrudian assemblages that the variation from bifaces to sidescrapers is quite continuous, a distinction being not always easy (Copeland 1983; Zaidner *et al.* 2016). Among the retouched tools other than sidescrapers, burins of Dederiyeh include those ascribable to "Adlun burins," which have been regarded as typical of the Acheulo-Yabrudian (Garrod and Kirkbride 1961). Their burin edges are slanted to the ventral surface of the blanks (Fig. 2: 8).

The technological features of the Dederiyeh Yabrudian also point to the affinity with the Yabrudian reported from the Central Levant. Core reduction is oriented to flake production, without traces of systematic blade production. The flake blanks are almost always detached from one or two broader working surfaces, a technology of *debitage facial*, often reported from the known Yabrudian sites (Shimelmitz *et al.* 2014; Zaidner *et al.* 2006). Core preparation is generally restricted to platform making by one or two large blows only. The use of the previous working surfaces as the platform for the second working surface was also practiced at Dederiyeh Cave. This strategy, so far reported under various terms including hierarchical core technology, has also been known at Yabrudian sites (Zaidner and Weinstein-Evron 2016). The blanks produced from these cores often retain natural backs as a consequence of intentional selection of percussion points for this purpose.

Thus, the 2005 assemblages from Dederiyeh Cave can be placed well within the variability of the known Yabrudian assemblages. Given the location at the northern end of the Levant, the Yabrudian of Dederiyeh might well bear some region-specific aspects of a northern variant of the Yabrudian. However, the geographic variations of this industry need to be discussed when more Yabrudian assemblages become available from the northern Levant. Likewise, temporal variability needs also to be defined to conduct a proper comparative study by geographic units. Available evidence for temporal changes of the Yabrudian is still limited due to the rarity of the deeply stratified sites. At Tabun Cave, the reported changes include the increase in centripetal cores, cortex flakes, and the scraper size (Shimelmitz *et al.* 2014: 22). The open-air site of Hummal, the El Kowm basin, also hinted at diachronic changes, showing that the production of thick flakes and manufacturing of sidescrapers with Quina retouch, as typical of the Yabrudian industry, became more conspicuous through time (Le Tensorer 2005). The Dederiyeh Yabrudian, deposited in about 1.5 to 2 m-thick layers, may also encompass diachronic variability. As noted above, the assemblages from K23 and J27 differ in both core types and tool composition. When radiometric dates become available for the Yabrudian layers, the Dederiyeh data will contribute to defining the Yabrudian temporal variability.

In dealing with the variability of Yabrudian, attention should be paid to the fact that Yabrudian has been regarded by many researchers as one of the functional variations of a single cultural complex called the Acheulo-Yabrudian Cultural Complex rather than representing a cultural tradition different from those of Amudian and Acheulean (Jelinek 1982; Barkai and Gopher 2011; Parush *et al.* 2016). Indeed, the variability of at least some Acheulo-Yabrudian assemblages of the Central Levant seems to show continuity between the three industries. For example, the Yabrudian assemblages from Qesem Cave have been reported to include an assemblage reminiscent of the Amudian, which contained over 20% of laminar elements (Parush *et al.* 2016: 31). On the other hand, the Yabrudian assemblages from Dederiyeh, which display intra-site variability, hardly show any elements approaching either of the other two supposedly functionally different industrial types of the Acheulo-Yabrudian Cultural Complex. Whether the Acheulo-Yabrudian set of the three industries was distributed to the northern Levant, and therefore whether the term Acheulo-Yabrudian is applicable to the Yabrudian of Dederiyeh, is an interesting issue to be investigated in the future (Le Tensorer *et al.* 2011: 244).

Conclusions

This study analyzed the late Lower Palaeolithic lithic assemblages from the 2005 season's excavations at Dederiyeh Cave. The results show that their techno-typological characteristics are wholly comparable to those of the Yabrudian known from the Central Levant, attesting to the presence of a Yabrudian industry as far as the northern end of the Levant. The stratigraphic position of the Dederiyeh Yabrudian, situated below the Early Levantine Mousterian layers containing plenty of elongated Levallois elements, indicates that the cultural occurrences took a similar path in the regions of the Levant, suggesting a cultural cohesion along the eastern Mediterranean over the late Lower to the early Middle Palaeolithic periods.

At the same time, the Yabrudian of Dederiyeh Cave provides an important dataset to explore the variability of not only Yabrudian but also the so-called Acheulo-Yabrudian Cultural Complex from a regional perspective. The significance in this context will be better understood when more late Lower Palaeolithic sites are discovered in the northern Levant, and their analyses, including those of the entire Yabrudian assemblages from Dederiyeh Cave, are completed.

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