ANTHROPOLOGIE • XLIV/1 • pp. 93–111 • 2006

NIGEL GORING-MORRIS, ANGELA DAVIDZON

STRAIGHT TO THE POINT: UPPER PALEOLITHIC AHMARIAN LITHIC TECHNOLOGY IN THE LEVANT

ABSTRACT: Several recent refitting studies of Early Upper Paleolithic Ahmarian assemblages from the arid margins of the southern Levant have enabled the systematic investigation of their distinctive technology. The reconstruction of the Ahmarian chaîne opératoire *presented herewith is based on the assemblage from Nahal Nizzana XIII in the western Negev lowlands. It seems that the method involves the use of a narrow N-fronted "row boat" core preform with a plain, acute angled platform. The primary focus of knapping was the provision of series of predetermined, distinctive pointed blade/let blanks for el-Wad points (and perforators). These blanks were produced using platform abrasion and a soft stone percussor. Secondary blanks for other tool classes mostly derive either from decortication and setting up the core preform or during core maintenance by means of core tablets, both usually with a harder hammerstone. The elegance of this integrated method to the knapping concept used at Nahal Nizzana XIII is further demonstrated by comparisons with other Ahmarian assemblages in the region. Seemingly greater variability is displayed by Ahmarian-related assemblages in the Mediterranean zone, where an opposed platform technology supplements the distinctive "N-fronted" method outlined above. Contrary to longstanding and widespread anecdotal claims, there is little evidence for systematic use of the punch technique in the Ahmarian; rather the knapping mode combined two complementary stone hammer types according to the knapping stages.*
Finally, possible antecedents for the Ahmarian are examined. It seems likely that a poorly documented intermediate phase probably separates Intermediate (MP/UP) Boker Tachtit-like assemblages from the Ahmarian.

KEY WORDS: Upper Paleolithic – Levant – Chaîne opératoire *– Ahmarian – Lithic technology – Refitting*

INTRODUCTION

Following the pioneering investigations of the local Upper Paleolithic sequence in the Mediterranean zone of the Levant research on the period remained largely static (Garrod, Bate 1937, Neuville 1934, Turville-Petre 1932). It was only from the 1970's onwards that comprehensive techno-typological studies of Late Pleistocene assemblages were initiated. Initially, this research was conducted within the framework of a series of field projects in and around the arid margins of the southern Levant (e.g. Bar-Yosef, Phillips 1977, Ferring 1980, Gilead 1981a, Marks 1976, 1977, 1983). These investigations contributed directly to the definition of the blade/let-oriented Upper Paleolithic "Ahmarian" tradition, which was characterized by such tool categories as el-Wad points, flat burins and scrapers (Gilead 1981b, Marks 1981)[1]. Since then numerous other Ahmarian occurrences have been described, again primarily from the arid periphery (e.g. Becker 1999, 2003, Belfer-Cohen, Goldberg 1982, Boëda, Muhesen 1993, Coinman 2000, 2003, Coinman, Henry 1995, Fox 2003, Fox,

[1] Throughout this paper we consistently use the term "Ahmarian" only for so-called "Early Ahmarian", while the so-called "Late Ahmarian" is referred to as the "Masraqan" (see also Goring-Morris, Belfer-Cohen 2003).

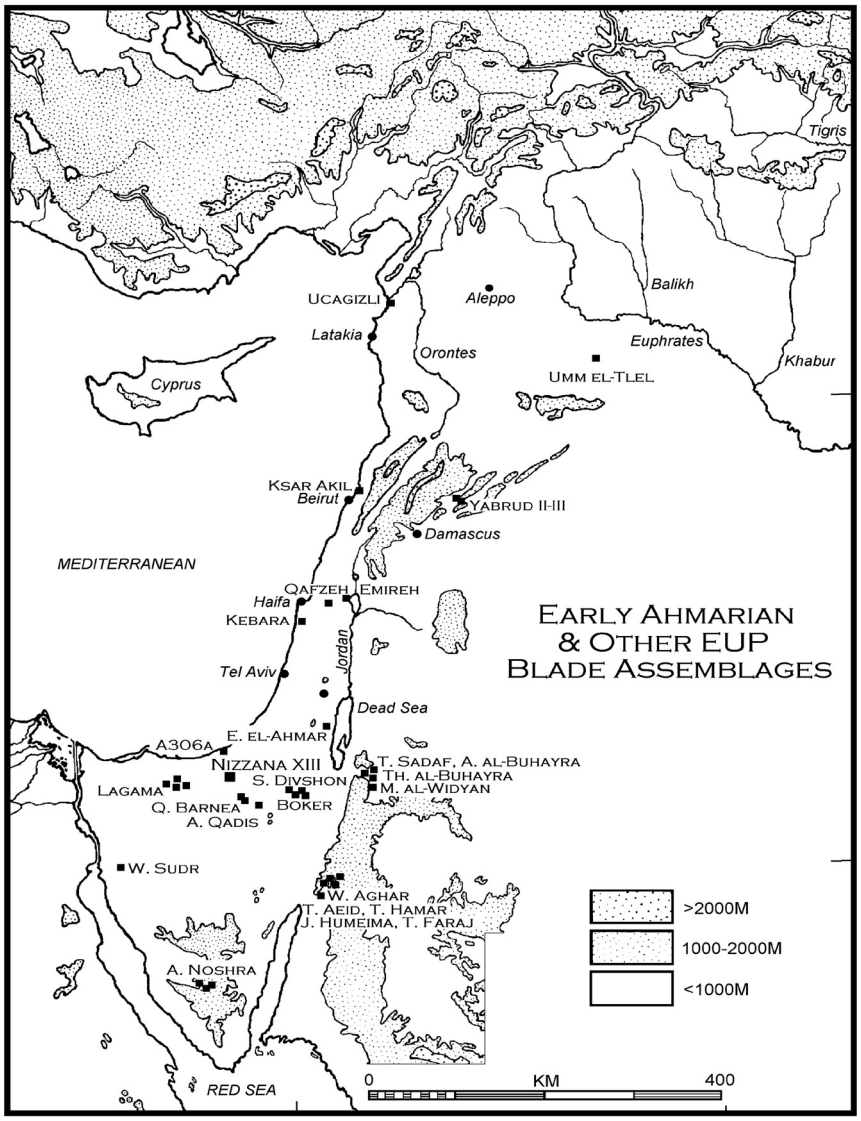

FIGURE 1. Map of the Levant showing the location of major Ahmarian sites.

Coinman 2004, Gilead, Bar-Yosef 1993, Goring-Morris 1987, 1995, Kerry 1997, Phillips 1991, 2003, Ploux 1998, Ploux, Soriano 2003, and see *Figure 1*).

The short duration and limited extent of many Late and Terminal Pleistocene occurrences in the marginal zone have rendered numbers of them as ideal candidates for detailed technological studies and the reconstruction of the *chaîne opératoire*, often but not always involving refitting studies (e.g. Volkman 1983, Ferring 1980, Becker 1999, Davidzon, Goring-Morris 2003, Gilead, Fabian 1990, Goring-Morris *et al.* 1998, Marder 2002, Monigal 2003, Phillips 1991, 2003, Škrdla 2003, Tostevin 2003). These studies have contributed to the addition of new criteria to the list of material culture attributes of the lithic assemblages, a prime input involving the method of knapping. The particular significance of this kind of study provides a dynamic "technological narrative" to lithic assemblages and enables the reconstruction of the systematic knapping practices of specific cultural groups. Another factor to be considered concerns the strong linkage between technology and culture, be it contemporary or prehistoric, and thus the existence of traditional, culturally specific sets of technological knowledge and practices (e.g. Karlin *et al.* 1992, Lemonnier 1992, 1993, Leroi-Gourhan 1943, Mauss 1936).

This paper focuses on the lithic technology of the Early Upper Paleolithic Ahmarian entity, by using as an example the extensively refitted assemblage of Nahal Nizzana XIII in order to illustrate the broader conceptual framework in which it was practised. Reconstruction of the southern Ahmarian knapping method provides new perspectives to questions concerning cultural variability and change, but not less important it also contributes to discarding some previous preconceptions concerning Upper Paleolithic technology in the Near East.

NAHAL NIZZANA XIII – AN EXAMPLE OF THE SOUTHERN AHMARIAN KNAPPING METHOD

The assemblage of Nahal Nizzana XIII (henceforth NN XIII) derives from an ephemeral Ahmarian campsite

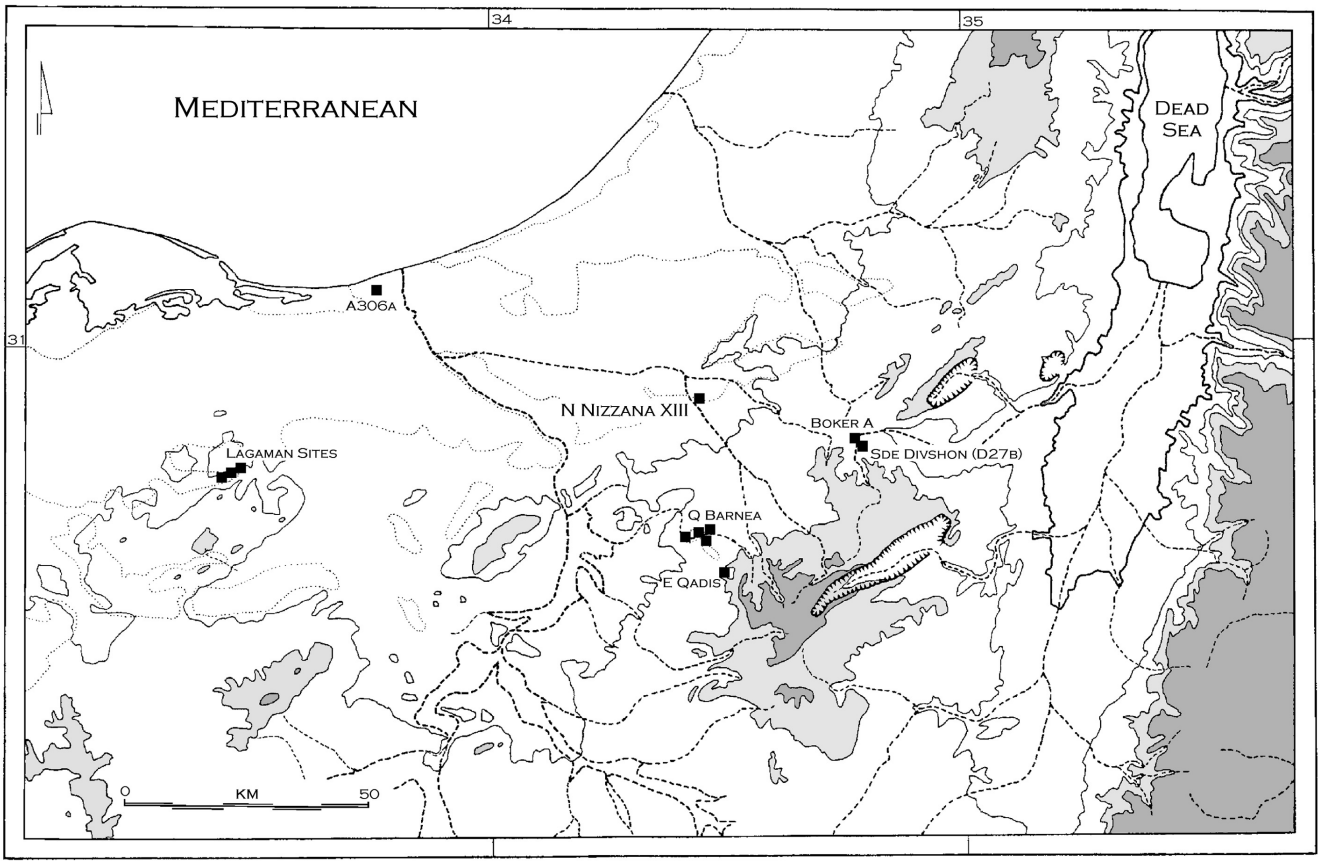

FIGURE 2. Map of the central and western Negev and northern Sinai showing the location of Nahal Nizzana XIII in relation to other Ahmarian sites.

TABLE 1. The composition and various indices of the Nahal Nizzana XIII assemblage.

Debitage	N	%
Primary elements	177	17.7
Flakes	336	33.7
Blade/lets	385	38.6
Core tablets	18	1.8
Ridge blades	35	3.5
Core trimming elements	31	3.1
Burin spalls	16	1.6
Total:	**998**	**100.0**
General category		
Cores	18	0.9
Debitage	998	52.7
Tools	40	2.1
Debris	839	44.3
Total:	1,895	100.0
Intrusive elements:	7	
Ratios:		
Tools: Core	2.2	
Debitage: Core	55.5	
Blade/lets: Flake	1.1	
Debitage: Tool	**25**	

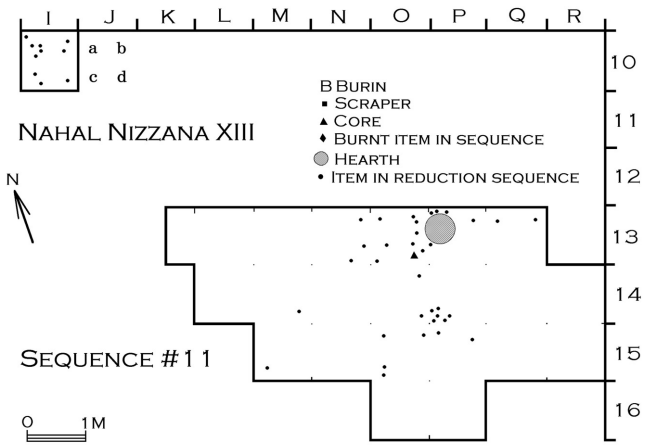

FIGURE 3. Plan of excavations Nahal Nizzana XIII, showing the locations of items belonging to reduction sequence #11.

located on a low wadi terrace in the western Negev lowlands of Israel (*Figures 1, 2*). Although partially deflated, the entire site, encompassing at most 40 m², was completely excavated (*Figure 3*), and subsequently systematically refitted (Davidzon 2002, Davidzon, Goring-Morris 2003)[2]. Although undated radiometrically, the typo-technological affinities of the lithic assemblage indicate that it is broadly contemporary with dated Ahmarian assemblages from

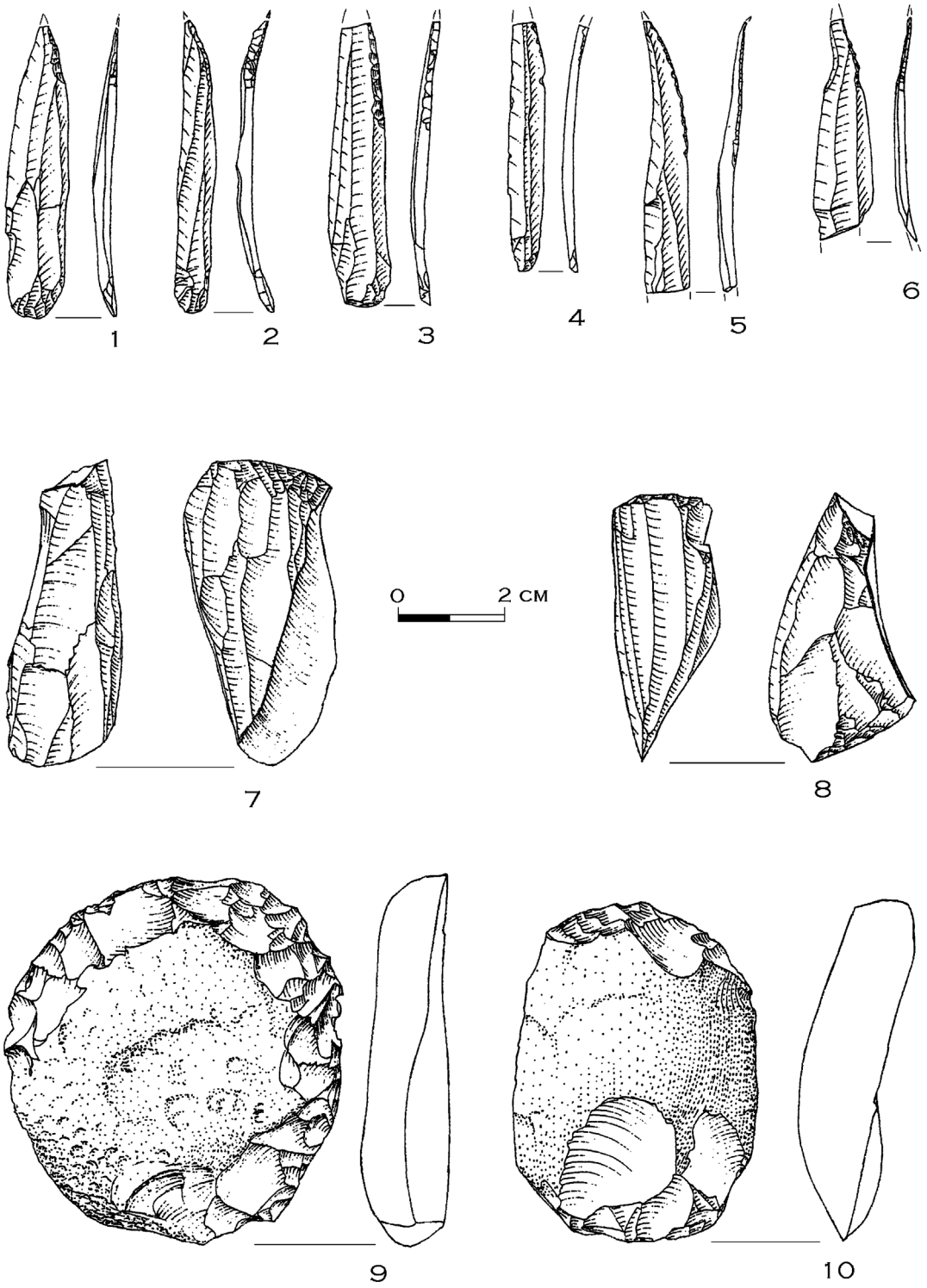

FIGURE 4. Cores and tools from Nahal Nizzana XIII: 1–6: el-Wad points and pointed blade/lets; 7–8: cores; 9–10: scrapers.

[2] Excavations at NN XIII took place in the framework of the Emergency Archaeological Survey of the Negev during the early 1980's. The refitting study described herein was conducted as part of a large-scale project directed by one of us (ANG-M) to examine technological changes in the region during the course of the Upper Paleolithic and Epipaleolithic (Davizon 2002, Davizon, Goring-Morris 2003, Goring-Moris *et al.* 1998, Marder 1994, 2002).

elsewhere in the Negev and Sinai, placing it in the range of *ca* 38,000–30,000 years ago. Numbers of burnt flints indicated the original presence of a hearth, since deflated, around which much of the knapping at the site appeared to have occurred.

The NN XIII lithic assemblage comprises 1,895 flint items (*Table 1*). The raw material consists of wadi cobbles and, less commonly, pebbles, both from the nearby

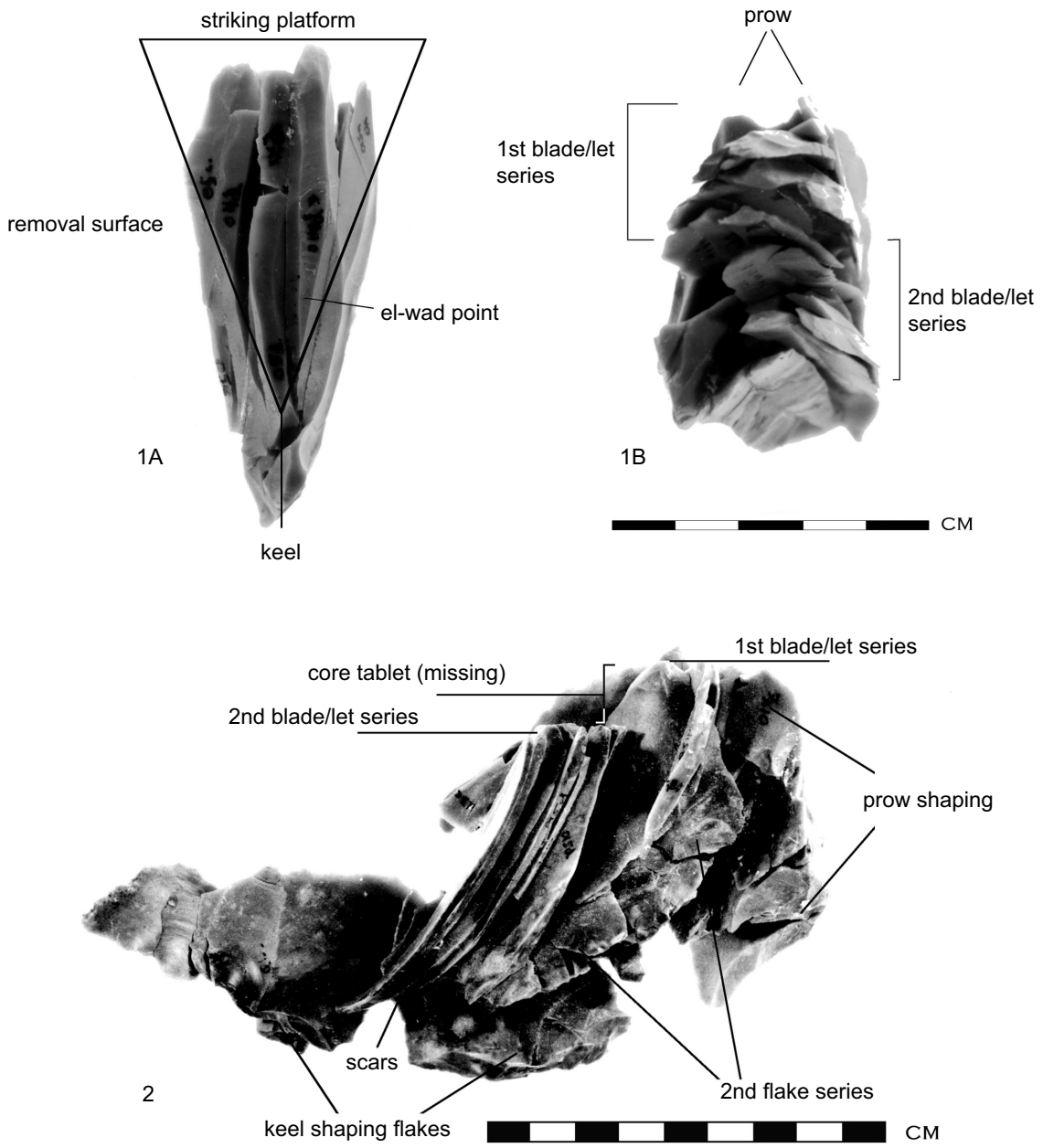

FIGURE 5. The primary, targeted blade/let blanks in the Ahmarian knapping system for el-Wad points derive from a "wedge" in the centre of the removal surface. 1: from sequence #2; 2: reduction sequence #1.

streambed. Most chosen cobbles were of high to good knapping quality. Selected nodules were usually quite thick and flat (tending to discoidal), varying from cherty flint, through finer-grained flint, to translucent chalcedony, in a range of hues and textures.

Blade/lets and flakes comprise the two dominant debitage categories, with the former very slightly outnumbering the latter (however, when taking into account primary and core trimming elements, flakes clearly outnumber blade/lets). Primary elements are relatively common, as are core-trimming elements. Amongst the ridge blades, most display lateral removals only at the distal tip. The core tablets generally tend to be "classic" in terms of removing the entire previous striking platform of the core as slices, thus having more-or-less parallel ventral and dorsal surfaces[3]. The exhausted cores are mostly blade/let types with narrow

[3] In this respect Ahmarian core tablets (not only at NN XIII – see e.g. Monigal 2003) contrast markedly with Middle and Late Epipaleolithic core tablets in the Negev, the latter commonly being far less symmetrical (see also Marder 2002).

TABLE 2. Detailed typology of the Nahal Nizzana XIII assemblage.

	Tool type	N
A1	Scraper on a flake	3
A5	Rounded scraper	1
C1	Dihedral burin	2
C3	Burin on a break	2
C3b	Burin on a natural pan	4
E1	Partially retouched blade	2
E3	Bladelet retouched on both sides	1
E4	Blade with inverse retouch	1
G2	Truncation	1
I6	Bladelet with fine retouch	4
I31	Fragment of a retouched bladelet	3
H1	el-Wad point	4
L1/2	Awl/borer	1
M1	Notch	2
M3	Denticulate	1
N5	Massive scraper	1
O1	Retouched flake	6
O4	Hammerstone	1
Total:		40

removal surfaces, and some were clearly made on flakes (*Figure 4:7, 8*). As indicated by the various ratios (*Table 1*), debris is quite profuse, while tools are relatively rare.

The small tool assemblage is dominated by retouched blade/lets, although burins and scrapers are also quite common (*Table 2*, *Figures 4, 6*). Of note are the retouched pointed blade/lets, most of which display partial, fine, non-invasive retouch that hardly alters the original configuration of the narrow, incurvate bladelet blanks. This is a characteristic feature of the Ahmarian (Gilead 1981a, 1981b, Marks 1981). The assemblage also includes a few el-Wad points (*Figures 4:1–3, 5:1*). The scraper class comprises simple, non-carinated types made on thick, mostly cortical blanks (*Figures 4:9–10, 6:1–2*). One large scraper is made on a core trimming element. The burins are also made on thick blanks, often on core tablets, though one is on a simple flake. The most common burin type is dihedral (*Figures 6:3*). Other tools recovered include retouched flakes, notches, an awl and a denticulate.

REFITTING STUDIES

Several factors contributed to the high rate of actual refits (*ca* 50%) at NN XIII: the excavation encompassed virtually the entire site and the assemblage is quite small. A wide range of raw material types in terms of textures and colours were present. Also significant was the highly uniform, patterned approach of the knappers towards initial roughing out and pre-forming cores, as well as to subsequent targeted blank production. Thus, as refitting progressed it was possible to predict where specific items should be located within specific knapping sequences. In consequence, even when two separate sequences were composed of similar raw materials, it was often possible to distinguish between them on the basis of the particular location of aggregates or of specific items within individual knapping sequences.[4]

Following the actual process of refitting the assemblage, the individual aggregates, together with the non-refitted items that belonged to the same raw material category were grouped in order to describe individual knapping sequences. Thus, for each such sequence, the refitted items could be classified according to their locations within the knapping sequence. Each distinct raw material group was treated as a separate sequence (provided that at least some knapping stages of the item's life history could be reconstructed). Some sequences comprised well over 100 items, while others involved only a single core preform, lacking any refits. Sometimes entire reduction sequences had taken place on-site. However, more often than not, it became obvious that only certain segments of the individual knapping sequences had taken place on-site, while other parts clearly had occurred elsewhere.

Within the total flint assemblage, 813 items (accounting for 77% of the assemblage, excluding debris), could be identified and attributed with a high level of certainty to raw material groups, and assigned to specific reduction stages. Of these, some 521 items (49% of the assemblage) could be [physically] conjoined (*Table 3*).

Ultimately the lithic assemblage was divided into 21 distinct reduction sequences. These include refitted sequences, together with the additional raw materials that belong to them but which could not be physically conjoined. Also included are four cores to which no actual refits or other items could be assigned. The numbers of items for specific raw material sequences vary from 1 to 172. The four most prolific sequences represent complete or almost complete wadi cobbles that were introduced and intensively knapped on-site. Together, these four sequences account for 45% of the total items in the assemblage excluding debris.

Tables 4, 5 and *6* compare the frequencies of groups of items in the entire assemblage to those within the reconstructed sequences. Few categories show significant differences between the distributions, so it seems that the refitted sequences do reliably represent the assemblage. The most notable difference relates to the tools, the numbers of which are smaller within the sequences than in the assemblage as a whole. We believe the most parsimonious explanation is that numbers of tools produced elsewhere were introduced individually to Nahal Nizzana XIII and subsequently abandoned on-site; concurrently many (if

[4] An "aggregate" comprises any group of reffited items within a reduction sequence that cannot physically be conjoined back onto a core. For this and further definitions of the terminology employed see also Davizon, Goring-Moris 2003, Marder 2002.

TABLE 3. Typo-technological division of items belonging to the individual reduction sequences at Nahal Nizzana XIII. The reduction sequences listed include physically refitted aggregates as well as items that clearly belong to those sequences on the basis of raw material and other attributes ("near refits"). Also included are four cores with no conjoins that nevertheless contribute to understanding the knapping patterns.

Sequence	Primary elements	Flakes	Blade/lets	CTE	Core tablets	Ridge blades	Burin spalls	Chunks	Cores	Tools	Total	Conjoins[1]
1	32	53	38	2	1	3	–	5	1	2	137	95
2	11	19	35	2	–	3	–	–	–	1	71	53
3	4	23	7	2	–	–	–	3	–	–	39	18
4	–	–	–	–	–	–	4	–	1	3	8	8
5	31	65	56	6	1	2	1	8	1	1	172	138
6	14	36	13	4	–	–	–	2	1	2	72	54
7	32	28	29	–	4	1	2	–	–	3	99	61
8	1	16	19	–	3	6	–	–	1	2	48	17
9	–	–	–	1	–	–	–	–	1	–	2	2
10	–	1	–	–	–	–	–	–	1	–	2	2
11	15	11	1	1	1	1	–	–	1	–	31	23
12	7	8	9	2	2	–	–	–	–	–	28	6
13+14[2]	–	7	52	6	2	2	–	–	2	3	74	21
15	3	7	–	–	2	–	–	–	–	–	12	11
16	–	–	–	–	–	–	–	–	1	–	1	–
17	–	4	2	–	–	–	–	–	1	–	7	5
18	–	–	–	–	–	–	–	–	1	–	1	–
19	–	2	4	–	–	1	–	–	–	–	7	7
20	–	–	–	–	–	–	–	–	1	–	1	–
21	–	–	–	–	–	–	–	–	1	–	1	–
Total	150	280	265	26	16	19	7	18	15	17	813	521

[1] The total number of actual physical conjoins in each reduction sequence.

[2] The raw material of these two sequences could not be separated (see detailed explanation in the text).

TABLE 4. Comparisons between categories in the assemblage and in the sequences at Nahal Nizzana XIII (excluding debris).

	Absolute counts in assemblage	% in total assemblage	Absolute counts in sequences	% in sequences
Cores	18	1.7	15	1.9
Debitage	998	94.5	763	96.0
Tools	40	3.8	17	2.1
Total:	1,056	100.0	795	100.0

TABLE 5. Comparisons of the frequencies of categories in the sequences and in the total assemblage at Nahal Nizzana XIII (excluding debris).

	Absolute counts in total assemblage	% of total assemblage	Absolute counts in separated sequences	% of separated sequences
Cores	18	1.7	15	1.9
Primary elements	177	16.8	150	18.9
Flakes	336	31.8	280	35.2
Blade/lets	385	36.5	265	33.3
Core tablets	18	1.7	16	2.0
Ridge blades	35	3.3	19	2.4
CTE	31	2.9	26	3.3
Burin spalls	16	1.5	7	0.9
Tools	40	3.8	17	2.1
Total:	1,056	100.0	795	100.0

TABLE 6. Various technological indices and ratios at Nahal Nizzana XIII.

	Complete assemblage	Refitted and assigned sequences
Tools: Core	2.2	1.1
Debitage: Core	55.5	50.1
Blade/lets: Flake	1.1	1.1
Debitage: Tool	25	45

not the vast majority) of the tools and targeted tool blanks deriving from the locally knapped sequences were exported from the site.

Detailed technological study of the refitted assemblage indicates that all knapping sequences were primarily focused upon the production of thin, elongate symmetrical and convergent blade/let blanks, especially suitable for modification into el-Wad points (Davidzon, Goring-Morris 2003). The method of knapping was predicated upon the predetermined shape of these targeted blanks. This observation is reinforced by the fact that the other tool classes present in the assemblage were made on blanks deriving from either the initial roughing out of the core preform, or from subsequent maintenance operations, e.g. core tablets, of knapping sequences oriented towards the production of the targeted items.

Systematic analysis of the knapping sequences enabled reconstruction of the complementary aspects of knapping: in other words, the "conceptual *scheme*", as well as its "practical application". Our analysis thus advanced from specific examinations of individual *chaînes opératoires* to the general concept common to all knapping practices on-site.

Five specific modes of setting up the raw material for long sequences of blade/let production were observed at Nahal Nizzana XIII (*Figure 7*). Four used wadi cobbles and pebbles and the fifth, a large flake (*Figures 4:7–8; 10*). Nevertheless, it should be stressed that these all ultimately reflect pragmatic variations on a *single* conceptual theme.

Thus, in each instance, the shortest axis of the raw material was designated to become the narrow targeted blade/let blank removal surface; while the two parallel, longer axes were respectively turned into the striking platform and the lower keel, i.e. the base of the future core (*Figure 8*). This second decision of the knappers (the first being the choice of the appropriate raw material) was preferentially held constant through the entire sequence, i.e. there were no changes in the orientation of the core, unless specific circumstances dictated otherwise[5]. This indicates the preference for somewhat shorter targeted blanks (but

[5] *Figure 6:1* illustrates an initial unsuccessful attempt to adhere to the concept due to hinging, which was then followed by re-orientation of the designated surfaces.

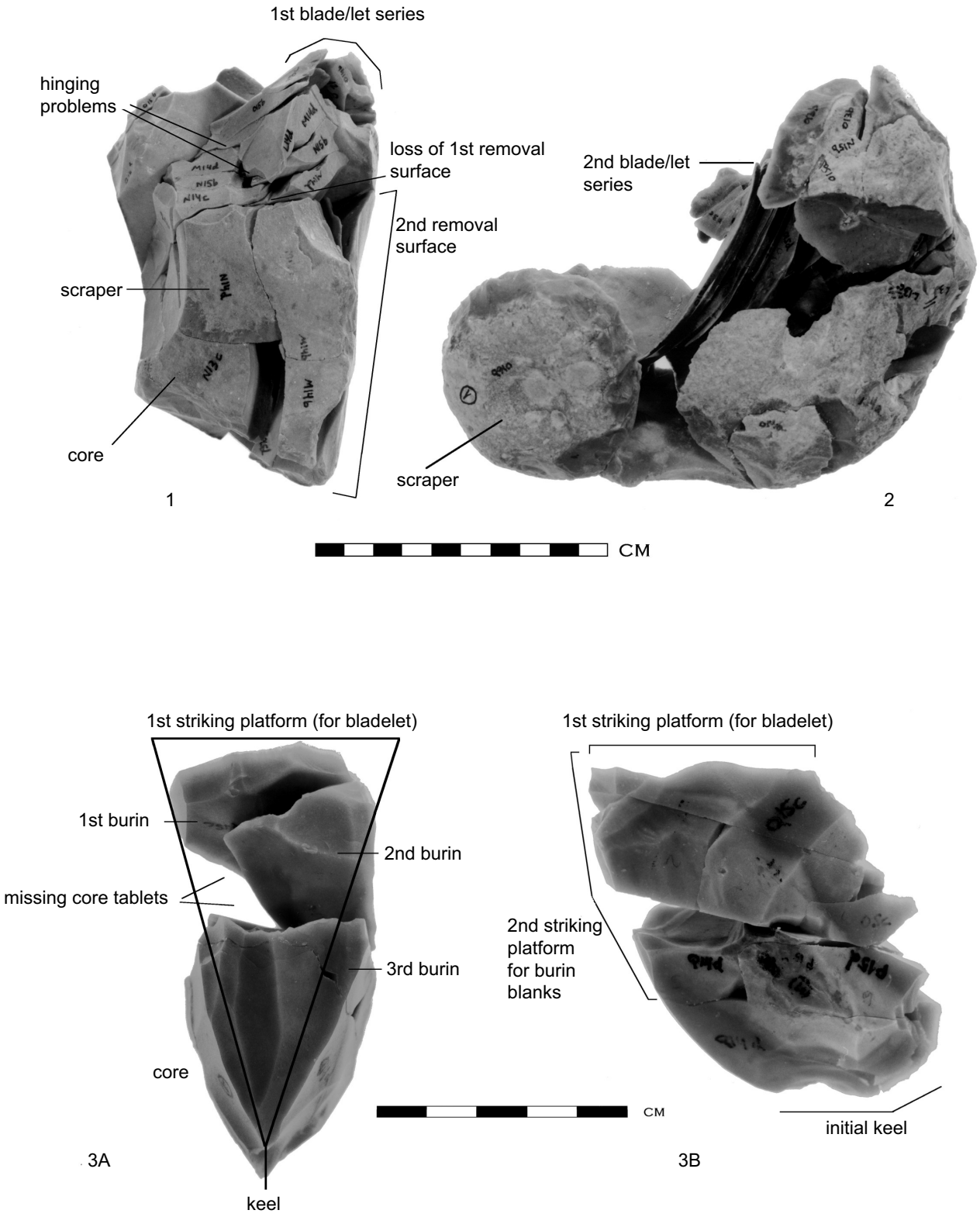

FIGURE 6. The location of secondary blanks for other tool classes within the reduction sequence: 1–2: scrapers are made on blanks deriving from the preparation stage; and 3: burins are made on blanks deriving from core maintenance (core tablets). Note different scales.

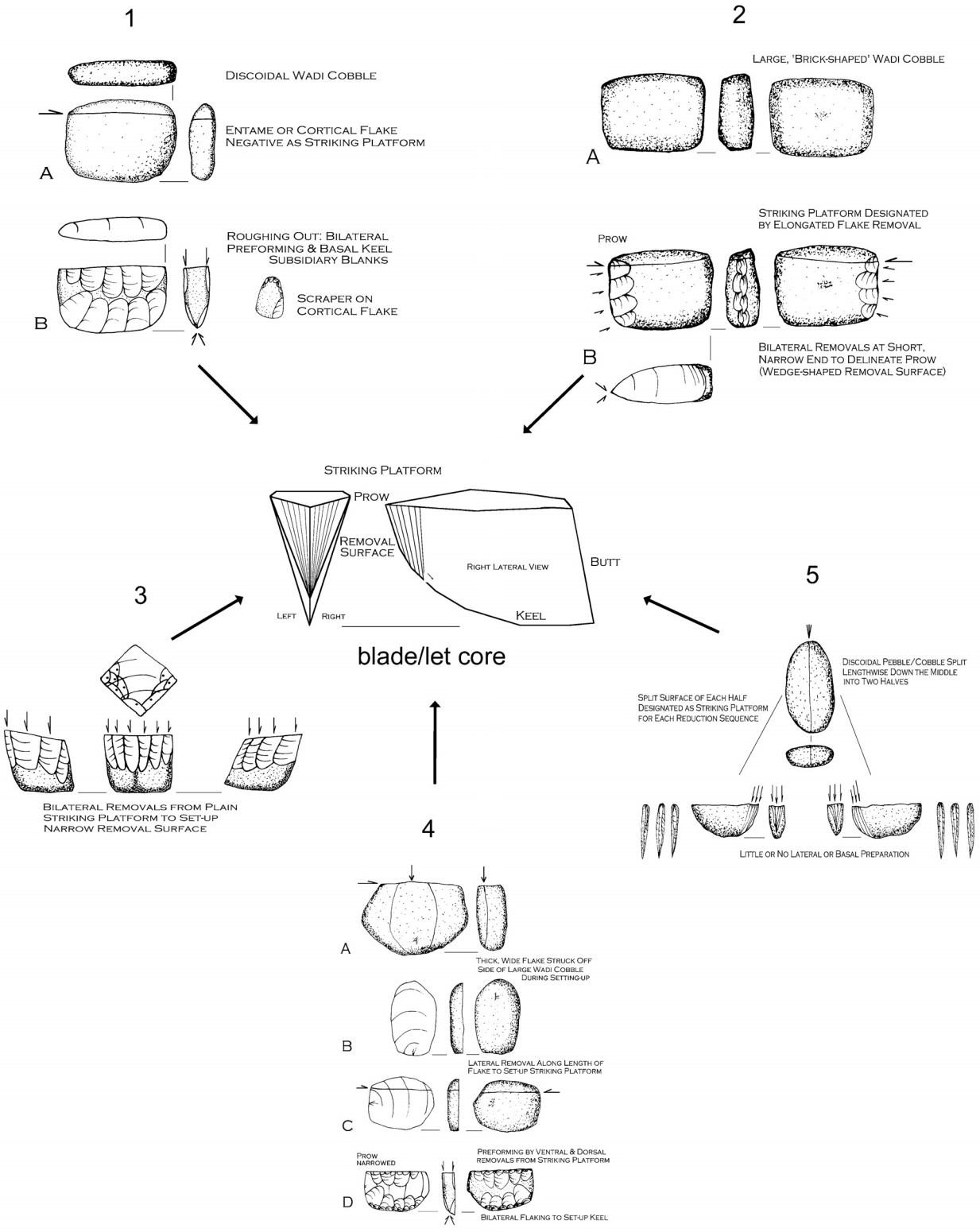

FIGURE 7. The methods of raw material preparation at Nahal Nizzana XIII: 1: general roughing out of a wadi cobble; 2: minimal preparation of a wadi cobble; 3: lateral roughing out; 4: preparation of a large flake; 5: longitudinal splitting of a pebble or cobble.

more of them) than could theoretically have been produced from the same raw material.

Preforms were set-up by various combinations of careful choice of appropriately shaped nodules, general three-dimensional roughing out, simple lateral preparation, or longitudinal splitting (*Figure 7*). In so doing, an elongated striking platform was achieved by the removal of a large, long cortical (or ridge) flake or blade from one of the longer sides of the raw material. Depending upon the shape of the raw material the lateral sides of the core were narrowed and a lower, basal keel was shaped (*Figure 8*). The frontal prow was the last area to be prepared, through bi-directional removals, again according to necessity. In its final configuration the core preform thus resembled a rowboat, with a flat upper "deck" (= striking platform), a lower "keel" (= base of the core) and a wedge-shaped frontal "prow" (= removal surface), while the "stern" (= back) was often flat. Removal angles thus tended to be acute. The resulting characteristic Ahmarian configuration is thus an elongated narrow or "N-fronted" core preform with a short removal surface. In this it contrasts in orientation with the classic *short-platformed, elongated removal surface* prismatic blade core, i.e. "*débitage de lames sur nucléus à crête*" (see Tixier *et al*. 1980: Fig. 26). This latter form has commonly been viewed as the "typical" Upper Paleolithic type blade core, but in reality it is characteristic of late Upper Paleolithic industries in western Europe.

The symmetrical wedge-shaped frontal removal surface was maintained throughout the sequence by alternating blade/let removals from around either side of the front (prow) of the striking platform (*Figures 5: 1B, 9, 10*). Systematic abrasion on the edge of the removal surface preceded the removal of each blade/let. The desired configuration was retained by narrowing the sides of the core with lateral *débordante* blade or flake removals and, where necessary, reconfiguring the basal keel of the core. The acute angle of the striking platform was rejuvenated by the removal of classic core tablets detached from the front of the removal surface (*Figures 8, 9,* and *10*). Targeted blade/lets tended to display straight but slightly incurvate profiles (*Figure 4:1–6*).

Based on the correlation between the morphologies of striking platforms and the bulbs of percussion on the debitage, as well as Newcomer's (1975) cautionary remarks, and discussions with accomplished experimental knappers, it is probable that two types of hammerstone were systematically used in tandem. A hard (and probably heavier) stone hammer was thus employed for the initial preparation of the raw material, and for such later core maintenance operations as the removal of core tablets (*Figure 6: 3*). This is reflected by: the absence of any special preparation prior to application of the removal blow; the use of relatively thick striking platforms; the specific location of the blow in some distance from the striking platform edge; the presence of a protruding bulb of percussion; and the occasional evidence for the impact of more than one relatively powerful blow having been applied in order to accomplish the specific removal (e.g. see Davidzon, Goring-Morris 2003: Fig. 39). A softer hammer (but still of stone) was applied for blade/let blank production. These targeted blade/lets exhibit: meticulous preparatory blunting and micro-chipping of the removal surface prior to detachment; very narrow striking platforms; and the application of a notably marginal, relatively light blow for the actual removal. Notwithstanding the presence of lipping on numbers of the targeted blade/let blanks[6], we disagree with long entrenched anecdotal assertions to the effect that in the Near Eastern Upper Paleolithic knappers made habitual use of either indirect percussion punch technique and/or a soft, organic percussor to produce the targeted blade/let blanks (see for example Garrod 1951, 1954, Marks, Volkman 1987, Phillips 1994, Pelegrin 2000 amongst others). There may also be sporadic examples of the use of a punch, albeit only for corrective measures to remove hinges on the core.

The high proportion of refitted items and the additional division into raw material groups enabled us to evaluate the nature and degree to which lithic material at Nahal Nizzana XIII had been imported and exported (*Tables 4, 5* and *6*). The imports included mainly tested wadi cobbles, large flakes that were to be used as cores, and previously used or prepared cores and preforms, as well as some larger curated tools. By contrast, exports comprised mainly the highest quality blade/let blanks produced on-site, as well as prepared (but still unexhausted) cores. Virtually all serviceable blade/let blanks had been removed from the site, only those that had seemingly broken during initial knapping or retouching being discarded. All the above indicates that a major focus of activities on-site involved gearing-up for hunting and, perhaps, some butchery[7].

STABILITY OF THE AHMARIAN KNAPPING "CONCEPT"

The above observations at Nahal Nizzana XIII as characteristic of Ahmarian technology are supplemented by other recent refitting studies, such as those conducted at Boker A and Abu Noshra I and VI (Becker 1999, 2003, Monigal 2003, Phillips 1991)[8]. In addition there are numbers of other systematically studied Ahmarian assemblages elsewhere in the Negev (Sde Divshon, Boker), Sinai (Lagama, Qadesh Barnea, Ein Qadis) and southern Transjordan (Tor Sadaf II, EHLPP 1, Ain al-Buhayra, Jebel Humeima, Tor Aeid) (Bar-Yosef, Belfer 1977, Coinman 2003, Ferring 1976, 1980, 1988, Fox 2000, 2003, Gilead

[6] Punctiform, crushed and linear platforms are also present.

[7] Although a pilot use-wear study was attemped at NN XIII, only a single scraper displayed use-wear other than post-depositional. This was consistent with scraping dry hide (Becker, nd.).

[8] The refitted assemblages of Abu Noshra I–II and Boker A are similar in size and scope to that of Nahal Nizzana XIII.

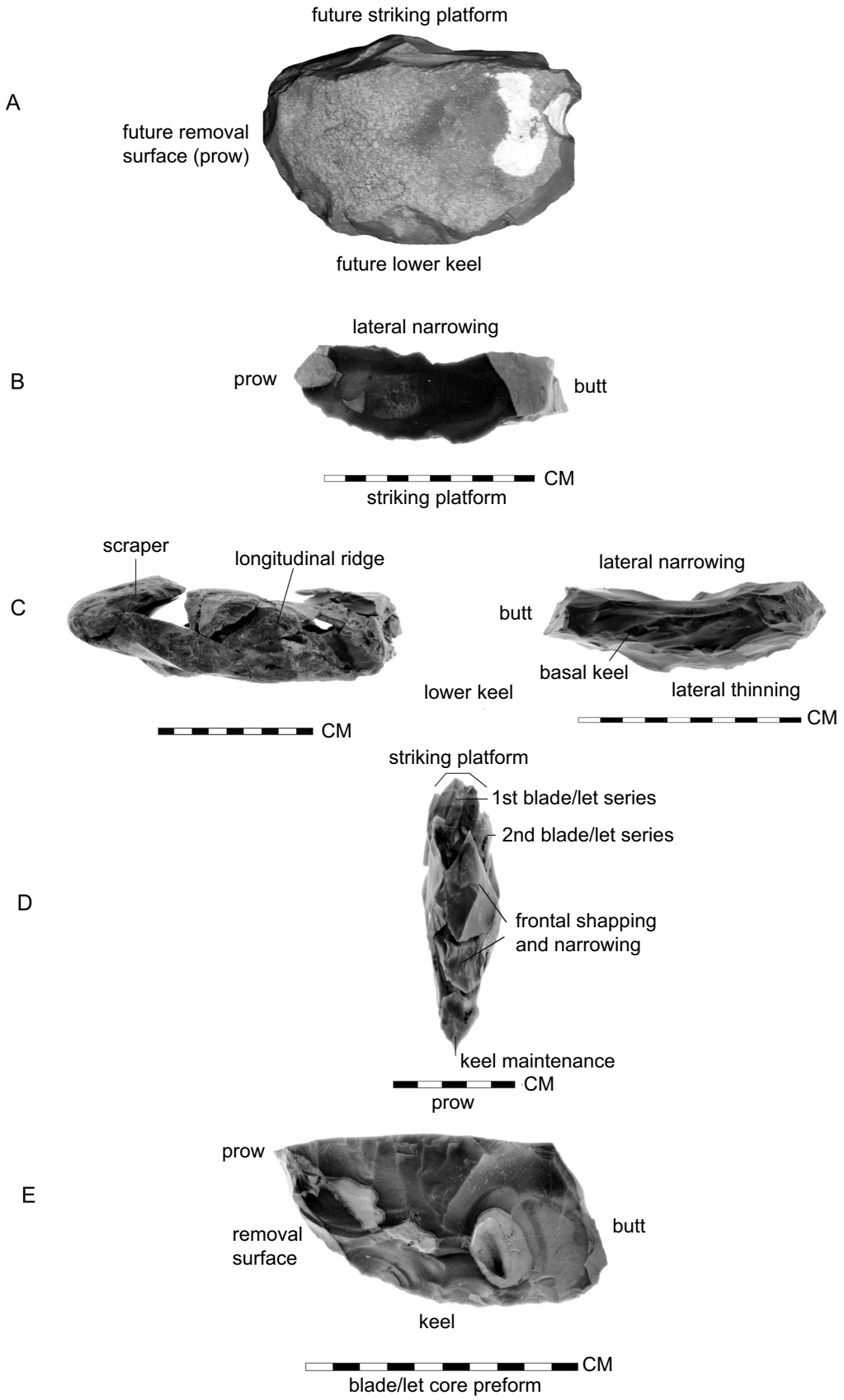

FIGURE 8. Preparation of a core preform by general roughing out (i.e. method 1), for targeted blade/let production: A: choice of a discoidal cobble of good to high quality (it was collected in the nearby channel of Nahal Nizzana); B: preparation of the striking platform; C: preparation of the lower keel; D: preparation of the removal surface (the prow); E: the blade/let core preform.

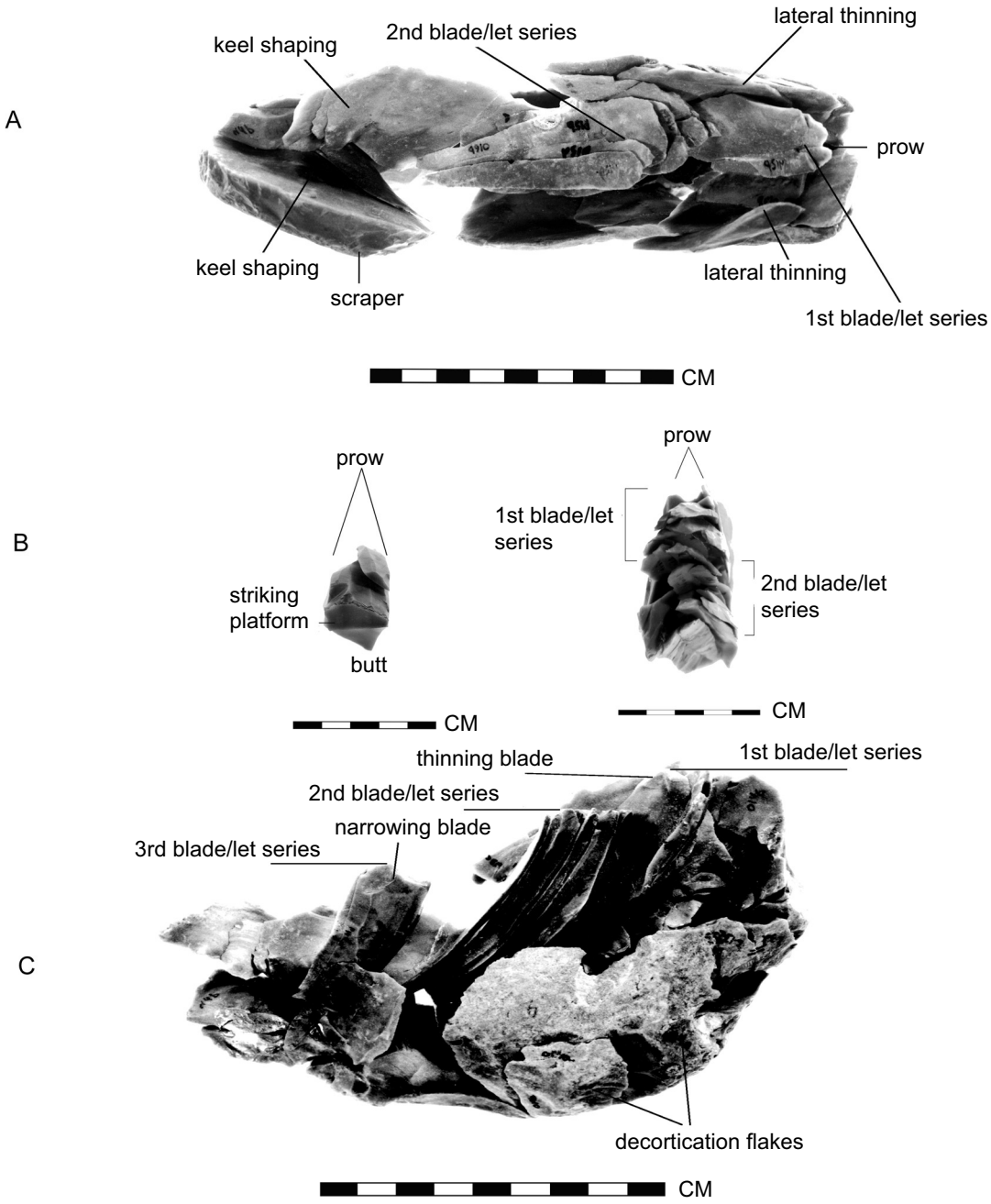

FIGURE 9. Blade/let production and maintenance: A: blade/lets are produced from a single narrow striking platform; B: maintenance operations are aimed towards retaining the narrow removal surface; C: maintenance operations include: core tablet renewals and thinning by lateral removal of flakes and *débordante* blades.

1981a, Gilead, Bar-Yosef 1993, Goring-Morris 1995, Kerry 1997, Williams 1997).

Comparisons indicate close typo-technological similarities between most southern Ahmarian assemblages with regard to the general knapping conceptual *scheme* (Davidzon, Goring-Morris 2003: 188–191). Such minor technological variability as can be discerned may be ascribed to combinations of raw material availabilities (especially the size and shape of nodules), chronological factors, functional issues, regional idiosyncrasies, as well as the quirks and abilities of individual knappers. For instance, one of the less used modes of preparing a cobble for blade/let production at NN XIII appears to be the dominant one at the site of Boker A, whereby lateral shaping and cortical peeling is interwoven with targeted blade/let removals (Monigal 2003). This seemingly ties in with the use of the particularly thin nodules exploited at Boker A.

Another example of minor variations within the general southern Ahmarian *scheme* concerns the location of subsidiary blanks within the reduction sequence. As described above the primary targets of virtually all southern Ahmarian knapping sequences were blanks for

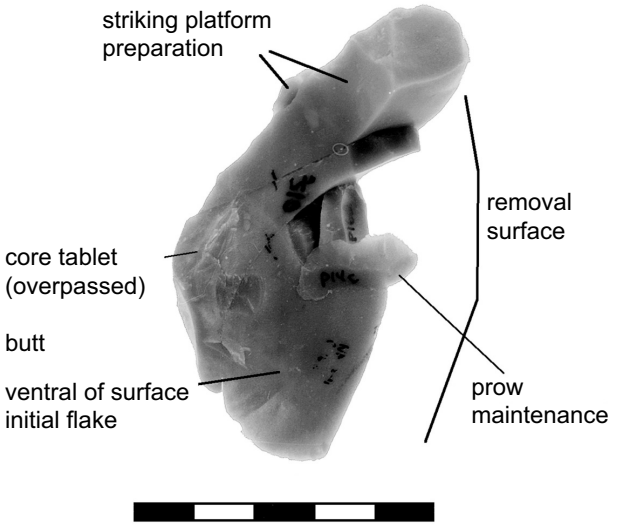

FIGURE 10. A core-on-flake (Sequence #13). The ventral surface of the original flake is shown and the removal surface located at the distal end, while the striking platform was located on the lateral edge of the original flake. A core tablet renewed the striking platform, but the 2nd bladelet series was unsuccessful due to hinging.

el-Wad points and related pointed blade/lets.[9] Other tool classes were fashioned on (subsidiary) blanks originating either during roughing out (preforming) or during core maintenance. This integrated pattern of primary and secondary targeted blanks is clearly displayed by all other reported southern Ahmarian assemblages. Still, for example, at Abu Noshra scrapers seem to have been fashioned mostly on maintenance blades (Phillips 1991), whereas at NN XIII refitted scraper blanks were cortical, deriving exclusively from initial core preparation.

THE AHMARIAN IN THE MEDITERRANEAN ZONE

While investigations of the Levantine Upper Paleolithic in the Mediterranean zone much preceded studies in the more arid margins, our comprehension of the sequence and characteristics of the recovered industries in the former region remains complex and problematic. This derives in large part from a combination of problems in early recovery techniques from caves and rockshelters, the taphonomic integrity of occupation horizons in long stratified sequences, as well as inconsistencies and differences in the criteria for labelling assemblages (see Belfer-Cohen, Goring-Morris 2003, and references therein). Refitting studies in such settings are simply not a viable option. Additionally, a wider array of activities was likely practised habitually within such Mediterranean, as opposed to steppic settings. Accordingly, while excavations of Ahmarian-related layers have been renewed in some sites, e.g. Kebara (Bar-Yosef *et al.* 1992, 1996), old assemblages were restudied, e.g. Qafzeh and Ksar Akil (Bar-Yosef, Belfer-Cohen 2004, Bergman 1987, Ohnuma, Bergman 1990), and new sites were excavated, e.g. Üçağizlı (Kuhn *et al.* 2003), our knowledge of the Ahmarian in the north often still lacks the degree of resolution available further south.

Nevertheless a technologically distinct feature does seem to occur consistently in several northern Ahmarian assemblages, which are almost completely absent in the south. This involves the use of an opposed platform blade/let knapping technology which, of course, is in addition to the "normative" Ahmarian single platform "N-fronted" reduction sequence described above. Opposed platform cores are reported from Ahmarian layers at Üçağizlı B, B1–4 and C (Kuhn 2004, Kuhn *et al.* 2003), Ksar Akil XV–XX (Azoury 1986, Bergman 1987, 1988, Bergman, Stringer 1989, Ohnuma, Bergman 1990), Yabrud II (Rust 1950, Bachdach 1982), Kebara III–IV (Belfer-Cohen, Bar-Yosef 2006), and Qafzeh D–E (Bar-Yosef, Belfer-Cohen 2004).[10]

This additional use of a bi-directional knapping method in northern Ahmarian assemblages may be significant for two reasons (and see Davidzon, Goring-Morris in press). Firstly, the longer axis of the nodule was used as the removal surface, in contrast to the southern Ahmarian, which uses only the shorter axis as the removal surface. Secondly, blade/let blanks deriving from this opposed platform method of knapping tentatively appear to be somewhat straighter in longitudinal profile than those deriving from the above-described single platform 'N-fronted' cores of the southern Ahmarian. It is perhaps of interest to note that many such targeted blanks in the Mediterranean zone appear to be relatively robust. Nevertheless, the opposed platform method was used for the production of blade-oriented assemblages, comprising a broadly similar range of tool types, including el-Wad points, as occur in the southern Ahmarian (although the proportions of such tool classes were likely to vary inter-regionally). In part, of course, this regional variability may also reflect attempts to extract the maximum relative length blanks from the available raw materials in the north. But then again, perhaps the difference in the production method that resulted in different blanks is the reason for the methodological confusion surrounding the issue of el-Wad points, which were defined, redefined, and still pose a problem that some researchers tend to overcome by simply "ignoring" this tool type altogether (e.g. Phillips 1991, Phillips, Saca 2003) or, alternatively, by simply lumping all pointed forms together.[11] Thus the blanks for el-Wad points, as defined by some researchers

[9] Becker (2003) reports that use-wear studies of targeted pointed blade/lets at Abu Noshra indicate that they were often used as perforators, though it is unclear to what extent this represents a local phenomenon.

[10] A few cores at NN XIII initially appeared to represent opposed platform types, but detailed observations indicated that they were actually unidirectional (albeit with basal maintenance removals). A similar phenomenon was also noted in many Middle Epipaleolithic assemblages in the Negev (Marder 2002).

(e.g. Copeland 1970, Copeland, Hours 1971, Garrod, Bate 1937, Neuville 1951), range from slender curved, to straight robust, and on to twisted variants. Consequently the range of variability of el-Wad points in terms of size, shape and profile, as well as the location and nature of subsequent modification is considerable (see summaries in, e.g. Bar-Yosef, Belfer 1977, Bergman 2003).

Still, as noted above, there is a tight linkage between general el-Wad point morphology and the distinctive 'N-fronted', single platform knapping method in the marginal zone. This can thus be considered as a case of predetermination. Indeed, it is even akin, at least in broad conceptual terms, to the *recurrent* Levallois method, even if the actual techniques applied to achieve this goal differed significantly (see Belfer-Cohen, Goring-Morris *in press*).

In summary, while systematic technological study of the northern Ahmarian is still wanting, it does seem, even in the current state of research, to differ in some technological parameters from the southern facies of the Ahmarian.

THE ORIGINS OF THE AHMARIAN

There is a broad-based perception that the Early Upper Paleolithic in the Levant evolved locally, perhaps in a dendritic manner. Thus, in the north we find the transition represented by a so-called "*Moustérien tardif*" at Umm el-Tlel, the "Initial" Upper Paleolithic of Üçağizlı, and levels XXV–XXI at Ksar Akil with its distinctive chamfered items, while in the south Boker Tachtit and similar assemblages are characterized by Emireh points (Azoury 1986, Bourguignon 1996, 1998, Copeland 2001, Kuhn *et al*. 2003, Marks, Kaufman 1983, Marks, Volkman 1987, Ohnuma, Bergman 1990). Some scholars group most or all of the above under the rubric of the "Emiran" (e.g. Bar-Yosef 2000, 2002). But it is only with the appearance of the subsequent Ahmarian, which is widely reputed to have evolved locally directly from this background, that we have what constitutes the first veritable Upper Paleolithic entity in terms of both technology and typology. Various contentious issues remain to be evaluated, not least of which is whether an intermediate stage may be missing at least in some areas (see also Marks 1981: 346).

There are several significant points of reference to consider when examining the option of local *in situ* techno-typological developments from the Middle Paleolithic to the Upper Paleolithic in the southern Levant. There is indeed a widespread consensus in support of local continuity from "Transitional" Boker Tachtit to "Early" Ahmarian (e.g. Bar-Yosef, Kuhn 1999, Copeland 2003, Marks 2003, Škrdla 2003). Indeed there is a common tendency to directly compare the later part of the Boker Tachtit sequence level 4 (Marks, Kaufman 1983, Marks, Volkman 1987, Volkman 1983) and Tor Sadaf III–IV (Fox 2003) as part of a virtually "seamless" development into such classic Ahmarian assemblages as Boker A (Jones *et al*. 1983, Monigal 2003) and Tor Sadaf II (Fox 2003). Such an approach tends to minimize the techno-typological differences, between a loosely Levallois-associated technology and an apparent "classic" Upper Paleolithic blade technology.

Researchers are in general agreement that the Boker Tachtit sequence is characterized by a broadly Upper Paleolithic typological repertoire (save the "Levallois" *sensu lato* and Emireh points), and by ongoing technological developments through the course of the sequence. Thus by level 2 in Boker Tachtit a largely blade-oriented technology from single platform cores is already in place and, in that platform faceting occurs, it approximates core tablet reduction, albeit still not of the "classic" Ahmarian kind (Marks, Volkman 1987: 16). It seems that such platform faceting continues the earlier, Middle Paleolithic "prepared-platform" mindset, prior to removal of the targeted blanks. By level 4 at least three distinct methods of core reduction were employed, one of which closely paralleled that described for the Ahmarian of Boker A (Jones *et al*. 1983, Ferring 1988, Monigal 2001, 2003, Volkman 1983: Fig. 6–32). This involved the "setting up" of the core preform using the narrow side of the nodule. However, at Boker Tachtit 4 the shortest side of the raw material was not habitually chosen as the future removal surface, as was the case for the southern Ahmarian. In addition, the fact that the knappers at Boker Tachtit 4 were not looking for longer sequences of shorter items, as in the Ahmarian, is strengthened by their choice of raw materials. Contrary to the Ahmarian of Boker A, located a mere 100 m away, whose knappers chose flat and keeled nodules (Monigal 2003), the knappers of Boker Tachtit 4, out of the same range of raw materials chose more variably shaped, sometimes globular cobbles. Nevertheless, although it is evident that the knappers preferred shorter sequences of longer targeted blanks at Boker Tachtit 4, this was still within the general conceptual framework of producing a series of elongate, convergent targeted blanks by a *recurrent* technique, thus broadly presaging the Ahmarian *scheme*. Indeed, by Boker Tachtit level 4 the Emireh point had completely disappeared and the only points present are variants that are morphologically Levallois in appearance, but, which Marks and others emphasize, derive from a series of blade removals (Marks, Volkman 1987, Marks, Kaufman 1983, Škrdla 2003).[12] These convergent points

[11] In this paper we refer to el-Wad points *sensu lato*, and include such types variously defined by others as "*pointe à face plan*", "Ksar Akil point", "pointed retouched bladelet", and even perforator, etc. We thus believe that the "el-Wad point" should represent a broad-based morphotype.

[12] We would venture that to the actual knappers of Boker Tachtit what was significant was less the semantics of whether the items they were producing were or were not immediately predetermined and hence "Levallois" in nature, but rather their ability to efficiently produce elongate, symmetrical convergent pointed items with relatively thin, easily haftable butts.

still had rather chunky bulbar bases deriving from faceting (rather than proper core tablets) produced by a hard stone percussor, characteristic of the Middle Paleolithic. This, of course, contrasts with the combination of a hard and softer (but still stone) percussor and abrasion of the core's removal surface characteristic of the Ahmarian, which enabled a more marginal blow to produce items with thinner, more easily hafted butts (see also Belfer-Cohen, Goring-Morris in press).

Indeed, micro-flaking of the removal surface (representing another technological solution for achieving thinner butts) is present on some items from Boker Tachtit and also at Umm el-Tlel (Boëda, Bonilauri 2006, Bourguignon 1996, 1998, Volkman 1983: Fig. 6–24). Of course, similar micro-flaking also occurs on Emireh points – while the inverse thinning retouch definitely occurs following detachment of the blank, the obverse removals may sometimes have been removed prior to detachment.

Some lines of evidence may support the direct local development from Boker Tachtit-type assemblages into the Ahmarian in the south, yet certain specifics of the practiced lithic technologies are equivocal. Another option is that there is an intermediate stage, as indeed seems to be reflected by a range of problematic and often poorly documented assemblages in the south, which stratigraphically (and probably technologically and typologically also) fill the void between the two. These include assemblages such as Boker D (Jones *et al*. 1983), Wadi Aghar (Coinman, Henry 1995, see also Monigal 2001), Tor Fawaz (Kerry, Henry 2003), Sde Zin 7 (Goring-Morris, Rosen 1989), and the still uninvestigated Nahal Eilonim (ANG-M personal observation).

CONCLUSIONS

The detailed investigations on a range of Ahmarian assemblages from throughout the arid margins of the southern Levant over the past three decades demonstrate that the basic concept behind the Ahmarian knapping method was especially standardized, robust and stable. The ultimate attraction of this long-lasting concept (minimally *ca* 15 Ka) was that it enabled the integrated production of both primary, predetermined targeted blade/let blanks for pointed tools, as well as secondary blanks for other tool classes. It was thus possible to efficiently extract the entire array of the Ahmarian toolkit from a single reduction sequence.

This Ahmarian concept preferably involved the reduction of discoidal nodules, using a single elongated striking platform, together with a prow-shaped removal surface, and a wedged keel. This basic design enabled the sequential removal of series of targeted pointed blade/let blanks of predetermined configuration (i.e. el-Wad points *sensu lato*). Larger secondary blanks, whether flakes or blades, derived either from initial decortication and setting up of the preform, or from later core rejuvenation and core maintenance operations. Variability, inasmuch as it occurred, relates more to the vagaries of suitable local raw material availability, and rendering it to the desired preform configuration, than to technological constraints.

The mode of knapping, which made use of complementary percussors, was adjusted to the method as well. Thus a hard hammer was used for initial shaping of cobbles and for some maintenance operations that also involved heavier blows (i.e. thick core tablet removals). Blanks deriving from these knapping stages served for such larger tool classes as scrapers and burins. A softer percussor, but still of stone, was used for abrasion and detachment of the thin targeted blade/let blanks. There is little, if any evidence for the habitual use of a punch technique to produce the targeted blade/let blanks.

While this distinctive, "normative" knapping method was practiced virtually ubiquitously amongst Ahmarian sites in the south, there is some evidence to indicate more variability including a supplementary secondary method amongst Mediterranean Ahmarian assemblages. This involved the additional exploitation of an opposed platform technology, to produce a broadly similar range of targeted tool blanks. Those blanks seem to have been relatively more robust and straighter in profile than those from the "normative" Ahmarian method. Such technological differences could perhaps account for the variability seen in the blanks of el-Wad points (*sensu lato*) between assemblages in the arid and Mediterranean zones.

In examining the evidence of possible local precursors for the Ahmarian in the south, aspects of assemblage types such as those represented by Boker Tachtit superficially appear to be attractive candidates, since they do provide some degree of technological continuity. Still, various chronological uncertainties, together with the presence of other, still poorly documented assemblages in the region tentatively provide the possible existence of an intermediate bridging phase.

ACKNOWLEDGEMENTS

We are grateful to L. Meignen and J. M. Geneste for asking us to participate in this stimulating session on aspects of "Late Middle to Early Upper Paleolithic Developments East of the Carpathians", and for having the patience to coax us through to finishing this paper. M. Becker kindly conducted a pilot use-wear study of selected tools from Nahal Nizzana XIII. We also thank O. Marder and A. Belfer-Cohen for input concerning various issues raised in this paper. We have also benefited enormously from discussions with B. Madsen, who has shared his extensive knowledge and observations concerning experimental knapping. Angela Davidzon particularly thanks N. Pigeot and B. Valentin for their insights on various aspects of lithic technology during her participation in the Étiole workshop. However, we bear sole responsibility for the positions described herein and for any errors or omissions.

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Nigel Goring-Morris
Angela Davidzon
Department of Prehistory
Institute of Archaeology
Hebrew University
Jerusalem 91905, Israel
E-mail: goring@mscc.huji.ac.il
E-mail: adavidzon@gmail.com