9

Buran-Kaya III Layer B: The Lithic Assemblage

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Layer B of Buran-Kaya III was excavated during three periods of the site's field investigations (Figure 9-1). First, some 5 m^2 were uncovered in a sondage in 1990 by A.A. Yanevich, then about 6 m^2 were excavated in 1994 by A.A. Yanevich and M. Yamada, and finally, somewhat more than 12 m^2 were excavated between 1996 and 2001 by the Ukrainian-American expedition. Because of excavation techniques that resulted in some mixing of different archeological levels during the first two seasons of work (Yanevich et al. 1997; Chabai et al. 2000:61–64), only the materials from the 1996–2001 excavations will be described here.

During 1996, 1997, and 2001, clearly in situ Layer B deposits were excavated in the western and central sectors of the rockshelter in squares E8–9, Д6–9, Г6–9, B7–8, Б7–11, and A8–11, and in the eastern sector of the rockshelter in squares B12, Г12, and Д12. Because of the variable bedrock configuration, the total excavated areas of Levels B and B1 of Layer B vary and sometimes do not coincide in certain squares. As a whole, Level B (usually 0.10–0.15 m thick) was excavated over an area of ca. 13.2 m^2, while Level B1 (ca. 0.20 m thick) was excavated over an area of ca. 11.2 m^2. If the earlier excavations are considered, covering some 9 m^2, then the overall excavated in situ area of Buran-Kaya III Layer B covered about 20 to 22 m^2. Given the erosional patterns and the wall of the rockshelter, it is likely that this area is very close to the extant in situ surface.

Lithologically, both Levels B and B1 of Buran-Kaya III Layer B (geological Unit IV of the rockshelter's lower part of the depositional sequence in Figure 9-2) are characterized by the same sandy silt fill with a large number of fresh, angular small limestone debris derived as *éboulis sec* from the rockshelter's roof and walls. The difference between Levels B and B1 lies in their color: Level B (upper) is a yellow-brown color, while Level B1 (lower) is dark brown and ashy-black. The coloration of B1 gives the level the appearance of a humus rich stratum, formed by a high content of organic substrate, burnt bones, and most likely, a fill of disturbed hearths and/or fireplaces. Aside from a very localized and thin (0.02–0.03 m) archeologically sterile lens of rounded limestone debris between

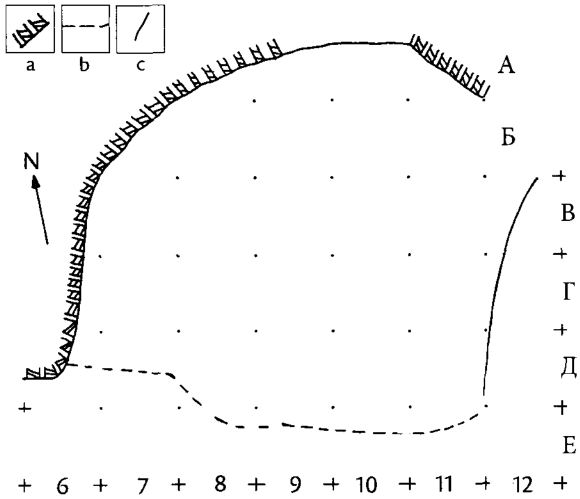

Figure 9-1—The site's plan for Layer B finds maximum distribution within the rockshelter's inner part, limited in the south by the drip line, in the east by natural washing away processes, and in the north and west by the back wall: a–back wall; b–drip line; c–line showing eastern edge of Layer B.

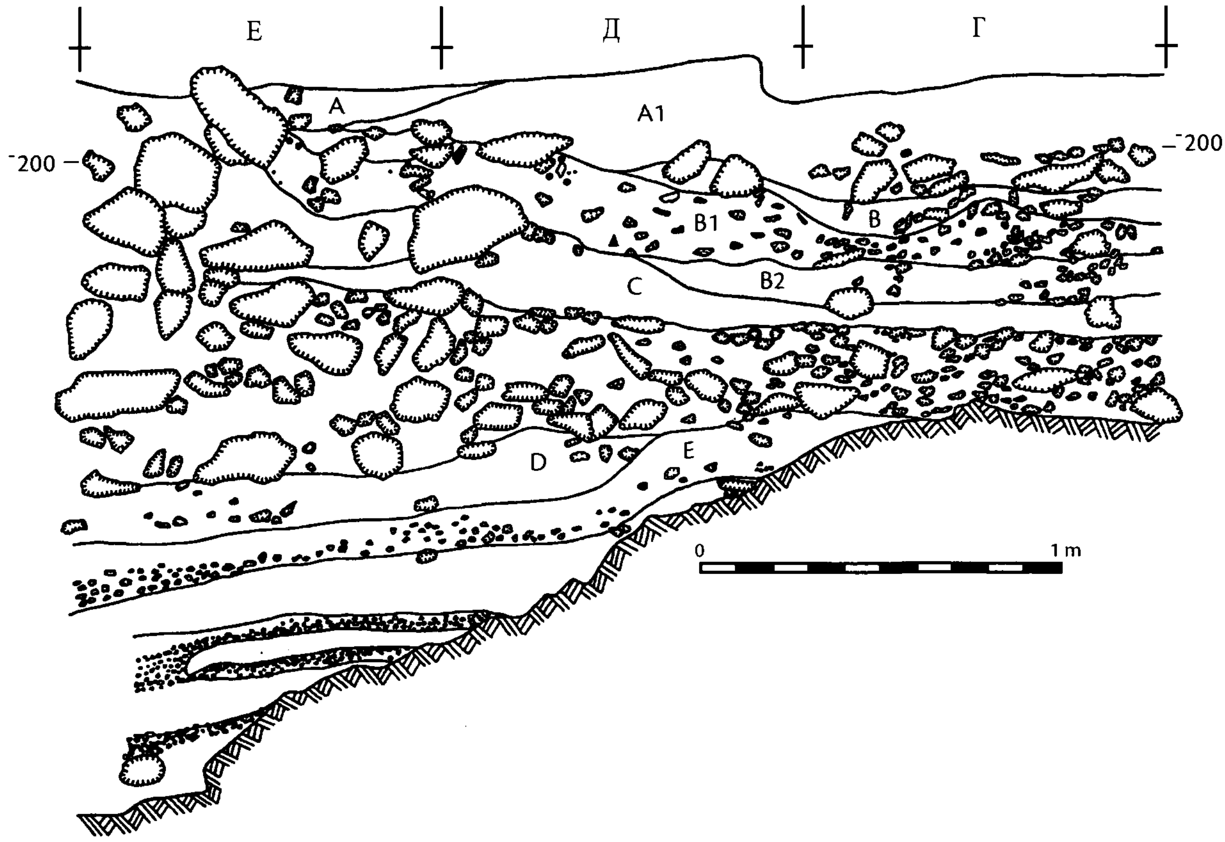

Figure 9-2—Partial western profile of the rockshelter's lower depositional sequence along line 8/9.

Levels B and B1 observed during the 2001 excavations in square Б9, there were no clearly visible sterile lenses between these two levels over the rest of the excavated areas. On the other hand, the Layer B deposits are separated from earlier and later archeological remains by sterile sediments. In the southern part of the excavation area, Layer B is separated from the overlying Aurignacian/Epigravettian (?) Level 6-5 by Layer A, which is a redeposited sediment (Figure 9-2). Near the back wall, Layer B is separated from the overlying occupations by an archeologically sterile clay lens 2 to 3 cm thick. Layer B is separated from the underlying Level C by a sterile lens of the dark brown sandy silt of Level B2 (2 to 10 cm thick), seen most clearly in the rockshelter's western sector.

Among all excavated Layer B areas, the most typical was in the rockshelter's western sector investigated in 1996, where both Levels B and B1 are notable by an almost horizontal position. Here, they are spatially well-represented by a great number of artifacts (17,342 items) and animal bones throughout the area. This area provided the sample reported here. The Level B sample (2,127 items) came from squares Б7–8, В7–8, Г7–9, Д7–9, and E9 (ca. 6.4 m^2), while the Level B1 sample (15,215 items) came from ca. 6.9 m^2 of squares Б7–8, В7–8, Г6–9, Д6–9, and E8–9. No constructed features, including pits, hearths, fireplaces, or special bone concentrations were recognized in Layer B. The Level B1 sediment color, however, indicates the presence of fire areas; owing to intense and repeated occupations, these could not be spatially distinguished.

Because of such artifact and bones densities, only artifacts 3 cm and greater in length and bones 5 cm or greater in length were mapped. Even with the "noise" of the small chippage and bone splinters removed, densities were such that no spatial patterns were discernable.

Two absolute AMS dates from Level B1 are 28,840 ± 460 years BP (OXA-6673) and 28,520 ± 460 years BP (OXA-6674). These dates are consistent with underlying and overlying dates. At two standard deviations, P. Pettitt has recognized a chronological interval of 29,760/29,440–27,920/27,600 years BP for the Kiik-Koba layer (Pettitt 1998a:332). Taking these age ranges into consideration, we suggest that Crimean Micoquian Neanderthals visited the Buran-Kaya III rockshelter during the Arcy Interstadial (Gerasimenko, Chapter 2; Markova, Chapter 3).

Raw Material Variability and Availability

High quality flint sources are well known in eastern Crimea where the main outcrops are primarily confined to Upper Cretaceous chalk-like marlacious limestones (Petrun 1969). The most widely distributed and abundant natural flint sources are mainly in the form of plaquettes (usually 1 to 4 cm thick). Such deposits occur most commonly at the border of the steppe and the northern foothills of the Second Ridge of the Crimean Mountains, forming a so-called "flint belt," extending from the west (near the village of Tsvetochnoye) eastward to the northern outskirts of Belogorsk (around the Sary-Kaya cliff), for a total distance of ca. 15 km east to west and some 3 to 4 km wide. Some secondary deposits are also known around Belogorsk, as well as along the Biyuk-Karasu River, to the north of Belogorsk. The Middle Paleolithic sites of Zaskalnaya, Krasnaya Balka, and Sary-Kaya are all situated near these high quality flint sources. Buran-Kaya III, however, is not located in immediate proximity to any flint outcrops. The nearest known sources of high-quality flint are found ca. 10 km down the Burulcha River, at the northern edge of Tsvetochnoye. These outcrops are characterized by plaquettes with a wide variety of colors—black, brown, and grey tints. From an archeological point of view, the most important feature of all these flint outcrops is that, as a rule, no one flint variety is restricted to one outcrop. Therefore, lithic artifacts from archeological sites situated up to 20–25 km from the eastern Crimean "flint belt" cannot be precisely connected to any one particular flint source just by color. The only definitive observation that can be made about the flint is the cortex condition, which indicates whether it came from a primary or an alluvial source.

In the case of Buran-Kaya III Layer B, the flint is consistent in its range of color with the Tsvetochnoye-like outcrops. In a sample of 1,008 pieces (all objects of primary flaking processes, flakes, blades, and tools, excluding two fragments of bifacial tools and sixteen unidentifiable and tiny fragments of unifacial tools' retouched edges), 17.8% were black, 60.9% were brownish, 2.2% were grey, 18.5% were heavily patinated, rendering their true color indistinguishable, while 0.6% were a brown chert of poor quality, as opposed to the high quality flint which characterized all other pieces. These proportions are consistent with percentages by artifact categories obtained for the entire assemblage. This indicates that brown flint was predominant, with only a moderate representation of black flint. The small number of grey flint artifacts is not significant because this color of flint comes from the same outcrops as do the brown and black flint. On the other hand, the few pieces of poor quality brown chert are worth noting because this source is restricted to distinct Paleogene limestones, the closest of which is in the Kuchuk-Karasu River valley, some 25 km from Buran Kaya III as the crow flies. Of course, it cannot be excluded that this chert came from a presently unknown but closer source. A more detailed examination of the assemblage by raw materials can be found in Chapter 14 by M. Kurbjuhn and Chapter 12 by T. Uthmeier.

The flint varieties present at Buran-Kaya III Layer B indicate that their source was no less than 10 km from the site, but in reality, given local topographic features, closer to 20 km. Thus, there is no doubt that flint was not immediately available to the site. The high density of artifacts and animal bone from Levels B and B1 cannot therefore be interpreted as a base camp occupation(s), as was initially done for other sites with a Kiik-Koba type industry (e.g., Demidenko 1996; Chabai et al. 1995; Chabai and Marks 1998). This interpretation was subsequently corrected to intensively and recurrently occupied "short-term camps," which are usually compacted into one or two dense archeological cultural layer(s) due to slow sedimentation rates (e.g., Chabai 1999a; Chabai et al. 2000; Demidenko 2000).

The Layer B Lithic Assemblage

A total of 17,342 flint artifacts was recovered during the 1996 excavations from slightly less than 7 m^2 (Level B = ca. 6.4 m^2, Level B1 = ca. 6.9 m^2): an extremely high density per square meter. The assemblage has been subdivided into seven general categories: chips (< 1.5 cm), large chips (1.5 cm–2.9 cm), flakes, blades, tools, specific waste of tool rejuvenation, and heavily burnt pieces. This division shows the dominance of chippage: some 89.2% while no other category reaches even 5% (Table 9-1). On the other hand, excluding what is normally considered debris (chips, tool rejuvenation pieces, and heavily burnt pieces), leaves 1,026 flints from the remaining four categories: objects of primary flaking processes (3.6%), flakes (38.5%), blades (4.8%), and tools (51.3%). The striking structural feature of this assemblage is the truly high percentage of retouched tools, which actually exceeds all debitage combined at 53.1% versus 43.3%. This pattern is consistent even when the assemblage is subdivided into Levels B and B1, in spite of the marked difference in total items (2,127 in Level B and 15,215 in Level B1 (Table 9-1). Aside from small chips

TABLE 9-1
Flint artifacts structure in Layer B of Buran-Kaya III

	Level B		*Level B1*		*Total Layer B*		
	N	%	*N*	%	*N*	%	*ess %*
Objects of primary flaking processes:	12	0.6	25	0.2	37	0.2	3.6
flint plaquettes	2		3		5		
preforms	1		1		2		
core-like pieces	6		15		21		
bifacially treated fragments of core-like/bifacial preforms	3		6		9		
Chips (≤ 1.5 cm)	1,200	56.4	9,449	62.1	10,649	61.4	
Chips (> 1.5–2.9 cm)	576	27.1	4,241	27.9	4,817	27.8	
Flakes	73	3.4	322	2.1	395	2.3	38.5
Blades	4	0.2	45	0.3	49	0.3	4.8
Tools:	132	6.2	413	2.7	545	3.1	53.1
bifacial tools (complete & fragments)	17		56		73		
unifacial tools (complete)	50		132		182		
unifacial tools (fragments)	31		137		168		
retouched pieces (complete)	19		45		64		
retouched pieces (fragments)	15		43		58		
Specific waste of tool rejuvenation:	24	1.1	110	0.7	134	0.8	
rejuvenation pieces of unifacial tools' tips	13		75		88		
rejuvenation pieces of bifacial tools' tips	11		35		46		
Heavily burnt pieces	106	5.0	610	4.0	716	4.1	
Total Flints	2,127		15,215		17,342		

(< 1.5 cm) and tools, the other six artifact categories from Levels B and B1 have percentage deviations of no more than 1.3%. Tool percentages differ only by 3.5%, while the proportions of small chips vary just by 5.7%. These differences between the two levels are even less marked when only the two chip classes and the debitage are considered. In this case, the differences between Levels B and B1 respectively are: chips (< 1.5 cm) 64.8% and 67.2%, chips (1.5–2.9 cm) 31.1% and 30.2%, debitage 4.1% and 2.6%. This structural similarity between Levels B and B1 is reinforced by fully comparable techno-typological characteristics, as will be shown below. In addition, since these two archeological levels surely do not represent just two occupational events, but rather the remains of a series of visits there, the combination of the assemblages of Levels B and B1 into one united Layer B lithic assemblage for analyses and description seems to be quite reasonable. Thus, the following data are based on the entire combined sample of 17,342 artifacts.

Objects of Primary Flaking Processes

Objects of primary flaking processes represent the initial stage of the flint-knapping process and are composed of plaquettes, preforms, core-like pieces, and bifacially treated fragments of either core-like pieces or bifacial preforms (Table 9-1).

Plaquettes

Plaquettes indicate the form of unmodified raw material used for primary flaking processes at the site. Given the reduction intensity seen on the artifacts, as expected, none of the plaquettes is whole. All are fragments, two of which bear a few clear small flake scars from supposed testing blows on their otherwise cortical surfaces. It is obvious that the plaquettes were broken during their initial testing. Because of their fragmentation, only general measurements were taken, with length measured as the longest edge. Lengths range from 3.1 to 4.9 cm, widths from 1.4 to 3.6 cm, and thicknesses from 0.7 to 1.6 cm. The thickness measurement is the most important, as it may represent the typical initial blank volume of pieces destined for further reduction: the mean thickness for all plaquettes is 1.1 cm.

Preforms

There is one typical (e.g., Chabai and Demidenko 1998:39) complete preform on a plaquette with a few "testing" negatives on its surfaces (Figure 9-3: *7*). It has neither a striking platform, characteristic of precores/cores, nor the clear treatment typical for bifacial preforms. It is 5.3 cm long, 5.1 cm wide, and 2.1 cm thick. As such, it may be a better indicator of initial raw material package size than are the fragmentary plaquettes.

A second preform is almost completely covered by small flake scars struck from three weakly developed striking platforms. Neither the scars nor the striking platforms can be attributed to any core feature because of the absence of any regular core-like flaking. At the same time, it also does not bear clear signs of bifacial tool elaboration. Therefore, it is classified as a preform. Because of the many small scars, the blank type is unidentifiable. It is 4.3 cm long, 3.8 cm wide, and 2.3 cm thick. Again, its dimensions are considerably larger than those of the plaquette fragments.

Core-Like Pieces

Cores are poorly represented both numerically and morphologically, consisting of 1 radial, 1 discoidal, 9 parallel, and 10 unidentifiable types. All cores need rather detailed morphological descriptions and interpretative explanations because their classification does not really reflect any role or technological importance of different flaking methods implied by the strictly typological definitions.

RADIAL CORES

The radial core is ovoid with a convex undersurface (Figure 9-3: *1*). It has a crudely faceted striking platform and an advanced, intensive centripetal reduction, resulting in the core's exhaustion with both a concave flaking surface and an overall small size (length = 3.6 cm, width = 2.8 cm, thickness = 1.4 cm).

DISCOIDAL CORES

The discoidal core (Figure 9-3: *3*) is also ovoid with, by definition, two opposite flaking surfaces. There is some cortex on both flaking surfaces indicating that a plaquette was the blank type. It too is exhausted and small: length = 1.2 cm, width = 3.1 cm, and thickness = 1.5 cm. It has removal scars of centripetal reduction around its circumference on one side and just a single pronounced removal scar on other side. The limited reduction of the second face places it as atypical.

PARALLEL CORES

The parallel cores are the most numerous identifiable core type and they are represented by four subgroups: parallel of irregular shape (5), parallel transverse of irregular shape (2), parallel of triangular shape (1), and parallel unidentifiable (1).

PARALLEL CORES OF IRREGULAR SHAPE Parallel cores of irregular shape (Figure 9-3: *2, 4, 5*) are so-called "peculiar not specially organized" cores with either a naturally flat (3) or flat (2) undersurface, crudely faceted (4) or finely faceted (1) striking platforms, and which produced unidentifiable (4) or flake (1) blank types. They bear only one large scar of the last removed flake on the flaking surface. These last scars cover 80% to 100% of each core's flaking surface, making continued reduction problematic. Additional flaking would call for significant and difficult repreparation of each core's flaking surface. The last removals for three of the cores overpassed (Figure 9-3: *4, 5*), while on the two others the flaking surfaces were highly concave (Figure 9-3: *2*). Given the small size of the cores (length = 3.5 to 4.0 cm, width = 1.8 to 3.2 cm, thickness = 1.1 to 1.4 cm), significant rejuvenation would have been impossible.

It is impossible to tell on three of these cores if other reduction strategies were initially used, due to the lack of other striking platforms and scars (Figure 9-3: *5*). Two cores, however, are more informative in this respect. One (Figure 9-3: *4*) has the remains of a finely faceted striking platform, as well as the upper portion of a flake scar struck from it. The combination of these reduction features suggests that the core had either an orthogonal or a partially centripetal flaking history. The second core, made on a flake (Figure 9-3: *2*), has no signs any previous flaking and therefore seems to have undergone just a single reduction episode. Such reduction of small-sized cores, either at the end of their multiple reduction history or just as a single flaking event, definitely indicates the attempt to derive blanks from even very small pieces of flint.

PARALLEL TRANSVERSE CORES OF IRREGULAR SHAPE Parallel transverse cores of irregular shape (Figure 9-3: *6*) are similar to those described above but the width of their flaking surface is greater than the length of their flaking surface, making them typologically transverse. One core is 2.5 cm long and 4.6 cm wide with a thickness of only 0.6 cm (Figure 9-3: *6*). It has a strongly overpassed flaking surface from the removal of one large flake, and another small and narrow removal scar, and the original cortex-covered ventral surface of the blank that was used for this reduction. Thus, a primary flake's convex ventral surface served as the core's flaking surface, while its abrupt lateral edge was used as an unprepared plain striking platform. Its undersurface is naturally flat—the flake's dorsal surface with primary cortex. Technologically, it is a kind of ad hoc reduction of a core-on-flake with quick exhaustion. It is analogous to the parallel core illustrated as Figure 9-3: *2*.

Another core on an unidentifiable blank also has only two parallel scars on its flat flaking surface, though it has traces of previous crudely faceted striking platforms all around its convex undersurface. Therefore, it is quite possible that the observed parallel-like reduction is only the last reduction stage for the core. Thus, this core is not systematic or intentionally parallel. It looks similar to the parallel core illustrated in Figure 9-3: *4*. Its abandonment may have been connected to its small size (length = 3.2 cm, width = 3.6 cm, thickness = 1.8 cm).

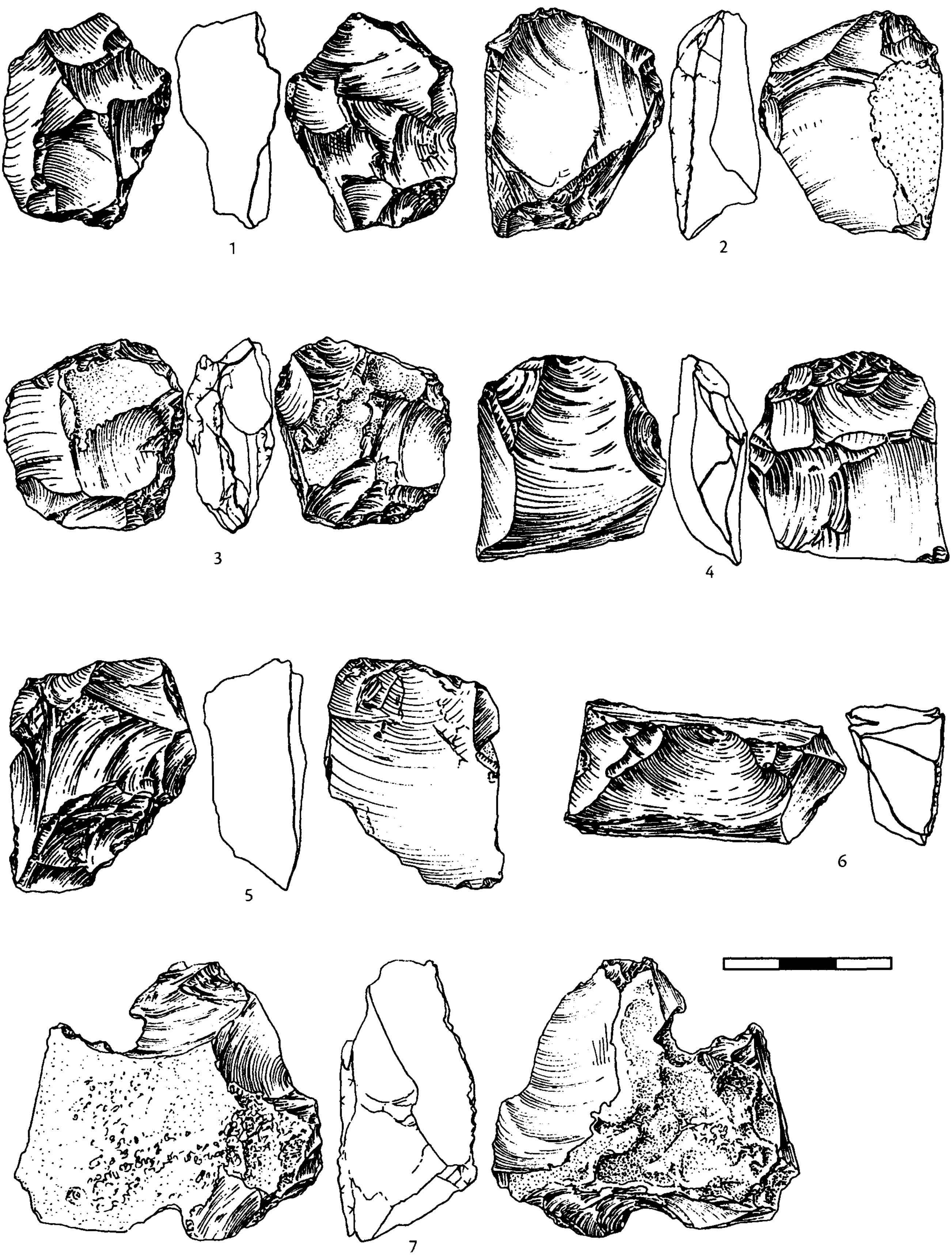

Figure 9-3—Buran-Kaya III Layer B objects of primary flaking processes: *1*–radial core; *3*–atypical discoidal core; *2, 4, 5, 6*–parallel cores; *7*-preform. Items 1-2, 4-7 from Level B1; item 3 from Level B.

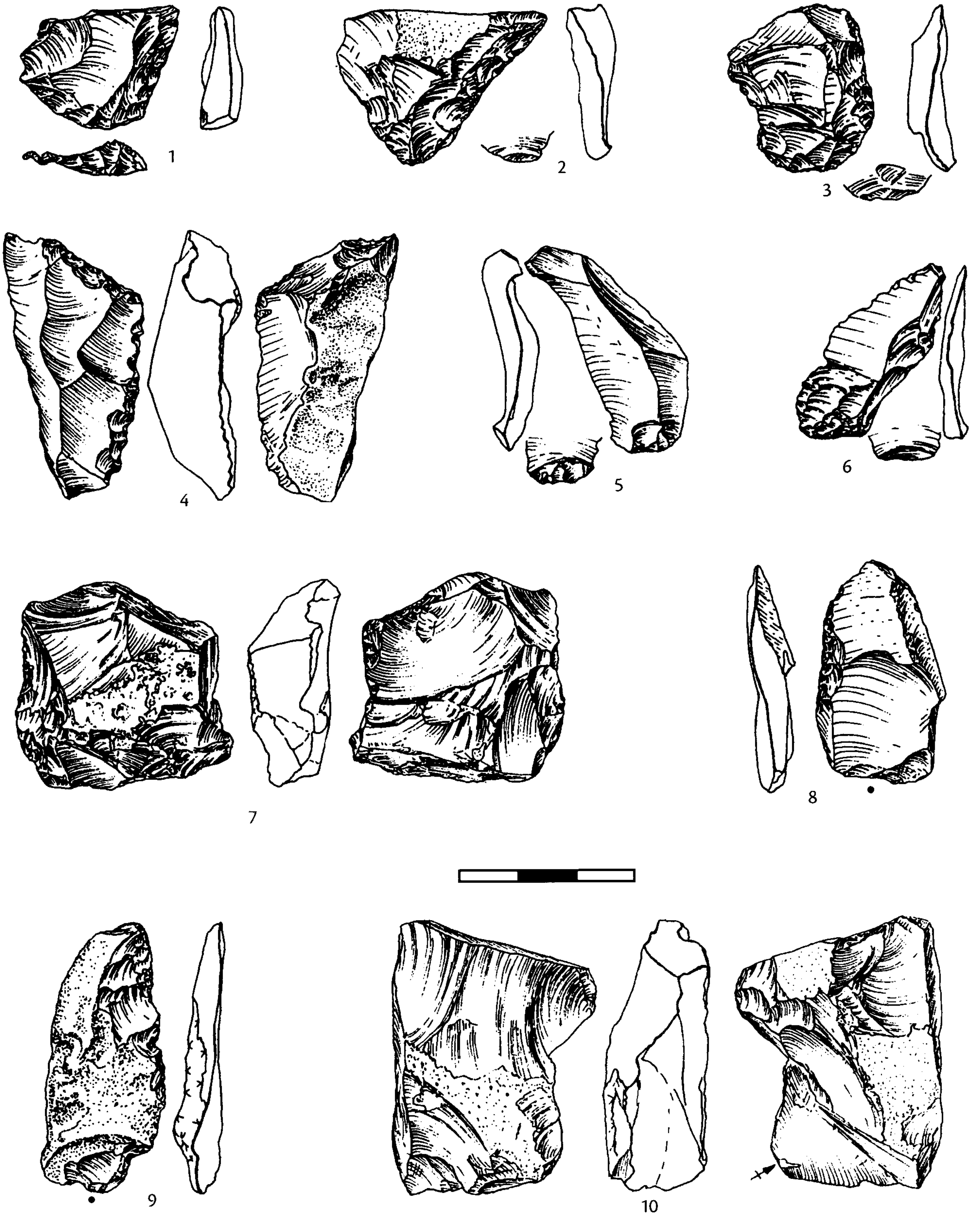

Figure 9-4—Buran-Kaya III Layer B unifacial tools (1, 2, 3, 8, 9), objects of primary flaking processes (4, 7, 10), and bifacial reduction pieces (5, 6): *1, 2, 3, 8, 9*–simple scrapers; *4*–parallel core; *5, 6*–bifacial thinning blades; *7*–unidentifiable core ("completely exhausted"); *10*–bifacially treated fragment of either a core-like piece or a bifacial preform. Items 1, 2, 3, 4, 9, 10 from Level B1; items 5, 6, 7, 8 from Level B.

PARALLEL CORES OF TRIANGULAR SHAPE The parallel core of triangular shape was made on an unidentifiable blank type and has a naturally flat undersurface (Figure 9-4: *4*). It is has three parallel scars on its elongated and narrow flaking surface (4.5 cm long, 2.2 cm wide) that were struck from a crudely faceted striking platform The core's exhaustion is evident from its small size and especially, its minimal thickness of 1.0 cm. On one hand, this core could be an example of a systematic and intentional parallel reduction, but it is more likely that this is another example of a short-term core reduction where the small size and elongate/narrow proportions of the original blank were suitable only for parallel flaking.

PARALLEL CORES OF UNIDENTIFIABLE SHAPE The single example of a parallel core of unidentifiable shape has 5 parallel scars on its flaking surface, all struck from a crudely faceted platform. Oblique fragmentation of the piece makes all but length (4.2 cm) indeterminable.

UNIDENTIFIABLE CORES

Unidentifiable cores are subdivided into 3 that are longitudinally fragmented; 4 that are transversely fragmented, preserving only the upper portion with striking platform; and 3 that are whole but completely exhausted.

Those with longitudinal breaks could be only characterized by striking platform treatment (2 finely faceted and 1 crudely faceted). Their dimensions ranged from 3.6 to 4.5 cm in length and 0.9 to 1.7 cm in thickness. Those broken transversely have only crudely faceted striking platforms. Given the breakage, only width and thickness could be measured (width from 3.2 to 4.2 cm and thickness from 0.8 to 1.4 cm).

EXHAUSTED CORES

Completely exhausted cores (Figure 9-4: *7*) are defined by their small size, the presence of no fewer than two flaking surfaces, three to four striking platforms, and unsystematic and/or a combination of parallel- and centripetally-directed short removal scars on the flaking surfaces. Combined, these indicate maximum reduction with no coordination between different flaking surfaces. Morphologically, these three cores have 11 striking platforms (5 plain, 6 crudely faceted), with one plaquette and two unidentifiable pieces as their blanks. Metrically, they range from 3.3 to 4.0 cm in length, 2.6 to 3.3 cm in width, and 1.0 to 1.3 cm in thickness.

Bifacially Treated Fragments of Either Core-Like Pieces or Bifacial Preforms

Fragments of cores and preforms that have bifacial treatment (Figure 9-4: *10*) are included with the cores and preforms because these broken pieces lack the clear bifacial treatment that would put them unambiguously into one or the other group. Such pieces could be found in any Middle Paleolithic site where both intensive on-site core reduction and bifacial tool treatment took place. Given their broken state, measurements are not useful, but thickness is quite consistent with other categories: from 1.0 to 1.9 cm. Except for two on plaquette, the other blanks were unidentifiable.

Summary of Metric and Morphological Data for Objects of Primary Flaking Processes

If the various items described above are broken down into the three categories of plaquettes/preforms (7), cores (14), or unidentifiable core fragments (7), it becomes clear that while size decreases as reduction continues and breakage increases, the changes are not great.

The dimensions of plaquettes and preforms have the following ranges: length from 3.0 to 5.9 cm (mean = 4.3 cm), width from 1.0 to 5.9 cm (mean = 3.1 cm), and thickness from 1.0 to 2.5 cm (mean = 1.4 cm). Of the seven pieces, six are plaquettes, while one preform is on a flake.

The dimensions of cores have the following ranges: length from 2.0 to 4.9 cm (mean = 3.6 cm), width from 1.0 cm to 4.9 cm (mean = 3.0 cm), and thickness from 1.0 cm to 1.9 cm (mean = 1.2 cm). As expected, the original raw material package of these cores is largely unknowable, although two were from plaquettes and two from flakes.

The dimensions of unidentifiable broken cores have the following ranges: greatest dimension from 3.0 to 4.9 cm (mean = 3.7 cm) and thickness from 1.0 cm to 1.9 cm (mean = 1.1 cm). Their blank types are all unidentifiable.

From these data, it is clear that the dimensions of pieces with only initial reduction are greater than the ones with more intensive reduction. The average differences, however, are not great at all: length = 0.7 cm, width = 0.1 cm, and thickness = 0.2 cm. This suggests that most initial raw material packages (plaquettes and flakes) brought to the site were quite small and as a result, were not and could not have been greatly reduced during blank production. Yet, the metric data could be interpreted that all these pieces were exhausted in terms of reduction potential. That is, the plaquettes and preforms were merely fragmented objects not suitable for any continued reduction. There are some cases of both multiple reductions from probably larger blanks and single reduction of definitely smaller blanks, with more of the latter.

There were also 29 striking platforms for 21 cores. This difference is explained by the presence of 11 platforms on three completely exhausted cores. The striking platforms are plain (20.7%), crudely faceted (69%), and finely faceted (10.3%), suggesting frequent platform preparation for the removal of almost each flake. This is consistent with the overall small sizes and tiny thickness of most of the cores, plaquettes, and flakes used as blanks. The rarity of finely faceted striking platforms is easily understood by the absence of the Levallois method.

The flake scars on the core flaking surfaces indicate centripetal and parallel (non-volumetric in concept) flaking. The accidental character of most of the parallel cores, with mainly overpassed and hinge-fractured flaking surfaces after a single or a last flake removal, shows that there was no systematic or intentional parallel reduction. Radial, atypical discoidal, and completely exhausted cores, most of all, are characterized by hinge-fractured concave flaking surfaces with short removal scars.

In summary, the assemblage's primary flaking was based upon non-Levallois methods with a non-volumetric concept of simple opportunistic parallel and centripetal techniques. These were directed to starting and/or continuing primary reduction on any suitable raw material package, mainly of small size. Of course, the above observations need to be seen in the context of corresponding data from debitage and tools, their analysis and comparisons with primary flaking objects, and their possible numerical and technological interrelations.

Debitage

The debitage of Layer B consists of 395 unretouched flakes (89%) and 49 unretouched blades (11%) (Table 9-1). In spite of the relatively low proportion of blades, they will be reported separately here.

Condition

Of the flakes, about a third (28.1%) is broken: 3.3% are proximal fragments, 2.5% are medial, and 13.2% are distal, while 9.1% have longitudinal breaks. Blades have different breakage patterns: of the 30.6% that are broken, 4.1% are proximal pieces, 12.2% are medial, while 14.3% are distal. The higher percentage of medial blade fragments is expected given the shape of blades. The low occurrence of medial flake fragments relates to the generally small size of the flakes, which lessens the likelihood of their breakage into more than two pieces. Again, the presence of longitudinally fragmented flakes indicates the general lack of flake elongation and hard hammer detachment.

Scar Patterns

Ten different scar patterns were recognized on 280 complete flakes. The most common is unidirectional (48.3%), followed by unidirectional-crossed (14.6%), cortical (9.6%), and bidirectional (6.1%). Four other patterns occur, but are rare: centripetal (5%), converging (5%), 3-directional (4.3%), and crested (4.3%). The final two patterns appear accidental: lateral (2.1%) and dorsal-plain (0.7%).

Blades have eight different scar patterns on 34 complete blades: unidirectional (53%), unidirectional-crossed (11.8%), 3-directional (11.8%), lateral (8.8%), crested (5.9%), bidirectional (2.9%), dorsal-plain (2.9%), and cortical (2.9%).

These flake and blade scar patterns correspond well with one another, as well as to the cores and preforms. It is worth noting that nearly one in ten flakes is cortical, providing evidence for some on-site flaking of initial raw material packages.

Surface Cortex Area and Location

Non-cortical flakes (38.6%) are fewer than ones with some cortex (61.4%). Of those with cortex, only about one in five are wholly cortex covered. Cortex occurs on 64.7% of the blades and only one in twenty-two is wholly cortex covered.

The presence of cortex on both flakes and blades confirms some on-site reduction of initial raw material packages. In addition, 52.4% of all partially cortical flakes have only distal cortex, while other pieces have both distal cortex and otherly positioned cortex. This overall dominance of pieces with distal cortex once again indicates that cores and plaquettes were small. On the other hand, cortex location is different for blades: lateral (32.4%), distal (17.7%), distal and lateral (8.8%), central (2.9%), and distal and central (2.9%). The dominance of blades with lateral cortex is easily explained by their detachment from edges of cores, preforms, and bifacial tools.

Shape and Axis

Of the 284 complete flakes, trapezoidal shapes dominate (58.8%), of which 17.7% are simple trapezoidal, 16.5% are elongated trapezoidal, and 24.3% are expanding trapezoidal. The next most common shape is irregular (24.6%), followed by rectangular (7%), ovoid (5.3%), leaf-shaped (2.1%), crescent (1.4%), and triangular (1.1%). Flakes struck off-axis are predominant (80.3%), compared to those on-axis (19.7%). Again, blades are largely struck off axis (73.5%) and mainly have varieties of trapezoidal forms: elongated trapezoidal (26.5%) and expanding (14.6%). There are, however, significant proportions of rectangular and irregular shapes (26.5% each), with trivial proportions of crescent forms (5.9%). In sum, flakes and blades have similar shape distributions, as well as a strong tendency for off-axis removals. It is worth noting that the variety of blade shapes suggests an absence of clearly consistent removals.

Lateral Profiles

For the 278 flakes that could be examined, profiles are rather evenly divided: incurvate medial (33.1%), incurvate distal (20.1%), twisted (22%), and flat (18%).

Those with convex profiles (due to major hinging) are rare (6.8%), as always. This balanced range of profile types is taken as evidence for the irregular character of core reduction at the site. Blades, on the other hand, show much less variability, with twisted profiles dominating (70.6%) over incurvate medial (26.5%) and flat (2.9%). The dominance of twisted profiles may be taken as evidence that most blades were by-products of bifacial tool shaping and rejuvenation.

Distal Profiles

Of 270 complete flakes, more than half (58.1%) have feathered distal ends, while hinged (27.8%) and blunt (11.5%) terminations occur less frequently. Overpassed flakes are rare (2.6%). The high number of hinged flakes indicates "irregular" and "unsystematic" flaking of short blocks/cores.

Cross-Sections at Midpoint

For 284 complete flakes, midpoint profiles are trapezoidal (36.6%), triangular (27.5%), irregular (16.2%), lateral steep (9.2%), crescent (5.6%), and flat (4.9%). Blades tend to have triangular midpoint shapes (53%), with fewer trapezoidal cross-sections (26.5%), and hardly any irregular (8.8%), lateral steep (5.9%), or crescent (5.9%). Considering trapezoidal midpoint shapes as an indicator for intensive core-like reduction, it is clear that neither flakes nor blades appear to be from such core-like reduction.

Platform Preparation, Lipping, Angle, and Abrasion

Observations on platform characteristics—types, lipping, angle, and abrasion—are based on a flake sample of 297 complete and proximal fragments and a blade sample of 36 complete and proximal fragments. Flake platforms are mainly unprepared (42.3%), including plain (19.5%), punctiform (19.5%), linear (4%), and cortical (3.7%). Prepared platforms include dihedral (8.1%), crudely-faceted (10.8%), and finely-faceted (9.8%). Crushed platforms are common at 29%. Excluding those with crushed platforms, flake faceting indices are IF = 40.3, IFs = 13.7. Blade platforms are fully comparable to those on flakes: plain (8.3%), punctiform (27.8%), linear (2.8%), and cortical (8.3%), while prepared platforms include dihedral (5.6%), crudely-faceted (8.3%), and finely-faceted (11.1%). Crushed platforms are quite common at 27.8%. Blade faceting indices are IF = 34.6, IFs = 15.4. Faceting indices for flakes and blades combined are IF = 39.7, IFs = 13.9.

On 171 flakes, over half (53.2%) exhibit semi-lipped platforms; truly lipped examples are uncommon (18.7%) but unlipped platforms are common (28.1%). Yet, if the percentages for semi-lipped and lipped platforms are combined, the total indicates most flakes were struck with a relatively soft hammer. Only 16 blade platforms could be observed: semi-lipped (50%), lipped (12.5%), and unlipped (37.5%).

Of the 171 flake platforms suitable for angle identification, right angles (about 90°) and semi-obtuse angles (90–110°) account almost two-thirds of all platforms (64.9%). The percentage of obtuse angles (>110°) is quite high (35.1%), however. Of 16 blades, 13 have right and semi-obtuse angles and 3 have obtuse angles.

Among the 224 identifiable flake platforms, abrasion traces are present on 27.2%. Only 2 blades with abrasion traces were found (10.5%).

The above data on lipping, angle, and abrasion show that there are quite a few lipped platforms with acute angles and abrasion: 20–35% among flakes and 10–20% among blades (Figure 9-4: *5, 6*). These items are certainly not connected to any primary flaking, but they are a typical waste by-product of bifacial tool shaping and reshaping.

Dimensions of Debitage

Debitage metrics for flakes and blades are shown in Table 9-2 by grouped data, which clearly demonstrate that flakes are short, wide relative to length, and quite thin. In fact, flakes wider than they are long are in the majority (53.9%). Therefore, the average flake length is less than 3 cm—the metric border for distinguishing chips from flakes. Because so many are wider than they are long, they still fall into the flake class. Blades are, quite expectedly, on average longer than flakes, less wide, and less thick. All 34 complete blades were used for the variety of measurements. The mean flake platform width and height (thickness) are 1.0 cm and 0.3 cm, respectively. The means for blade platform width and height are 0.5 cm and 0.2 cm, respectively.

Taking into account both flake and blade metric data, it is possible to say that, despite their obvious length/width differences, they are quite similar. The great majority of flakes are short and transverse, and blades have an average length : width ratio of only 2.57 : 1. Thus, blades seem to be mostly a result of random reduction.

Some Concluding Data on Debitage

The technological observations presented above provide an understanding of flint reduction processes, which were already displayed in the preforms and cores. The main contribution is that, aside from the obvious non-Levallois flake and blade production from cores, a significant number of both flakes and blades were by-products of bifacial tool production and rejuvenation. Based upon platform characteristics such as lipping, abrasion, and obtuse angles, it is possible to suggest that approximately 20% to 35% of all flakes and about 10% to 20% of all blades were detached during bifacial tool production/rejuvenation. An attempt to arrive at precise proportions of bifacial

TABLE 9-2
Debitage and unifacial tool dimensions in Layer B of Buran-Kaya III

Length groups (cm)	*N*	*1.0–1.9*	*2.0–2.9*	*3.0–3.9*	*4.0–4.9*	*5.0–5.9*	*6.0–6.9*	*Mean*
Flake debitage	284	1.5	36.0	48.2	4.9	0.4	–	2.81
Blade debitage	34	–	–	73.5	26.5	–	–	3.62
Simple sidescrapers	29	10.3	38.0	31.0	17.3	3.4	–	3.14
Transverse scrapers	26	34.6	38.5	19.2	7.7	–	–	2.47
Convergent scrapers	49	2.0	40.8	51.1	6.1	–	–	3.03
Points	58	5.2	37.9	39.7	13.8	3.4	–	3.16
Retouched pieces	64	7.8	57.8	28.1	1.6	4.7	–	2.80
Width groups (cm)	*N*	*1.0–1.9*	*2.0–2.9*	*3.0–3.9*	*4.0–4.9*	*5.0–5.9*	*6.0–6.9*	*Mean*
Flake debitage	284	13.7	30.3	48.9	6.0	0.7	–	2.89
Blade debitage	34	97.1	2.9	–	–	–	–	1.41
Simple sidescrapers	29	6.9	58.7	27.9	3.4	3.4	–	2.75
Transverse scrapers	26	7.7	26.9	57.7	7.7	–	–	3.07
Convergent scrapers	49	4.1	49.0	28.6	16.3	2.0	–	3.13
Points	58	8.6	46.6	32.8	6.9	3.4	1.7	3.04
Retouched pieces	64	9.4	51.5	34.4	4.7	–	–	2.75
Thickness groups (cm)	*N*	*0.2–0.9*	*1.0–1.5*	*1.6–1.9*	*>2.0*			*Mean*
Flake debitage	284	90.1	8.5	0.7	0.7			0.56
Blade debitage	34	94.1	5.9	–	–			0.49
Simple sidescrapers	29	89.7	6.9	3.4	–			0.62
Transverse scrapers	26	76.9	23.6	–	–			0.65
Convergent scrapers	49	81.7	16.3	2.0	–			0.73
Points	58	91.4	8.6	–	–			0.67
Retouched pieces	64	95.3	3.1	–	1.6			0.55

shaping and thinning flakes and blades versus those unquestionably produced from cores, suggests that 29.3% of flakes and 13.8% of blades resulted from bifacial reduction. Thus, this assemblage represents the results of raw material reduction by both core techniques and bifacial tool production and rejuvenation. This will be discussed further, below. The common debitage characteristics, on the other hand, confirm the already-noted suggestion that the core reduction was based upon non-Levallois methods with a non-volumetric concept of simple ad hoc techniques.

There are no actual morphological differences between flakes and blades in the debitage, beyond that imposed by their definitions. Aside from their differing length/width ratios, their attributes are essentially the same. Therefore, there is no reason to suppose that blades (Ilam = 11%) were purposefully produced: rather, they were simply one end of a single production strategy.

Tools

Aside from chippage, tools constitute the largest category in the assemblage, even more numerous than debitage (Table 9-1). This toolkit of 545 pieces with secondary treatment permits a detailed analysis of both intra- and inter-tool groups to get at the major tendencies of tool manufacture, rejuvenation, and discard.

General Tool Assemblage Structure

Given the large number of tools in this assemblage from Buran-Kaya III Layer B, it is possible to describe the tools not only in terms of whether they are unifacial, bifacial, or have just simple retouch, but also to distinguish, within groups, which tools are complete, as opposed to broken. This is important because this tool assemblage is characterized by an abundance of both unifacial and bifacial tools with multiple retouched edges. When such are broken, during either use or rejuvenation, in most cases the original tool type and shape are not clear. For instance, the proximal or medial parts of seemingly simple—and especially—double scrapers, in reality, could have been convergent scrapers or points. Therefore, when the original state of a broken tool is not clear, it will be listed as an unidentifiable fragment or, when the choice is between a point and a scraper that depends upon a missing distal morphology, the piece will be classified as "point/scraper" (Table 9-3). When, however, a tool is broken at its proximal end or only a small lateral portion of the piece is missing, then it will be classified as if it were complete. Because of the significant occurrence of unifacial and bifacial tools of the same classes (i.e., scrapers and points), the type list has separated them and has placed simple retouched pieces into a third group (Table 9-3).

Thus, the toolkit (545 pieces) is structured in the following way: unifacial tools (64.2%), retouched pieces (22.4%), and bifacial tools (13.4 %) (Table 9-3). Complete tools (52.5%) are only slightly more common than broken tools (47.5%). Of all 73 bifacial tools, 31.5% are complete and 68.5% broken. The ratio of complete to broken tools is surprisingly identical for both unifacial tools and retouched pieces. The bifacial tools are characterized by a reverse order of

TABLE 9-3
Internal structure of the tool assemblage from Layer B

	Level B		*Level B1*		*Total Layer B*	
Unifacial tools (complete)	*50*		*132*		*182*	
Scrapers:	34		74		108	
simple		5		24		29
transverse		11		15		26
double		3		1		4
convergent		15		34		49
Points	14		44		58	
Denticulates	1		6		7	
Notches	–		3		3	
Perforators	1		2		3	
Endscrapers	–		1		1	
Burins	–		2		2	
Unifacial tools (fragments)	*31*		*137*		*168*	
Scrapers:	14		42		56	
simple		3		18		21
transverse		3		4		7
double		6		6		12
convergent		2		11		13
convergent (tiny tips)		–		3		3
Points	–		13		13	
Points (tiny tips)	2		11		13	
Denticulates	2		1		3	
Notches	–		1		1	
Endscrapers	–		1		1	
Unidentifiable (heavily fragmented/burnt) pieces	9		31		40	
Tiny fragments of retouched edges	4		37		41	
Retouched pieces (complete)	*19*		*45*		*64*	
Pieces with marginal retouch	8		23		31	
Pieces with irregular retouch	11		22		33	
Retouched pieces (fragments)	*15*		*43*		*58*	
Pieces with marginal retouch	5		24		29	
Pieces with irregular retouch	10		19		29	
Bifacial tools (complete)	*10*		*13*		*23*	
Points	6		5		11	
Scrapers	4		5		9	
Denticulates	–		2		2	
Preforms	–		1		1	
Bifacial tools (fragments)	*7*		*43*		*50*	
Points (distal parts)	–		5		5	
Points (distal tips)	1		11		12	
Points/scrapers (proximal parts)	3		6		9	
Points/scrapers (proximal ends)	–		9		9	
Points/scrapers (lateral edges)	1		7		8	
Preforms	2		5		7	

complete and broken pieces. This much higher proportional occurrence of broken bifacially retouched tools than unifacially retouched ones may well point to greater degrees of resharpening and rejuvenation of the former than the latter. On the other hand, with the tendency for bifacially retouched tools to have more than one retouched edge, it is not always clear whether the break in any way affected the relevant working edge.

Unifacial Tools

The 350 unifacial tools consist mainly of scrapers (46.8%) and points (24%), with very low percentages of other tool forms: denticulates (2.9%), notches (1.1%), perforators (0.9%), endscrapers (0.6%), and burins (0.6%) (Table 9-3). In addition, there are a good number of tiny fragments of retouched edges (11.7 %) and heavily fragmented and/or burned pieces (11.4 %). These, along with the classified yet broken tools, indicate both the effects of breakage during tool use and the processes of tool edge rejuvenation.

Removing these two unidentifiable tool groups, the definable unifacial tool sample is reduced to 269. In this case, the proportional representation of different unifacial tool groups is: scrapers = 61%, points = 31.3%, denticulates = 3.7%, notches = 1.5%, perforators = 1.1%, endscrapers = 0.7%, and burins = 0.7%. Clearly, most unifacial tools are scrapers and points, while denticulated and notched pieces account together for only 5.2%, and Upper Paleolithic types are rare at just 2.5%. At the same time, the tool group structure of the combined sample of complete and broken unifacial tools coincides with comparable data taken separately for complete and broken tools. The 182 complete unifacial tools consist of scrapers (59.4%), points (31.9%), denticulates (3.9%), notches (1.6%), perforators (1.6%), endscrapers (0.5%), and burins (1.1%). The 87 broken unifacial tools are comprised of scrapers (64.4%), points (29.9%), denticulates (3.5%), notched pieces (1.1%), and endscrapers (1.1%). This is very important for the study of the three facies of the Crimean Micoquian (Ak-Kaya, Starosele, Kiik-Koba), as it is well-known that the Kiik-Koba facies, to which Buran-Kaya III Layer B belongs, is characterized by both a large number of tool fragments and by intensive tool rejuvenation, compared to the other facies.

The blanks used in the production of unifacial tools were predominantly flakes (83.9%), with blades (3.6%), chips (11.6%), and flake-proportioned resharpening pieces (0.9%) occurring rarely. Bifacial shaping and especially, bifacial thinning debitage, including chips, account for 31 items among the tool blanks (Figures 9-5: *4, 10*; 9-6: *1, 8, 12*; 9-7: *10*; 9-8: *6, 8*).

UNIFACIAL SCRAPERS

There are 162 unifacial scrapers, of which 34.1% are broken but still classifiable. Typologically, they are evenly divided between those with one retouched edge (simple and transverse) and those with two retouched edges (double and converging). Within this unifacial scraper group, convergent are most numerous (39.6%), followed by simple (30.5%), transverse (20.1%), and double (9.8%). Complete (108) and broken examples (56) show some differences by subclass. While complete simple scrapers account for 26.8% of the class, they account for 37.5% of the broken examples. The reverse is true for the convergent scrapers: 45.4% of the complete scrapers, but only 28.6% of the broken ones. While this might lead to the conclusion that those with two retouched edges would be strong and thus less likely to break, the complete double scrapers account for only 3.7% of all complete scrapers, but 21.4% of the broken ones. The transverse scrapers follow a pattern similar to that of the convergent ones: 24.1% of the complete scrapers and only 12.5% of the broken ones. It is most likely that the type of scraper has less to do with whether or not it breaks than do its dimensions.

SIMPLE SCRAPERS According to the configuration of the retouched edge and its placement on the blanks, as well as the presence or absence of backing and/or thinning features, all simple scrapers are subdivided into straight, convex, and concave types. There are 33 on flakes, 2 on blades, 6 on chips, and 9 on unidentifiable fragments. Simple scrapers are comprised of:

- straight dorsal – 13 complete and 11 broken (Figure 9-4: *1, 2, 3, 8, 9*)
- straight dorsal, naturally backed – 1 complete
- straight dorsal, thinned base – 1 broken
- straight dorsal, truncated-faceted base – 1 complete
- straight ventral – 1 broken
- convex dorsal – 8 complete and 4 broken (Figure 9-5: *5, 9, 11*)
- convex dorsal, naturally backed – 2 complete and 1 broken (Figure 9-5: *6*)
- convex dorsal, thinned base – 1 broken
- convex ventral – 1 complete
- concave dorsal – 3 complete and 2 broken.

In sum, straight scraper edges are most common (56%), followed by convex (34%). Concave scraping edges are rare (10%). These simple scrapers exhibit very little blank modification beyond the scraping edge, and the presence of those with natural backs reflects blank selection, rather than active modification. Ventral thinning is not very characteristic for either complete (1) or broken (2) simple scrapers. Retouch types vary, from flat sub-parallel to steep stepped with the vast majority scalar (Table 9-4). Metric data are presented in Tables 9-2 and 9-5. As expected, these scrapers are somewhat larger than the unretouched debitage sample in length and thickness and only slightly smaller in width.

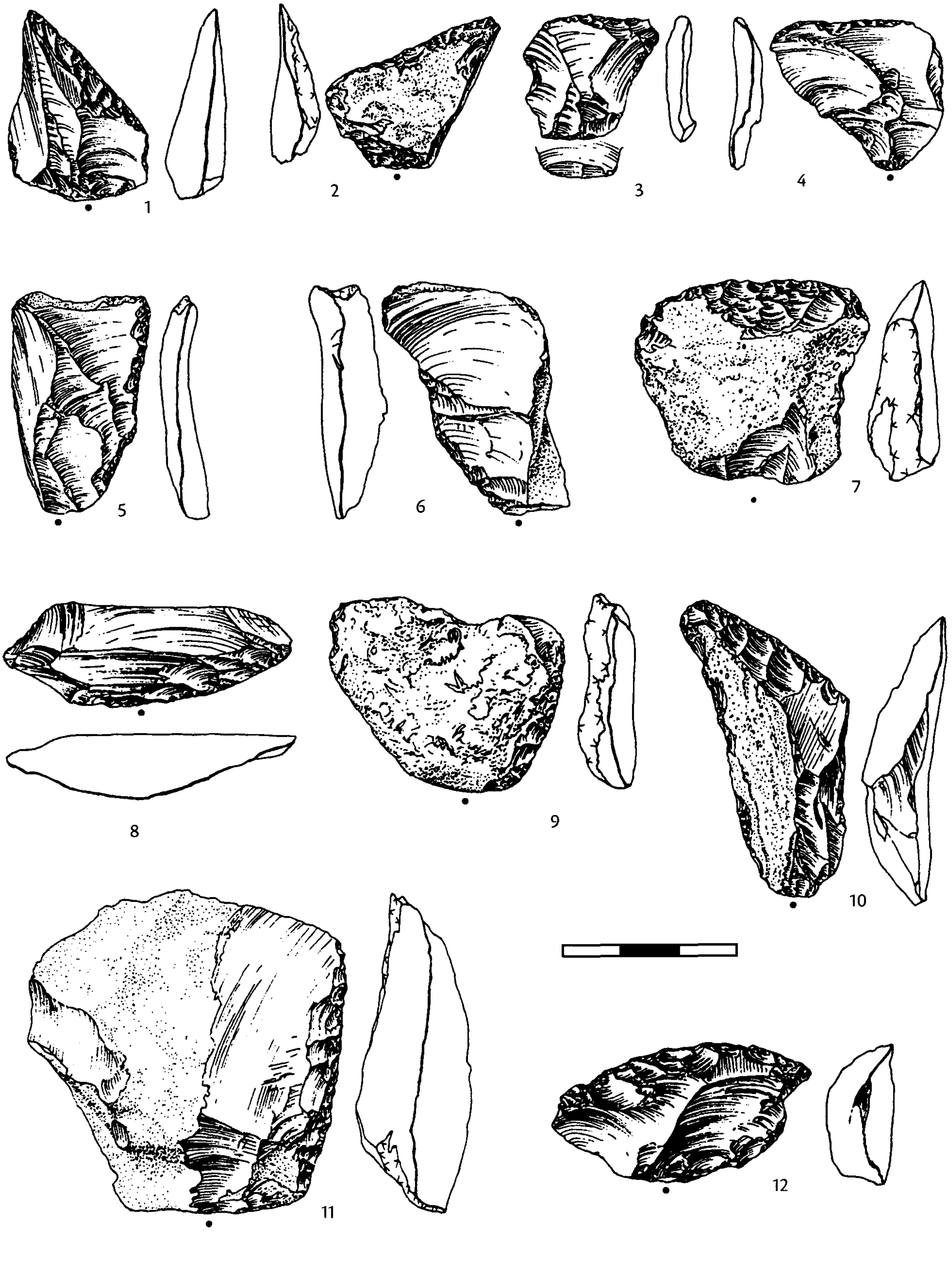

Figure 9-5—Buran-Kaya III Layer B unifacial tools: *1, 2, 3, 4, 7, 8, 10, 12*–transverse scrapers; *5, 6, 9, 11*–simple scrapers. Items 1, 3, 5, 6, 8, 9, 10, 11, 12 from Level B1; items 2, 4, 7 from Level B.

TABLE 9-4

Reduction sequence of unifacial tools reflected by variability of retouch types and angles in Layer B of Buran-Kaya III

	Simple scrapers		*Transverse scrapers*		*Double scrapers*		*Convergent scrapers*		*Points*		*Denticulates*		*Perforators*	
Retouch type	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
Scalar	21	72.4	26	78.8	28	87.5	76	64.4	89	61.8	7	46.7	4	50.0
Sub-parallel	4	13.8	4	12.1	1	3.1	10	8.5	13	9.0	–	–	–	–
Stepped	4	13.8	3	9.1	3	9.4	32	27.1	42	29.2	8	53.3	4	50.0
Retouch angle	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%
Flat	12	41.4	8	24.2	16	50.0	25	21.2	26	18.1	1	6.7	–	–
Semi-steep	12	41.4	16	48.5	9	28.1	61	51.7	99	68.7	4	26.7	2	25.0
Steep	5	17.3	9	27.3	7	21.9	32	27.1	19	13.2	10	66.6	6	75.0

TRANSVERSE SCRAPERS Of the transverse scrapers, 26 are on flakes, 2 on blades, 3 on chips, and 2 on either flakes or chips. They are subdivided as:

- straight dorsal – 9 complete and 3 broken (Figure 9-5: *2, 3, 4*)
- straight dorsal, thinned base – 1 complete
- straight oblique dorsal – 2 complete and 2 broken (Figure 9-5: *1*)
- convex dorsal – 11 complete and 2 broken (Figure 9-5: *7, 8, 12*)
- convex oblique dorsal – 2 complete (Figure 9-5: 10)
- double straight-convex dorsal – 1 complete.

The transverse scraper sample is characterized by: (1) only dorsal retouch, (2) no concave edges and an equal number of straight and convex edges, (3) a fair occurrence of obliquely-oriented scraping edges, (4) an absence of naturally backed blanks and only a single thinned example, and (5) mainly semi-steep scalar retouch (Table 9-4).

Metric data for all 26 complete transverse scrapers are shown in Tables 9-2 and 9-5. Predictably, tool length is shorter than debitage length and, equally predictably, tool width exceeds debitage width. Thickness is also greater than the mean debitage thickness, reflecting the choice of larger, thicker blanks for tool manufacture.

DOUBLE SCRAPERS Of the double scrapers, 5 are on flakes, 1 is on a blade, 1 is on a chip, and 9 have unidentifiable blanks. Twelve of the 16 are broken. They occur in the following types:

- double straight dorsal – 2 complete and 4 broken (Figure 9-6: *4*)
- double straight dorsal, thinned base – 1 broken
- straight-convex dorsal – 1 complete (Figure 9-6: 5)
- straight-convex dorsal, truncated-faceted base – 1 broken
- straight-concave dorsal – 1 broken
- double convex, dorsal – 4 broken
- convex-concave dorsal – 1 broken
- convex-concave alternate – 1 complete.

The retouched edges are straight (53.1%), convex (37.5%), and concave (9.4%). All but one alternate piece have dorsal retouch. Two cases of additional modification (ventral thinning and truncation) are noted for broken tools. Scalar retouch heavily dominates, although retouch is often flat, rather than semi-steep or steep (Table 9-4). In these attributes, they are comparable to the simple scrapers. The four complete examples range in length from 2.2 to 2.9 cm (mean = 2.62 cm), in width from 2.1 to 3.1 cm (mean = 2.52 cm), and in thickness from 0.2 to 0.7 cm (mean = 0.42 cm).

CONVERGENT SCRAPERS Most convergent scrapers are complete: 49 out of 65. Again, most were produced on flakes (51). Minor numbers were made on blades (1), either flakes or blades (3), chips (5), and on unidentifiable fragments (5). The convergent scraper types present are:

Rectangular—2

- semi-rectangular dorsal – 1 complete and 1 broken.

Ovoid—1

- sub-ovoid dorsal, thinned base and truncated-faceted back – 1 complete (Figure 9-6: *11*).

Leaf Shaped—6

- leaf-shaped dorsal – 2 complete and 4 broken.

Crescent—9

- sub-crescent dorsal – 3 complete and 2 broken
- semi-crescent dorsal, thinned base – 2 complete (Figure 9-6: *3*)
- semi-crescent dorsal, thinned back – 1 complete (Figure 9-6: *6*)
- crescent dorsal – 1 complete.

Triangular—9

- sub-triangular dorsal, thinned base – 1 complete
- sub-triangular ventral – 1 complete

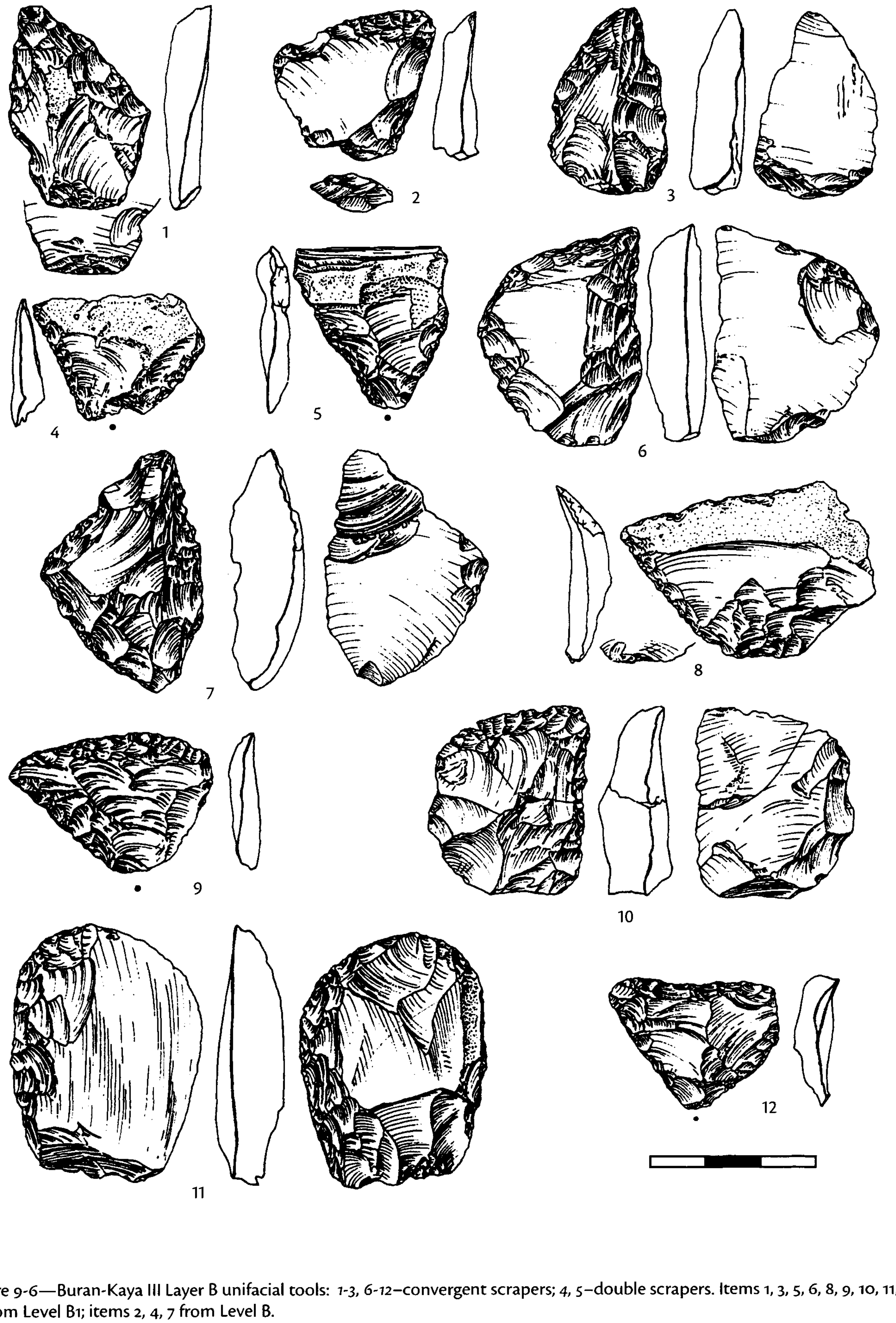

Figure 9-6—Buran-Kaya III Layer B unifacial tools: *1-3, 6-12*–convergent scrapers; *4, 5*–double scrapers. Items 1, 3, 5, 6, 8, 9, 10, 11, 12 from Level B1; items 2, 4, 7 from Level B.

TABLE 9-5
Average dimensions of major unifacial tool groups, retouched pieces, and debitage (in cm) in Layer B of Buran-Kaya III

	N	*Length (cm)*	*Width (cm)*	*Thickness (cm)*	*Transversal items (%)*
Unifacial tools (complete)					
Simple scrapers	29	3.1	2.8	0.6	41.4
Transverse scrapers	26	2.5	3.1	0.7	69.2
Double scrapers	4	2.6	2.5	0.4	25.0
Convergent scrapers	49	3.0	3.1	0.7	53.1
Points	58	3.2	3.0	0.7	50.0
Denticulates	7	2.6	3.2	0.9	85.7
Perforators	3	3.0	2.3	0.9	33.3
Retouched pieces	64	2.8	2.8	0.6	53.1†
Debitage					
Flakes	284	2.8	2.9	0.6	53.9
Blades	34	3.6	1.4	0.5	–

† Does not include the 3 blades.

- triangular dorsal – 6 complete (Figure 9-6: *12*)
- triangular dorsal, thinned terminal end – 1 complete (Figure 9-6: *7*).

Trapezoidal—35
- semi-trapezoidal dorsal – 9 complete and 6 broken (Figure 9-6: *2, 8, 9*)
- semi-trapezoidal elongated dorsal – 8 complete (Figure 9-6: *1*)
- semi-trapezoidal elongated dorsal, thinned back – 1 complete (Figure 9-6: *10*)
- semi-trapezoidal elongated dorsal, thinned base – 2 complete (Figure 9-7: *8*)
- sub-trapezoidal dorsal – 7 complete (Figure 9-7: *5*)
- sub-trapezoidal dorsal, thinned back and terminal end – 1 complete (Figure 9-7: *6*)
- trapezoidal elongated dorsal – 1 complete.

Unidentifiable (Tiny Tips)—3.

There are obvious differences between complete and fragmented convergent scrapers. First, the smaller number of broken convergent unifacial tools (including points) is because most of them are so fragmented that they are typologically unidentifiable. Second, regarding differences in shape, the main discrepancy is that significant quantities of leaf-shaped tools are broken. On the other hand, their identification is quite certain because they are distal parts. Finally, the absence of any ventrally thinned tools among broken convergent scrapers is caused by their fragmentation. Thus, the recognition of convergent scraper shape is only possible through an analysis of complete specimens.

Although there are many recognized shapes, there is a clear dominance of trapezoidal forms, a moderate number of triangular and crescent forms, but few leaf, ovoid, or rectangular examples (Table 9-6). All but one sub-triangular inversely retouched example have obverse retouch, but unlike the other scrapers, a good number of these have some other form of retouched modification. In addition, 20.4% of these scrapers have additional retouched modifications that normally thin the base or back of the tools. Two scrapers actually have two different kinds of thinning. Of the 118 retouched edges on the 49 complete pieces, about two-thirds have scalar retouch, followed by stepped and sub-parallel retouch. Retouch angles are most often semi-steep, followed by steep and flat (Table 9-4). In these observations, the retouched edges of the convergent scrapers are different from those of the simple and double scraper forms. The convergent scrapers have a significantly higher percentage of stepped retouch and, correspondingly, a lower percentage of scalar retouch than simple and double scrapers. As expected with the high percentage of stepped retouch, there are comparatively few flat retouched edges among the convergent scrapers. At the same time, convergent scraper retouch angles are similar to only transverse scrapers, while simple and double scrapers are very different (Table 9-4). Finally, ventral thinning on convergent scrapers (20.4%) is much more common than on other complete scraper types (2–3.4%).

Metrics of all 49 complete convergent scrapers are found in Tables 9-2 and 9-5. Of all measured pieces, 26 (53.1%) have transverse proportions, which is why the mean width is a little larger than the mean length.

UNIFACIAL POINTS

Of 84 points, 58 are complete and 26 broken; about the same proportions (2.2 : 1) as for scrapers (1.9 : 1). Of these, 61 are on flakes, one on a flake or blade, one on a flake or chip, 6 are on chips, two are on resharpening pieces, and the blank form on 13 of the fragments is unidentifiable. Point types are as follows:

Lateral—1
- lateral dorsal, thinned base—1 complete (Figure 9-7: *2*).

Crescent—8
- semi-crescent dorsal – 4 complete and 1 broken
- semi-crescent dorsal, thinned base – 1 complete (Figure 9-7: *1*)
- semi-crescent dorsal, thinned back – 1 complete
- sub-crescent dorsal – 1 complete (Figure 9-7: *7*).

Hook-Like—6
- sub-hook-like dorsal, truncated-faceted base – 2 complete
- sub-hook-like dorsal, thinned base – 1 complete (Figure 9-7: *10*)
- sub-hook-like dorsal, thinned back and base – 1 complete
- sub-hook-like dorsal, thinned base and terminal end – 1 complete
- hook-like dorsal, thinned back and base – 1 complete (Figure 9-7: *9*).

Triangular—12
- sub-triangular dorsal – 3 complete and 3 broken (Figure 9-7: *4*)
- sub-triangular dorsal, thinned base – 1 complete

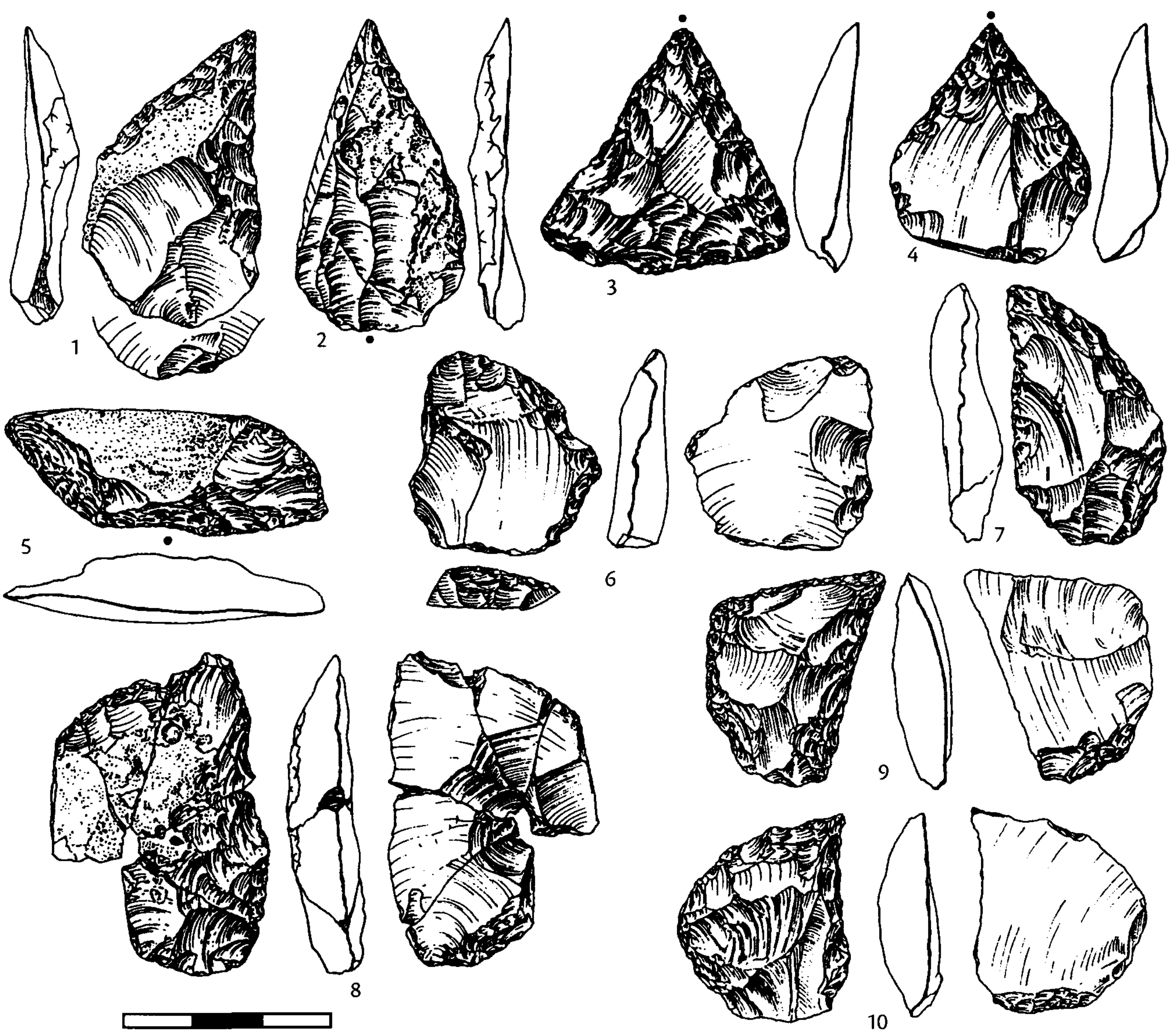

Figure 9-7—Buran-Kaya III Layer B unifacial tools: *1, 2, 3, 4, 7, 9, 10*–points; *5, 6, 8*–convergent scrapers. Items 1, 2, 3, 7, 9, 10 from Level B1; items 4, 5, 6, 8 from Level B.

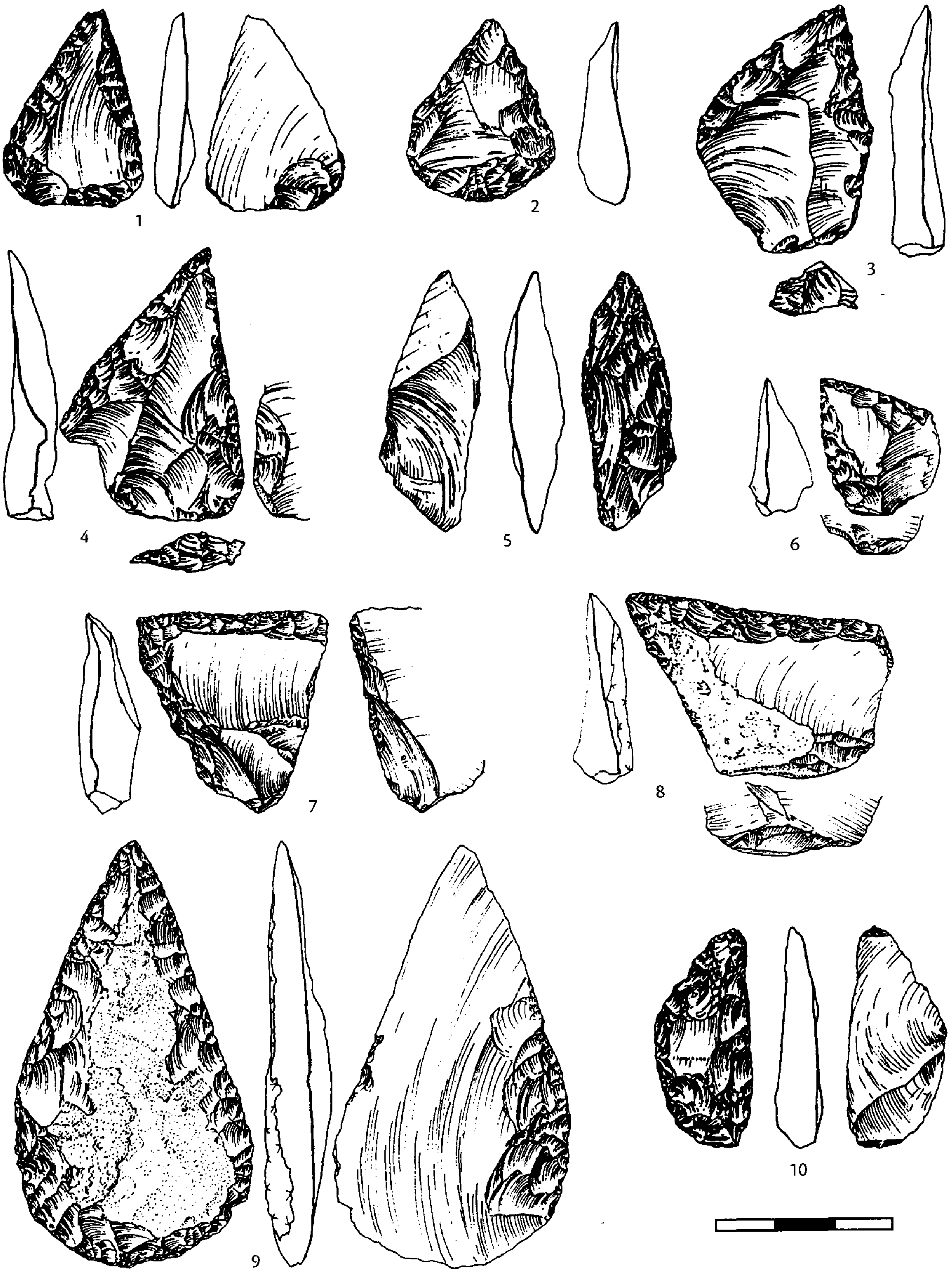

Figure 9-8—Buran-Kaya III Layer B unifacial tools: *1–10*–points. Items 1–6, 8, 10 from Level B1; items 7, 9 from Level B.

- sub-triangular dorsal, thinned back – 1 broken
- triangular dorsal – 2 complete (Figure 9-7: *3*)
- triangular dorsal, thinned base and back – 1 complete (Figure 9-8: *1*)
- triangular alternate, thinned back – 1 complete (Figure 9-8: *7*).

TRAPEZOIDAL—27

- semi-trapezoidal dorsal – 7 complete and 7 broken (Figure 9-8: *6, 8*)
- semi-trapezoidal dorsal, thinned base – 1 complete
- semi-trapezoidal dorsal, naturally backed and thinned base – 1 complete
- semi-trapezoidal elongated dorsal – 5 complete (Figure 9-8: *3, 4*)
- sub-trapezoidal dorsal – 1 complete (Figure 9-8: *5*)
- sub-trapezoidal dorsal, thinned base and back – 1 complete
- sub-trapezoidal elongated dorsal – 1 complete
- trapezoidal dorsal – 1 complete (Figure 9-8: *10*)
- trapezoidal elongated dorsal – 1 complete
- trapezoidal elongated dorsal, thinned base – 1 complete.

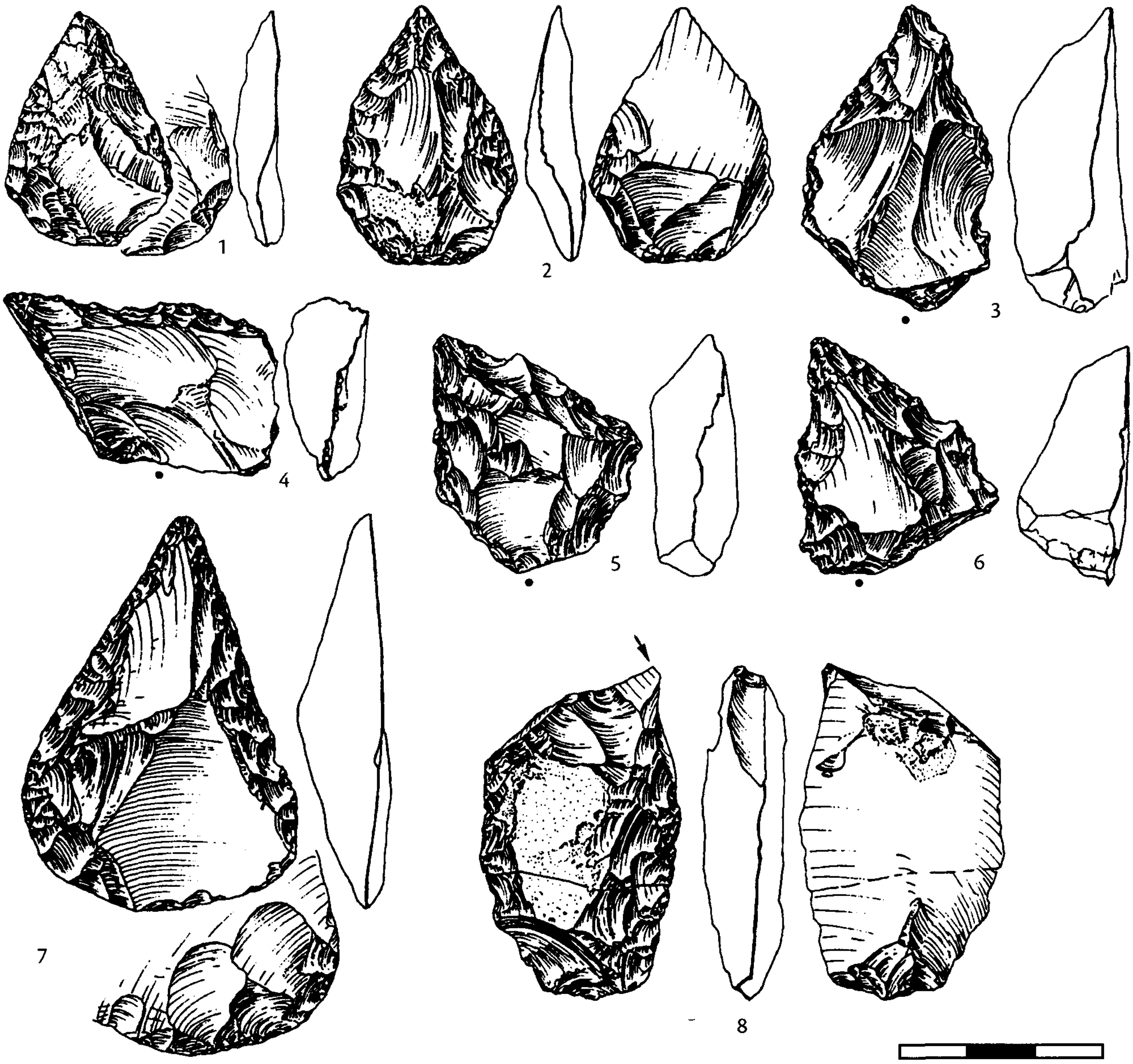

Figure 9-9—Buran-Kaya III Layer B unifacial tools: 1, 2, 7–points; 3, 4, 5, 6,–denticulates; 8–burin. Items 1–3, 5–8 from Level B1; item 4 from Level B.

Leaf Shaped—17

- sub-leaf dorsal – 1 complete and 1 broken
- leaf shaped dorsal – 8 complete (Figure 9-8: *2*)
- leaf shaped dorsal, thinned back – 1 complete (Figure 9-8: *9*)
- leaf shaped dorsal, thinned base – 2 complete (Figure 9-9: *1*)
- leaf shaped dorsal, thinned base and back – 4 complete (Figure 9-9: *2, 7*).

Unidentifiable (Tiny Tips)—13.

The reasons noted above for using only complete pieces for the analysis of convergent scraper morphology are also valid for analysis of points. As with the convergent scrapers, various trapezoidal forms are dominant; but, unlike the scrapers, leaf shapes are common (Table 9-6). Other forms occur only in moderate numbers: triangular, crescent, and hook-like, plus a single lateral example.

As for all the scraper groups, all but one of these have dorsal retouch. The frequency of thinning is high (39.7%) and that is without counting the combinations of two different kinds of thinning on 9 points. Retouch types and angles are dominated by scalar semi-steep retouch (Table 9-4).

These morphological features are significant in comparison with the scrapers. Thinning occurs twice as often on points than it does on convergent scrapers (39.7% versus 20.4%).

Semi-steep retouch occurs more often on points than it does on simple, transverse, and convergent scrapers (Table 9-4). Other attributes do not show such differences, however. Stepped retouch is marginally higher on the points and flat retouch marginally lower. Scalar retouch, again, is only a few percentage points lower than the lowest occurrence among the scrapers (Table 9-4).

Shapes show significant differences, even given the differences imposed by the definitions of scrapers and points (Table 9-6). This also applies to the convergent scrapers, which, intuitively, should be very similar. This is not the case. There are no hook-like scrapers, while such pieces account for 10.3% of all points. The main difference, however, is a radical shift from trapezoidal to leaf shapes. If the trapezoidal and leaf shapes are the most common among the points (34.5 and 27.6%, respectively), the convergent scrapers demonstrate quite different proportions: 59.2% and 4.1%, respectively. Given that other point and convergent scraper shapes are comparable, the differences between the point and scraper shapes directly relates to a decrease in trapezoidal points matched by an increase in leaf-shaped points.

The dimensions of points are found in Tables 9-2 and 9-5 and do not differ much from those of the scrapers.

Table 9-6
Shape types of complete unifacial and bifacial convergent scrapers and points (in percentages) in Layer B

	Unifacial convergent scrapers	*Unifacial points*	*Bifacial convergent scrapers*	*Bifacial points*
Lateral	–	1.7%	–	–
Ovoid	2.0%	–	–	–
Rectangular	2.0%	–	–	–
Hook-like	–	10.3%	20.0%	–
Crescent	14.3%	12.1%	20.0%	18.2%
Triangular	18.4%	13.8%	–	–
Leaf-shaped	4.1%	27.6%	20.0%	54.5%
Trapezoidal	59.2%	34.5%	40.0%	27.3%
N	49	58	5	11

unifacial denticulates

There are 7 complete denticulates and 3 broken. While rare in the assemblage, their secondary treatment is peculiar and important for understanding unifacial tool reduction. Of the 10 examples, 8 are on flakes, 1 is on a blade or flake, and 1 is on a chip:

- straight dorsal – 1 broken
- concave dorsal – 1 broken
- transverse convex – 1 complete (Figure 9-9: *4*)
- double straight dorsal – 1 complete
- semi-trapezoidal dorsal – 3 complete (Figure 9-9: *6*)
- sub-trapezoidal dorsal – 1 complete (Figure 9-9: *5*)
- sub-leaf dorsal – 1 complete (Figure 9-9: *3*)
- semi-rectangular dorsal – 1 broken.

The number of two-edged convergent denticulates is striking. Although the sample is small, it appears that convergent forms are the most common and as for both convergent scrapers and points, there is a dominance of pieces with semi- and sub-trapezoidal shapes. Such shape similarity is also matched by the data on retouch types and retouch angles seen on 15 retouched edges of the 7 complete denticulates (Table 9-4). All denticulates have obverse retouch and none has additional thinning.

The 7 complete denticulates are distinctive in comparison with the scrapers and points, as they have the highest number of transverse pieces (6) and are the thickest (Table 9-5). Length ranges from 2.1 to 3.6 cm, where the longest item (3.6 cm) is the only one exceeding 3 cm. Width ranges from 2.7 to 3.9 cm and there are just two examples less than 3 cm wide: one 2.7 cm and the other 2.8 cm. Thickness ranges from 0.4 to 1.5 cm.

All these observations indicate that the unifacial denticulates exhibit a greater degree of reduction compared to the scrapers and points, and at the same time, have significant similarities to the scrapers and points in their shape and secondary treatment. Therefore, it is reasonable to suggest that most, if not all, denticulates (especially convergent ones) are, in fact, a result of multiple rejuvenations of unifacial scrapers and points. This is a process similar to that described in the production of Quina retouch (Lenoir 1986). Hence, it is assumed that denticulates, as a purposeful tool type, did not exist in the Buran-Kaya III Layer B toolkit.

NOTCHES

Among the notches, 3 are complete and 1 is broken. All are obverse, simple lateral dorsal. The one on a broken blank is on a medial flake fragment with a truncated-faceted edge, suggesting it may have originally been a more complex tool. All are formed by retouch: 1 scalar, 1 sub-parallel, 2 stepped, 1 semi-steep, and 3 steep. No Clactonian notches were noted. Two notches were made on chips, 1 on a blade, and 1 on a blade or flake fragment. The complete specimens have highly variable metrics: 1.8 to 4.8 cm in length, 1.4 to 3.5 in width, and 0.6 to 1.3 cm in thickness.

PERFORATORS

Perforators are rare (3 items) but typologically interesting. In contrast to the usual Middle Paleolithic perforators with small and isolated pointed tips, these have retouch well down each side of the perforating point onto the blank and no difference in retouch quality between the tip and other retouched edges. Thus, these possibly are examples of a last rejuvenation stage for unifacial scrapers and points when the tips of these pieces were resharpened, forming a very pronounced and protruding perforator-like tip. Accordingly, the presence of intentionally manufactured perforators here is doubtful. It is also worth noting that some Middle Paleolithic industries with numerous unifacial convergent scrapers and points are also characterized by perforators, interpreted as rejuvenated points and scrapers. For example, see the perforators of subtypes 34a and 34d for the Zagros Mousterian industry of layer D at Shanidar Cave (Iraq) (Solecki and Solecki 1993:26-127, Fig. 4.8: a-c, h).

Each perforator is different: there is one that is subtriangular with a thinned terminal end (Figure 9-10: *1*), one that is trapezoidal with a truncated-faceted base (Figure 9-10: *3*), and one that is elongated trapezoidal elongated with a natural back (Figure 9-10: *2*). The retouch types and angles for the combined retouched edges are scalar and stepped (50% each), semi-steep (25%), and steep (75%). The perforators are 3.9, 2.7, and 2.3 cm long; 2.0, 2.2, and 2.7 cm wide; and 0.8, 1.2, 0.6 cm thick.

ENDSCRAPERS

One endscraper is complete (Figure 9-10: *5*), the other broken. These are obversely retouched, canted endscrapers on flakes with short, transverse proportions: 2.0 and 2.1 cm long, 3.4 and 3.0 cm wide, and 0.4 and 0.9 cm thick. Each of these has an endscraper-like, rounded, and rather narrow retouched edge situated along one of the lateral edges and, moreover, the edge is directly adjacent to the distal end that is also retouched. Thus, both specimens could have been classified as semi-trapezoidal scrapers. The presence of the endscraper-like convex and narrow retouched edge, nevertheless, permits us to call them atypical endscrapers.

BURINS

There were only 2 burins, both on flake fragments, which had clear burin spall scars. Both are typologically angle burins. These items, most likely, are not genuine burins. One of them (Figure 9-9: *8*), without taking into consideration the single-edged burin-like facet, is a unifacial double convex, bi-truncated-faceted scraper with stepped and semi-steep retouch and a scalar and flat retouch. In this case, the burin facet probably resulted from an unsuccessful removal of one of the truncated-faceting scars struck from the blank's distal end. The other piece has two burin-like facets removed from the flake's distal breakage, but these facets removed no more than one-third of the whole length of the flake's lateral edge and the remaining two-thirds of its edge has stepped and semi-steep retouch. This suggests the possibly of a simple convex scraper with an unsuccessful attempt of additional thinning from the distal end. On the other hand, typologically, both are burins, although probably not purposeful.

In sum, although there are typologically clear Upper Paleolithic tool types (perforators, endscrapers, burins) in this toolkit, they are proportionately rare among the unifacial tools (2.6%). More importantly, there are no serious morphological grounds to suggest the presence of purposefully and repetitively-made Upper Paleolithic tool types here. As discussed above, they resulted most likely from different variations of unifacial scraper and point secondary treatment and rejuvenation.

RETOUCHED PIECES

Retouched pieces account for a significant proportion (24.4%) of all tools (Table 9-3). They are divided between those with regular, continuous, or partial retouch on one or more edges and those where the retouch is irregular and discontinuous. The latter most probably are from usewear, rather than purposeful retouch, although even those with continuous retouch could have been formed by use. Marginally retouched pieces are evenly split between whole blanks (31) and broken blanks (29) and this pattern pertains as well to the irregularly retouched pieces (33 whole and 29 broken). With the exception of three examples, all retouch is obverse, although one piece has alternate retouch and another has a thinned base.

For the marginally retouched pieces, 29 are on flakes, 4 are on blades, and 14 are on chips, while for 13 the blank is either unknown or questionable. For the irregularly retouched pieces 43 are on flakes, 3 are on blades, 9 are on chips, while 7 are on unidentifiable blank fragments. When the complete blank sample is considered, 53.1% are transverse—wider than they are long (Table 9-5). This is certainly related to the high percentage of blanks that came from bifacial shaping and thinning (49.2%).

Using a scraper construct, the majority of marginally and irregularly retouched pieces (61.5%) have only one modified lateral edge, 22.1% have a single modified transverse edge, 8.2% are bilaterally retouched, and 8.2% have bilateral converging retouch.

RETOUCHED PIECES WITH MARGINAL RETOUCH The position and completeness of the retouch for all retouched pieces with marginal retouch are:

- lateral continuous – 30 (Figure 9-10: *6, 7*)
- lateral ventral continuous – 1
- lateral discontinuous – 5
- lateral and distal continuous – 2
- lateral and distal discontinuous – 2
- distal continuous – 8
- distal discontinuous – 4
- distal and lateral ventral discontinuous – 1
- sub-trapezoidal elongated (3 edges) continuous – 1
- bilateral continuous – 2 (1 is denticulated)
- bilateral alternate continuous – 1
- sub-triangular alternate continuous – 1
- bilateral ventral continuous – 1 (denticulated)
- lateral ventral continuous – 1.

RETOUCHED PIECES WITH IRREGULAR RETOUCH The completeness and position of the retouch for all retouched pieces with irregular retouch are:

- lateral partial – 35
- distal partial – 7 (1 with thinned base, Figure 9-10: *4*)
- lateral continuous – 1
- proximal partial – 1
- bilateral partial – 5
- bilateral alternate – 1
- distal partial – 1
- distal and lateral partial – 3
- ventral lateral continuous – 2.

Given the number of converging examples and the parallel between scraper forms and the continuously retouched forms, it is possible these represent initial stages of unifacial tool formation.

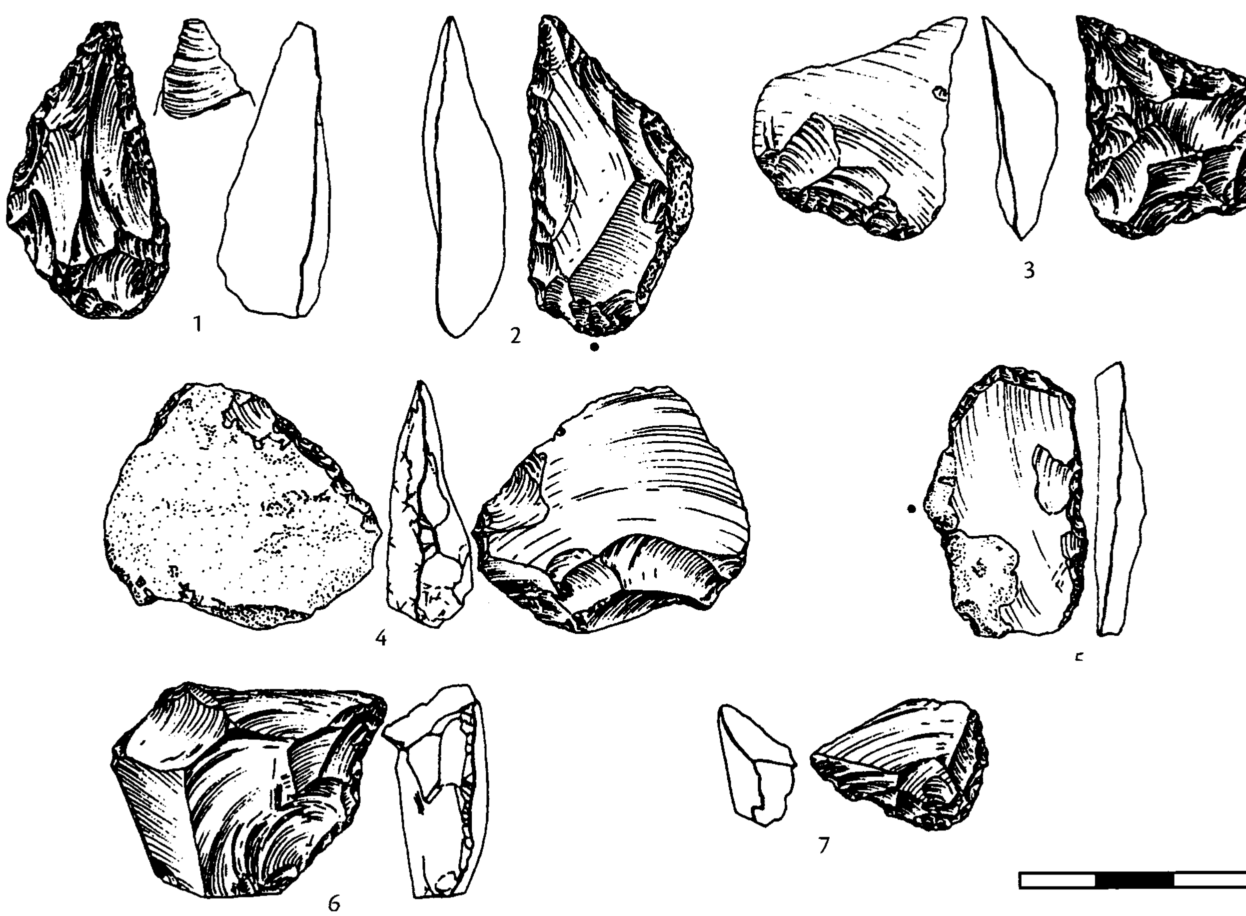

Figure 9-10—Buran-Kaya III Layer B unifacial tools (1, 2, 3, 5) and retouched pieces (4, 6, 7): *1–3*–perforators; *4*–retouched piece with dorsal distal irregular partial retouch and thinned base; *5*–atypical end-scraper; *6–7*–specially transversally fragmented retouched pieces with dorsal lateral marginal retouch. Items 2, 3, 5 from Level B1; items 1, 4, 6, 7 from Level B.

Bifacial Tools

Classification of all 73 bifacial tools according to the different tool groups (preforms, points, scrapers, denticulates) is presented in Table 9-3.

Among the bifacial tools there are 28 points (59.6%), 9 scrapers (19.1%), two denticulates (4.3%), and 8 preforms (17.0%). In addition, there are 26 fragments of bifacial tools that are too small and incomplete to permit classification into recognized types, so they have been classified as point/scrapers (Table 9-3). The bifacial tools differ significantly from the unifacial tools: there are almost twice as many scrapers as points. Another difference is that there is a higher ratio of broken to complete bifacial tools (2.2 : 1) than is the case for unifacial tools (0.9 : 1). A possible explanation for this will be discussed below, after the description of the samples. Of all 23 complete pieces, the original blank form could be recognized on only 4 (2 flakes and 2 plaquettes), because most had surfaces extensively covered by numerous preparation and retouch scars.

BIFACIAL PREFORMS

The one complete example of a bifacial preform (Figure 9-11: *7*), on heavily patinated flint, is 4.4 cm long, 3.5 cm wide, and 1.6 cm thick. It was evidently broken longitudinally but then reutilized by some secondary treatment. Its blank form is unidentifiable. Although it has some primary cortex on one surface, it is uncertain whether it was a plaquette or a primary flake. Its treatment in a probable plano-convex technique permits its classification as a bifacial preform with clear analogies to different Crimean Micoquian facies (e.g., Marks et al. 1996). The 7 fragments include 2 on plaquettes, but most have only rough shaping scars, indicating breakage during early stages of reduction.

BIFACIAL POINTS

The complete bifacial points include 2 on flakes. The other 9 are too completely covered with large shaping and retouch flake scars to distinguish whether they were made on flake or plaquette blanks. All were produced by a plano-convex reduction technique. By shape and secondary treatment, they are:

- leaf-shaped – 1
- leaf-shaped, truncated-faceted base – 1 (Figure 9-11: *3*)
- sub-leaf-shaped – 1 (Figure 9-11: *2*)
- semi-leaf-shaped (reutilized) – 3 (Figure 9-11: 7)
- trapezoidal elongated – 1 (Figure 9-11: *5*)
- trapezoidal elongated, alternate – 1
- sub-trapezoidal elongated (reutilized) – 1
- semi-crescent, thinned and concave (notched) base – 1 (Figure 9-11: *4*)
- semi-crescent, alternate (reutilized) – 1 (Figure 9-11: *6*)
- unidentifiable (distal parts and tips) – 17 (Figure 9-12: *2*, *9*).

Various leaf-shaped points account for just over half of the sample (Table 9-6). These are recognized, when whole, by being symmetrical and almost perfectly leaf-shaped. On the other hand, such points tend to be medially broken and when the broken part is reutilized/rejuvenated with fine retouch, the resulting shape becomes semi-leaf. The only exception is the sub-leaf point, which has no retouched distal end. This relates most likely to the tool's original blank shape and its overall delicacy. All leaf-shaped points are exclusively characterized by bifacial plano-convex technique retouch from initial shaping through final retouching. One of the leaf-shaped points is also notable by a clear truncated-faceted base.

Trapezoidal elongated points are similar to leaf-shaped ones because of their similar reduction. This refers to both complete plano-convex reduced points on flake blanks and to reutilized trapezoidal points. One burned example, however, has a peculiar plano-convex-alternate retouch where each of the two converging edges was treated with the plano-convex technique, but different sides were used for shaping and retouching. Such an uncommon bifacial reduction technique is evidence of the piece's multiple usage and rejuvenation, and should not be considered a special reduction technique.

One of the semi-crescent points with bifacial, plano-convex-alternate reduction and some medial reutilization emphasizes the former suggestion that it represents a long use-life. Another intact semi-crescent point (Figure 9-11: *4*) has considerable thinning and a resulting basal concavity (approaching a notched form) with a flute-like scar coming from it on a convex surface, resembling a North American Paleo-Indian Clovis point. These bifacial points range in length from 3.2 to 5.5 cm, in width from 2.1 to 3.8 cm, and in thickness from 0.6 to 1.3 cm (Table 9-7). They average 4.13 cm long, 3.05 cm wide, and 1.03 cm thick.

Distal fragments of points range from tips no longer than 1.5 cm to one greater than 3.0 cm (Figure 9-12: *2*). While all were formed with a plano-convex technique, two exhibit a plano-convex-alternate technique (Figure 9-12: *9*).

BIFACIAL SCRAPERS

Bifacial scraper blanks include 2 on plaquettes and 7 too heavily reduced to be identifiable. The following types, all produced by a plano-convex technique, are found:

- convex (reutilized) – 2 (Figure 9-12: *8*)
- convex, naturally backed (reutilized) – 1 (Figure 9-12: *1*)
- double convex, thinned base and terminal end/bi-truncated-faceted – 1

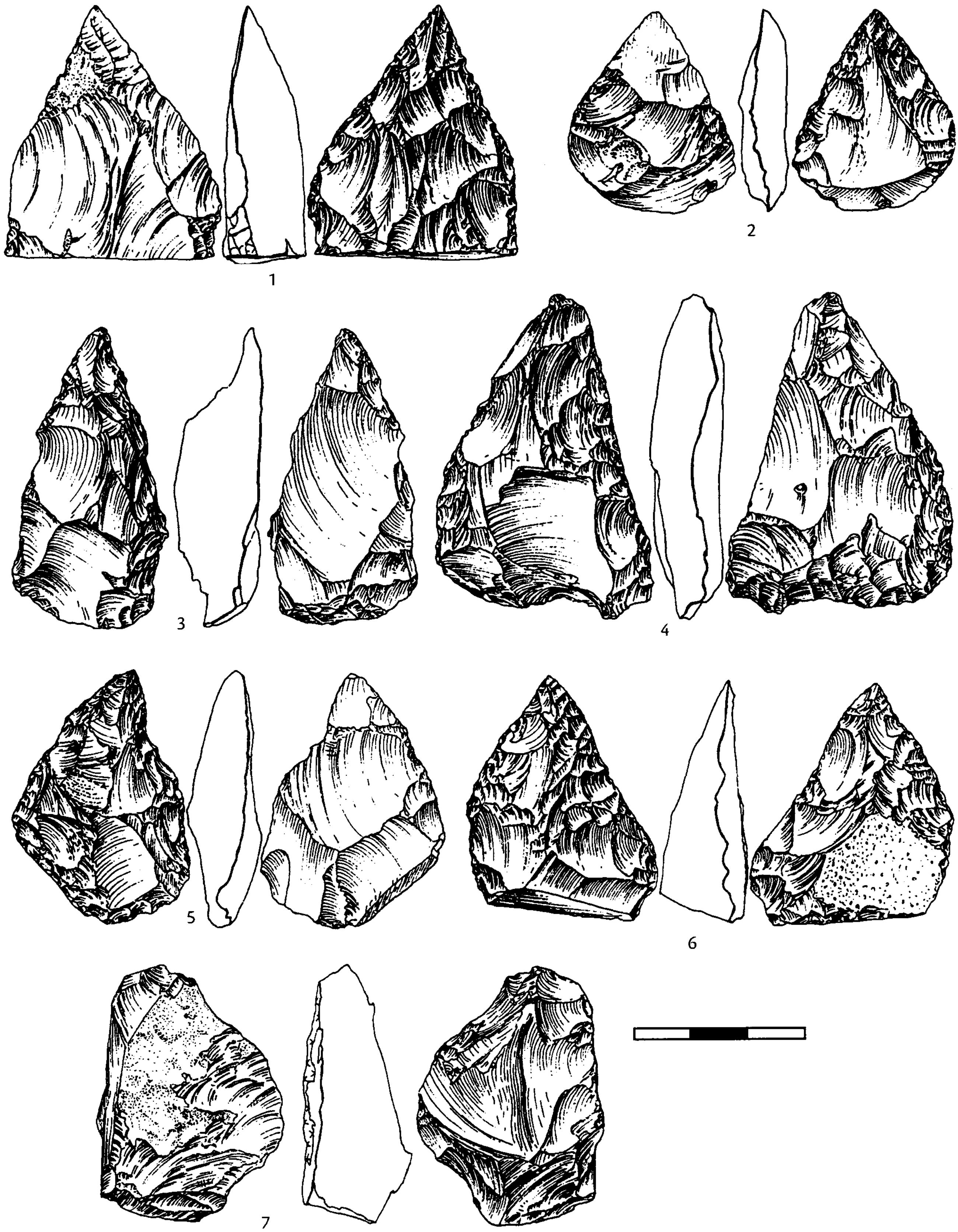

Figure 9-11—Buran-Kaya III Layer B bifacial tools: *1-6*–points; *7*–preform. Items 1, 2, 4, 7 from Level B1; items 3, 5, 6 from Level B.

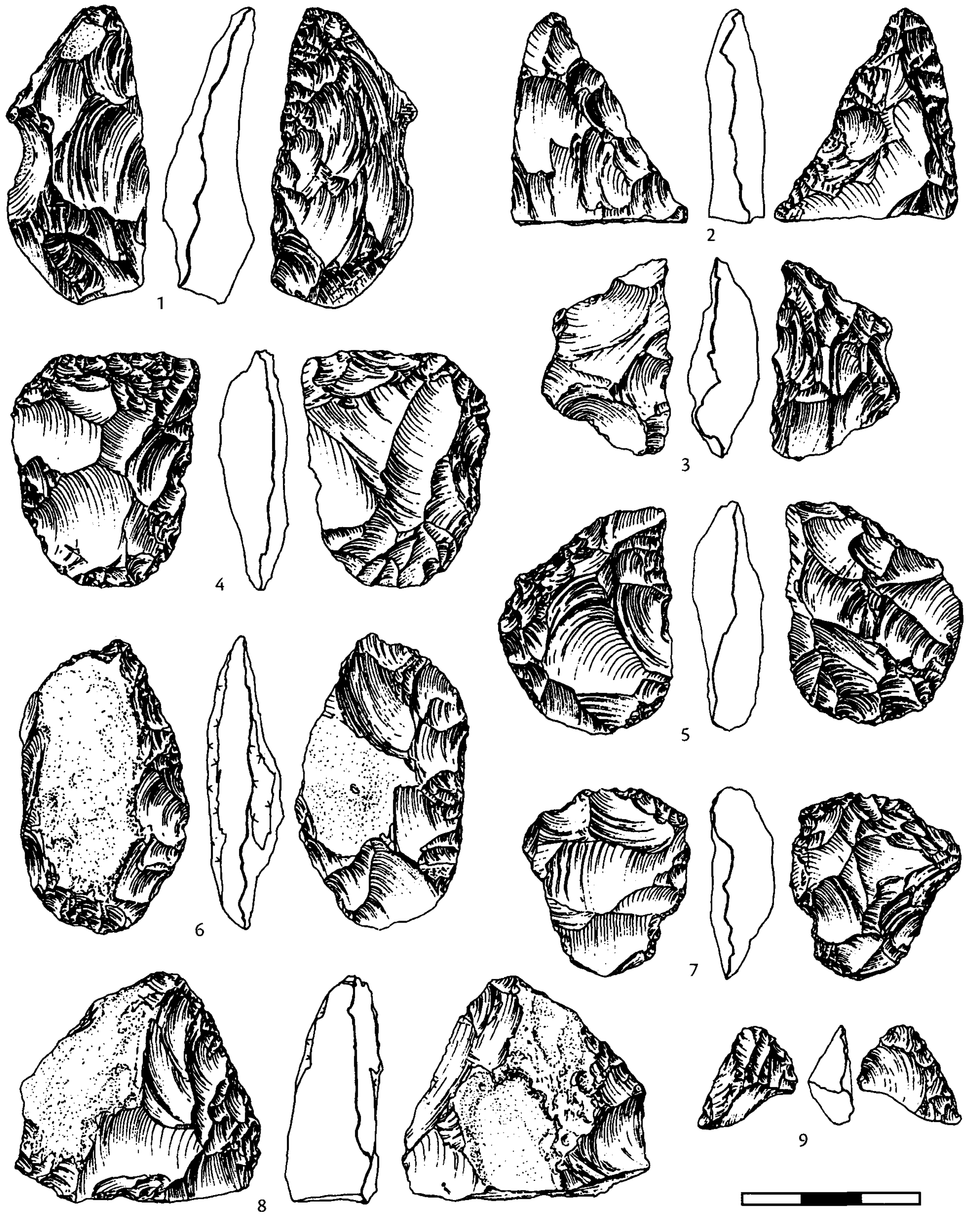

Figure 9-12—Buran-Kaya III Layer B bifacial tools: *1, 4, 5, 6, 8*–scrapers; *3, 7*–denticulates; *2*–point (distal part); *9*–point (distal tip). Items 1–5, 7, 9 from Level B1; items 6, 8 from Level B.

TABLE 9-7
Average metrics (in cm) of bifacial tool groups in Layer B of Buran-Kaya III

	N	*Length*	*Width*	*Thickness*	*Transversal items (%)*
Preform	1	4.4	3.5	1.6	—
Single-edged scrapers	3	4.2	3.1	1.3	33.3
Double-edged scrapers	1	4.2	2.9	0.9	—
Convergent scrapers	5	3.8	2.9	1.1	—
Points	11	4.1	3.1	1.0	9.1
Denticulates	2	2.5	3.0	1.0	50.0

- semi-leaf-shaped, thinned oblique base (reutilized) – 1
- trapezoidal elongated – 2 (Figure 9-12: *4*)
- sub-crescent – 1 (Figure 9-12: *6*)
- hook-like, alternate – 1 (Figure 9-12: *5*).

Simple scrapers and convergent ones occur about equally. The simple scrapers are characterized by either a significant reutilization of a broken lateral and/or medial section for single-edged items or a multiple rejuvenation of the double-edged piece by transforming a sub-trapezoidal scraper into a double one. This permits the suggestion that the simple scrapers are, in fact, initially convergent scrapers, broken pieces of which were subsequently used as blanks for an additional simple scraper edge.

The convergent scrapers (55.6%), aside from a single hook-like plano-convex-alternate form, are comparable in shape to the bifacial points (Table 9-6). Trapezoidal and crescent pieces, however, are regularly and thoroughly retouched by both rough treatment (forming the plano surface) and retouch (the convex surface). On the other hand, leaf-shaped and hook-like scrapers are different. The leaf-shaped specimen was broken and then reutilized, resulting in an accidental semi-leaf shape. The hook-like piece has both good secondary retouch, as well as a rounded base formed by an alternate plano-convex technique. This shift in technique indicates multiple usage and/or rejuvenation.

Thus, it is possible to see the same general characteristics for the bifacial scrapers as for the bifacial points and it is probable that some would have been points had they not been broken and then rejuvenated. Measurements of the bifacial scrapers are as follows: length = 3.3 to 4.9 cm (mean = 3.99 cm); width = 2.3 to 4.0 cm (mean = 2.96 cm); and thickness = 0.9 to 1.5 cm (mean = 1.16 cm). The somewhat smaller length and width values of the scrapers as compared to the points (Table 9-7), again, suggest that some were merely rejuvenation points.

BIFACIAL DENTICULATES

While it is quite unusual to classify bifacial tools as denticulates in Middle Paleolithic assemblages, distinguishing heavily denticulated plano-convex tools in a toolkit will most likely help define some peculiarities of secondary treatment and rejuvenation performed on bifacial tools, at least in this assemblage. These denticulates are trapezoidal plano-convex specimens. They are on unidentifiable blanks (Figure 9-12: *3, 7*), 3.0 and 2.0 cm long, 2.8 and 3.2 cm wide, 0.9 and 1.0 cm thick. The first piece is trapezoidal elongated, although the elongation is more related to our subjective judgment about tool orientation than any knowledge of actual use orientation. These denticulates are interesting in that their lengths and widths are smaller than most of the bifacial points and scrapers. This suggests they under went greater rejuvenation. Accordingly, the denticulated edges are interpreted to be final preparation attempts for further reduction that was not realized and therefore, the denticulation was preserved. The thickness of these pieces is about 1.0 cm, basically corresponding to the usual thickness for all bifacial tools in this assemblage. Metrical parameters are best seen through mean dimensions—3.95 cm long, 3.03 cm wide, 1.09 cm thick—as there are no large differences between the particular tool groups here (Table 9-7).

In summary, the high proportional occurrence of fragmentary bifacial tools, with denticulations, with thinning, etc., all point to intensive bifacial tool production but, more importantly, to extensive and intensive tool reformations and rejuvenation.

SPECIFIC WASTE FROM TOOL REJUVENATION

Aside from the oft noted presence of bifacial shaping and thinning elements as tool blanks, in terms of tool treatment waste, the assemblage is distinctive in its numerous rejuvenation products from the tips of unifacial and bifacial convergent tools (see Table 9-1): 134 examples (0.8% of the whole assemblage). These rejuvenation pieces serve as very clear indications of multiple on-site resharpening of retouched edges from both unifacial and bifacial convergent scrapers and more often, from points. They serve as evidence for the transformation of convergent tool shapes during rejuvenation.

This peculiar tool rejuvenation waste is usually a chip with a maximum width and length less than 3 cm. It is morphologically characterized by an expanding shape, most predominantly transverse, and almost always rhomboidal, where one of two transversal terminations is represented by a retouched pointed tool tip, while the second transverse termination does not bear any retouch. Unifacial tool tips have retouch only on the dorsal surface of one of two triangular transverse terminations (Figure 9-13: *1, 3, 4, 8*), while bifacial rejuvenation pieces have rough scars and retouch scars on both ventral and dorsal surfaces of one of the two triangular terminations (Figure 9-13: *2, 9, 10*). There are virtually twice as many examples from unifacial tools as from bifacial ones. Yet, the extremely small size of some of these makes them difficult to recognize, so this ratio may not be meaningful. It is also important to note that these specific rejuvenation pieces of both unifacial and bifacial convergent tool tips are not chips derived from intentional removal of the tips. Rather, they are real chips from resharpening edges adjacent to tips, resulting from strong blows, instead of a detachment of a tiny portion of a retouched edge.

As a rule, pieces derived from different secondary treatment and/or rejuvenation of unifacial and bifacial tools in European Lower and Middle Paleolithic assemblages, are usually, if at all, published as bifacial shaping and thinning flakes—e.g., the French Acheulian (Bordes 1961: fig. 1, 6 for Cagny); the Mousterian of Acheulian tradition, type A (Bordes 1961: fig. 1, 8; Bordes 1972: fig. 26, 1–4 for Pech de l'Azé I, layer 4); the Central European Micoquian (Wetzel and Bosinski 1969: Tafel 16, 6, 9 for complex IIIa of Bockstein cave; Mania and Toepfer 1973: Tafel 22, 1-13; Tafel 31, 3 for complex A of Königsaue; Richter 1997: Tafel 20, 8-9 for G-complex of Sesselfelsgrotte). On the other hand, specific rejuvenation pieces from bifacial and unifacial convergent tool tips are either not defined at all or very rarely illustrated in publications, e.g., the German Micoquian (Wetzel and Bosinski 1969: Tafel 18, 10-12, 14-15; Tafel 19, 2, 9; Mania and Toepfer 1973: Tafel 29, 4; Richter 1997: Tafel 102, 6), as well as the Zagros-like Mousterian industry of Erevanskaya Cave in Armenia (Eritsyan 1972: Fig. 14, 15, 16). The scarcity of identification of these specific tool resharpening waste products is mainly due to their being either simply included into a common

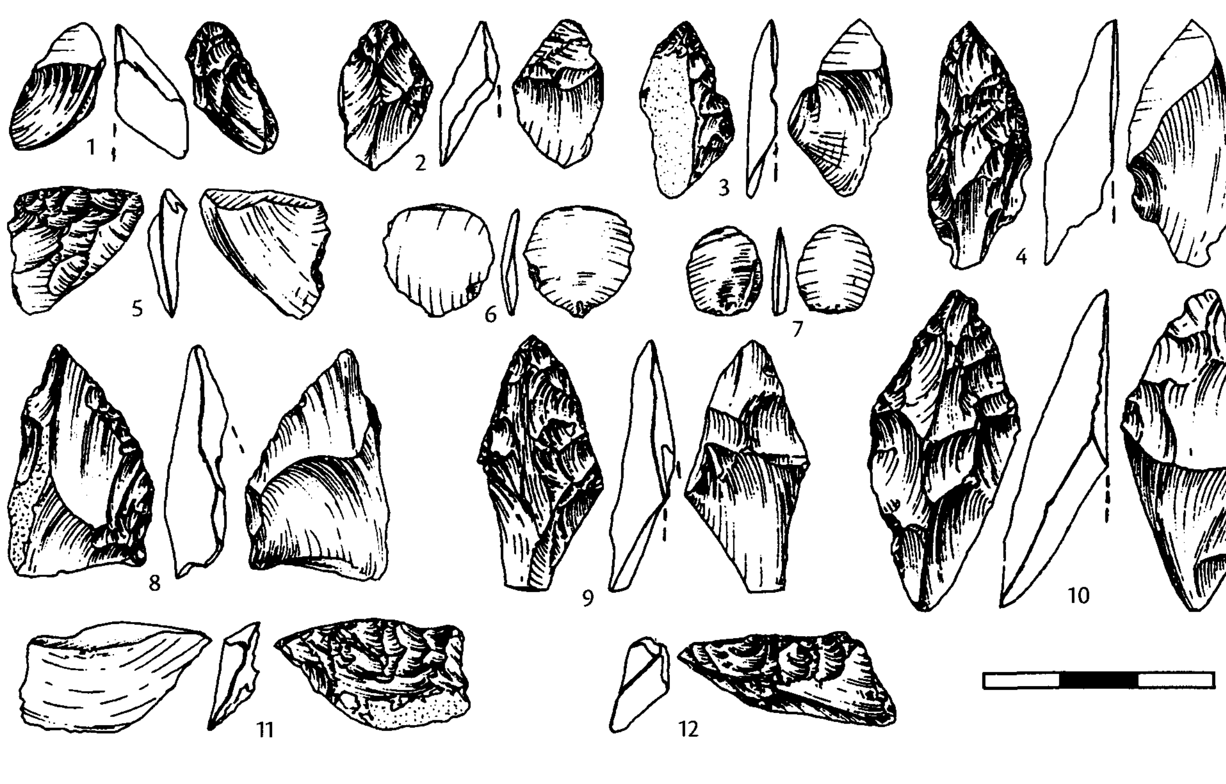

Figure 9-13—Buran-Kaya III Layer B specific waste from the rejuvenation of tools: *1, 3, 4, 8*–rejuvenation pieces of unifacial convergent tools' tips; *2, 9, 10*–rejuvenation pieces of bifacial convergent tools' tips; *5, 12*–peculiar retouch chips on tools' lateral edges fine resharpening; *6, 7*–"Janus/Kombewa" chips on unifacial tools' basal ventral thinnings; *11*–peculiar retouch chips on tool's lateral edges radical resharpening. All items from Level B1.

category of retouched pieces, with no special attention paid to them (e.g., as was done for the level 1 assemblage of Starosele, western Crimea, e.g., Marks and Monigal 1998) or as a surprising classification as "fragments of different tool terminal parts" as was done by V. N. Stepanchuk for the Ak-Kaya and Kiik-Koba facies of the Crimean Micoquian (e. g., Stepanchuk 2002: table XXXIX for Prolom-I rockshelter, eastern Crimea). At the same time, the paucity of these items in many Middle Paleolithic assemblages could be explained by a lack of significant tool rejuvenation on site, so their recognition is important.

Chippage

Taking into consideration the specific waste from tool rejuvenation, the large numbers of chips need to be discussed, bearing in mind their origins: from core reduction, tool shaping, or from rejuvenation/resharpening episodes, both unifacial and bifacial (Figures 9-4: *3*; 9-5: *3, 4, 10*; 9-6: *1, 8, 12*; 9-7: *10*; 9-8: *6, 8*; 9-13: *5, 6, 7, 11, 12*) . At first sight, the subdivision of chippage (all pieces less than 3.0 cm in greatest dimension) into two general categories of normal chips and by-products of bifacial shaping/thinning pieces used for Crimean Middle Paleolithic studies (Chabai and Demidenko 1998:40) seems simple. The main morphological features of the bifacial rejuvenation/resharpening chips, such as lipped platforms with abrasion and acute angles, proximally originating small dorsal scars, generally incurvate and twisted profiles, and thin bodies work quite well for pieces over 3.0 cm in length. On the other hand, for pieces less than 1.5 cm, there are a number of morphological problems. These smallest items are often characterized by an ambiguous condition (complete or broken), poorly definable dorsal scar patterns (as, for example, traces of platform abrasion—a consequence of retouching and resharpening tools) that cannot be distinguished from actual dorsal scars of previously removed pieces, and tiny platforms where the characteristics are unclear. Thus, for these smallest items, one can only define some small rejuvenation by-products of unifacial and bifacial convergent tool tips (Figure 9-13: *1, 2, 3, 4, 8, 9, 10*), and the rare Janus/Kombewa chips from ventral basal thinning of unifacial tools (Figure 9-13: *6, 7*; see also Demidenko 2000: fig. 8: 7).

It was decided, therefore, to subdivide the 15,466 chips into two subgroups by size: under 1.5 cm (68.9%) and 1.5–2.9 cm (31.1%). This considerable numerical difference between the subgroups points to a dominance of intensive tool maintenance. This view is reinforced when the sample of the smallest chips (66.9%) is considered with all other debitage. Both the number of chips and their variety indicate intensive reutilization and rejuvenation of bifacial and unifacial tools. Therefore, the most likely secondary reduction processes were characterized by a transformation of many simple and transverse scrapers into convergent scrapers and points.

Major Technological and Typological Trends and General Patterns of Raw Material Exploitation

Taking into consideration all the above data, it is clear that a primary feature of the Buran-Kaya III Layer B lithic assemblage is the extreme exhaustion of all products of primary and secondary reduction through multiple re-preparations and rejuvenation/resharpening. Such a high degree of reduction was caused by both the considerable distance of the rockshelter from high quality flint sources and a high intensity of occupation. These two factors are responsible for the observed characteristics of each artifact category, as summarized below.

The final stages of primary flaking is, at best, seen on small-sized cores, reflecting opportunistic flaking with the removal of only one or two flakes from very exhausted striking platforms and flaking surfaces. From a purely typological approach, it is also important to note the absence of pre-cores, the use of parallel flattened and transverse cores without supplementary lateral platforms, and the paucity of radial and discoidal cores. Thus, both the primary flaking methods and the overall reduction pattern of cores produced generally small flakes. The complete flakes with no secondary treatment have mean dimensions of less than 3 cm (2.81 cm long, 2.89 cm wide) with only 5.3% being longer than 3.0 cm and 7.1% wider than 3.0 cm. There is a prevalence of transverse flakes (53.9%). The blade index (Ilam) within the debitage is only 11%. Adding blanks for unifacial tools (4.3%) and retouched pieces (5.8%), the assemblage's real blade index is even lower (9.1%). All the morphological and metric data indicate the absence of a separate blade production strategy. Rather, they were struck from the same cores as the flakes were. This is confirmed by their faceting indices, which are fully comparable with the flake faceting indices: IF = 40.3 and 34.6, IFs = 13.7 and 15.4 for flakes and blades, respectively.

At the same time, cores were not the exclusive source of all debitage and blanks in the assemblage. As clearly seen by the morphological features of platforms (lipping, angle, abrasion caused by a soft hammer flaking), it is certain that a large number of blanks/debitage were detached during initial bifacial tool formation and shaping, as well as during rejuvenation. While the actual percentages are not high (29.3% of the flake debitage, 13.8% of the blade debitage, 25.4% of the unifacial tools, and 49.2% of the retouched pieces), the technique of reduction needs to be considered. This technique is traditional for European Micoquian bifaces and results in a plano-convex cross-section (e.g., Bosinski 1967; Boëda 1995). It consists of a series of operational steps on a blank—usually a flake or a plaquette. First, there is a detachment of relatively large flakes and some chips from the blank's ventral surface (technologically, the plano surface) and second, an intensive formation of the convex surface of the blank's dorsal surface by the removal of differently-sized flakes, chips, and perhaps some blades (Chabai and Demidenko 1998:50). As a result, the number of removals struck from the dorsal surface of these bifacial tools is much greater than the number of removals from the ventral plano surface, minimally with a ratio of 4–5 : 1. Thus, the percentage of all debitage derived from the plano surface of bifacial tools does not exceed 20 to 25% of all by-products detached during formation, shaping, and rejuvenation. The by-products from the plano surface lack morphological characteristics associated with bifacial reduction/rejuvenation. In those rare cases where such removals were refitted onto the plano surfaces of bifacial plano-convex tools (Demidenko and Usik 1993: fig. 2.2, 1995: fig. 2.2), they have no characteristic features of bifacial production by-products such as platform lipping, angle, and abrasion, and they are generally flat in profile. They could come from any type of reduction. This means that of all large removals (≥ 3 cm) from bifacial plano-convex tools, it is theoretically possible to define only about 75–80% as originating from the convex surface treatment. Moreover, experimental replication of five British Upper Acheulian handaxes (Bradley and Sampson 1986), using a hard hammer mode and a quartzite hammerstone application, showed that only 23% in this wholly bifacial waste sample could be so classified (!). These data came from a typical Acheulian biconvex reduction technique that, by definition, should permit a greater number of recognizable bifacial flakes than would be the case in plano-convex reduction. Thus, the bifacial thinning flakes in the Buran-Kaya III Layer B debitage are of importance in a quantitative sense. Taking into account the many regular flakes and blades (the waste products of any flint reduction), it may be supposed that the debitage is actually equally divided between products of core reduction and of bifacial tool production.

Almost half of the blanks that would subsequently become retouched pieces were produced during biface tool shaping and reshaping (49.2%), which is very important in this context. Since perhaps no retouched piece was brought into the rockshelter already retouched, all these pieces were used as initial tools, with all subsequent reduction carried out on-site. On the other hand, it is also obvious that some unifacial tools were brought into the rockshelter and therefore, the proportion of bifacial tool reduction blanks among unifacial tools (25.4%) does not reflect their true role within the total debitage sample produced at the site. Thus, it would not be an exaggeration to claim that the by-products of bifacial tool production were dominant, in comparison to blanks produced from cores.

The above suggestions can be elucidated using a series of ratios for different combinations of artifact classes (Table 9-8). The ratio of debitage + unifacial tools + retouched pieces to cores + identifiable bifacial tools (18.7 : 1) seems most realistic, given the small size of all cores and plaquettes, the reduction of which produced many larger chips, not to mention tiny chips. The ratio between these chips and debitage (including unifacial tools and retouched pieces) is 5.3 : 1. It is also worth noting the four other ratios involving these larger chips (1.5– 2.9 cm) shown in Table 9-8, which confirm that there was a great deal of reduction going on at the site. Thus, there are a number of factors pointing to a very significant intensity of flint reduction, seen through both primary reduction of cores/plaquettes and of bifacial pieces. This conclusion is further strengthened by additional information on tool production and rejuvenation.

Considering the importance of chips to the understanding of the assemblage, it cannot be forgotten that the vast majority small-sized chips (≤ 1.5 cm) were recovered during both excavation and double screening of sediments but not from flotation that would have significantly increased the sample of pieces less than 1.0 cm. Of course, while many of these chips were the result of primary flaking, it seems apparent that more than half were the result of tool production and rejuvenation.

The high incidence of broken tools—both bifacial and unifacial—is also important here; these data have been presented in previous sections by tool classes. The significant proportions of broken tools within all classes strongly indicate a high intensity of utilization and rejuvenation.

In addition, an important indicator of very intensive on-site tool rejuvenation and resharpening is the large number of rejuvenation products of unifacial and bifacial convergent tools compared to the actual number of convergent unifacial and bifacial tools (Table 9-8). There are 1.6 unifacial products per unifacial convergent tool and 0.5 products per bifacial convergent tool. We should not confuse this with any change in tool type. Rather, these products testify to the resharpening of already existent convergent tools. The intensive multiple reduction and re-preparation/

Table 9-8
Lithic variability in Layer B of Buran-Kaya III

Debitage : objects of primary flaking processes	12.0 : 1
Debitage : core-like pieces	21.1 : 1
Debitage : objects of primary flaking processes + identifiable bifacial tools	6.8 : 1
Debitage : core-like pieces + identifiable bifacial tools	9.1 : 1
Debitage + unifacial tools + retouched pieces : objects of primary flaking processes	24.8 : 1
Debitage + unifacial tools + retouched pieces : core-like pieces	43.6 : 1
Debitage + unifacial tools + retouched pieces : objects of primary flaking processes + identifiable bifacial tools	14.1 : 1
Debitage + unifacial tools + retouched pieces : core-like pieces + identifiable bifacial tools	18.7 : 1
Unifacial tools + retouched pieces : core-like pieces	22.5 : 1
Unifacial tools + retouched pieces : objects of primary flaking processes	12.8 : 1
Unifacial tools + retouched pieces : debitage	1.1 : 1
Unifacial tools : bifacial tools	4.8 : 1
Unifacial + bifacial tools : retouched pieces	3.5 : 1
Unifacial tools : retouched pieces	2.9 : 1
Unifacial tools (complete) : unifacial tools (fragments)	1.1 : 1
Unifacial tools (complete) : unifacial tools (tiny fragments)	1.9 : 1
Retouched pieces (complete) : retouched pieces (fragments)	1.1 : 1
Bifacial tools (complete) : bifacial tools (fragments)	0.5 : 1
Bifacial tools (complete) : bifacial tools (tiny fragments)	0.8 : 1
Unifacial convergent tools : rejuvenation pieces of unifacial convergent tools' tips	1.6 : 1
Bifacial convergent tools : rejuvenation pieces of bifacial convergent tools' tips	0.5 : 1
Chips (≤ 1.5 cm) : chips (> 1.5–2.9 cm)	2.2 : 1
Chips (> 1.5–2.9 cm) : debitage	10.8 : 1
Chips (> 1.5–2.9 cm) + debitage + unifacial tools + retouched pieces : objects of primary flaking processes	154.9 : 1
Chips (> 1.5–2.9 cm) + debitage + unifacial tools + retouched pieces : core-like pieces	273.0 : 1
Chips (> 1.5–2.9 cm) + debitage + unifacial tools + retouched pieces : objects of primary flaking processes + ident. bifacial tools	88.2 : 1
Chips (> 1.5–2.9 cm) + debitage + unifacial tools + retouched pieces : core-like pieces + identifiable bifacial tools	117.0 : 1

resharpening/reutilization of tools is also evident by the high number of all convergent tools (scrapers and points). This has long been recognized as a defining typological characteristic of the Kiik-Koba facies of the Crimean Micoquian (e.g., Gladilin 1971; 1976). Beyond this general observation, the structure of the tool assemblage is also informative.

Considering the three tools groups—simple unifacial tools, convergent unifacial tools, and bifacial tools—proposed by Chabai and Marks (1998) and Chabai et al. (2000) as one way of making comparisons among the facies of the Crimean Micoquian, the true dominance of convergent unifacial tools (51.2%), over simple unifacial tools (38%) and bifacial tools (10.8%) is clear in Buran-Kaya III Layer B. This dominance is even greater, if all broken but possible simple forms are included: rising to 60.5%,.

The internal structure of unifacial scrapers can be viewed by their total numbers of complete and fragments versus only complete scrapers (Table 9-3): simple = 30.5% and 26.8%, transverse = 20.1% and 24.1%, double = 9.8% and 3.7%, and convergent = 39.6% and 45.4%. These percentage indicate that there is a prevalence of simple scraper types (simple, transverse, and double ones) over convergent types, although their interrelations are not great at all: 1.5 : 1 and 1.2 : 1, respectively, for the entire sample and for only complete items.

The proportional dominance among unifacial tools of points over convergent scrapers (56.4% to 43.6%) is as strikingly similar as it is between simple and convergent unifacial scrapers (60.4% to 39.6%). This typological nuance, taken together with the known abundance of rejuvenation products of unifacial convergent tool tips, testifies to multiple and intensive rejuvenation of unifacial tools in general, and at the same time, to the constant resharpening and retouching of various convergently-shaped/reshaped tools. These two convergent unifacial tool types may also be compared on the basis of shape. The convergent unifacial scrapers (Table 9-6) have a prevalence of trapezoidal shapes (59.2%), with a moderate number of triangular (18.4%) and crescent (14.3%) forms, but few leaf-shaped (4.1%), rectangular (2%), or ovoid (2%) forms. Unifacial points (Table 9-6), on the other hand, have quite different shape distributions: trapezoidal (34.5%) and leaf-shaped (27.6%) pieces prevail, while triangular (13.8%), crescent (12.1%), and hook-like (10.3%) shapes occur in moderate numbers, and lateral (1.7%)is quite rare. It is evident that the shift in shapes from scrapers to points was at the expense of the trapezoidal forms of scrapers and their reincarnation as leaf-shaped and hook-like points.

Beyond the mere type-level comparisons, there is a possible relationship between retouch types and angles (Table 9-4). The associations are not always obvious, but they are real: sub-parallel retouch is always rare, sometimes absent, but can be seen as occurring in three clusters: 12.1–13.8% for simple and transverse scrapers, 8.5–9% for convergent scrapers and points, and 3.1% for double scrapers. On the other hand, scalar retouch dominates, although not evenly across each subclass: 72.4–87.5% for simple, transverse, and double scrapers; 64.4–61.8% for convergent scrapers and points, and 46.7–50% for denticulates and perforators. Stepped retouch also has three clusters: 9.1–13.8% for simple, transverse, and double scrapers; 27.1–29.2% for convergent scrapers and points; and 50–53.3% for denticulates and perforators. Thus, the three repetitive numerical clustering for each retouch type across these seven tool groups permits a number of conclusions about the sequence of unifacial tool reduction in the Buran-Kaya III Layer B assemblage. There is an obvious gradual trend through multiple reductions/rejuvenations from simple/transverse/double scrapers to convergent scrapers and points, and subsequently, to denticulates and perforators. Through this reduction stream, scalar retouch continuously decreases, from 87.5% and 46.7%. A similar decrease is seen in sub-parallel retouch, but in a different statistical range: from 13.8% for simple scrapers until its complete absence for denticulates and perforators. On the other hand, there is an increase in stepped retouch from 9.1% to 53.3%. Thus, the shifting percentages of retouch types indicate an increasing level of reduction, beginning with the initial and simple tool forms (simple, transverse, and double scrapers) to convergent tool forms (convergent scrapers and points) to radically and heavily treated tool forms (denticulates and perforators).

This reduction stream is further confirmed by the retouch angle data for unifacial tools (Table 9-4). Flat retouch angle distribution can be observed through three numerical clusters: 41.4 and 50.0% for simple and double scrapers (although transverse scrapers account for only 24.2%, this percentage is higher than the remaining five groups), 18.1 and 21.2% for convergent scrapers and points, with the third and numerically lowest cluster represented by 6.7% for denticulates (this is a single occurrence among all 15 edges and does not include perforators, which displayed no flat retouch. Semi-steep retouch angles also display three clusters: 68.7 and 57.1% for convergent scrapers and points; 48.5 and 41.4% for simple and transverse scrapers; and 28.1–25% for double scrapers, denticulates, and perforators. Steep retouch angles display an exponential increase from the medial cluster of 17.3–27.3% for simple, double, transverse and convergent scrapers to 66.6–75% for denticulates and perforators. The third, lowest cluster among the steep retouch angles is 13.2% for points—since, by definition, points do not have steeply retouched edges.

Summing up the retouch angle data, it is possible to argue that denticulates and perforators in Layer B are at the extreme end of a sequence displaying ever-increasing reduction intensity: about three out of four edges on these tools have steep retouch. Convergent scrapers and points fall into the intermediate cluster, and the simple scrapers/transverse scrapers/retouched pieces have, on average, the flattest retouch. Thus, retouch types and retouch angles indicate a reduction sequence for unifacial tools from simple tool types (simple, transverse, and double scrapers) to convergent types (convergent scrapers, points) that, in some cases, are reduced further into denticulates and perforators.

The metric data also confirm this postulated reduction sequence for the seven unifacial tool groups (Table 9-5). On the most general level, considering only complete items, there are no significant differences between the mean length and width data for all tool groups, retouched pieces, and unretouched flakes. Each of these groups is quite small, with dimensional means under 3.5 cm. The only exception among all subgroups is that which should be elongated—blades—also have a small mean length: only 3.62 cm. The mean length and width for the combined sample of all complete unifacial tools is 2.98 cm and 3.00 cm, respectively. A closer look, however, at mean dimensional parameters for all seven tool groups, retouched pieces, and flakes permits the following observations.

Retouched pieces and flakes have, strikingly, the same average lengths: 2.81 cm and 2.80 cm, respectively. On the other hand, there are obvious length deviations among the tool groups. For simple and convergent scrapers, points, and perforators, the average lengths are larger than for the retouched pieces and unretouched flakes (Table 9-5 plus previous descriptions). The other tool groups (which have smaller sample sizes), are on average shorter: denticulates = 2.6 cm, double scrapers = 2.62 cm, and transverse scrapers = 2.47 cm. No other objective explanations could be used to explain these differences than those related to reduction, and to general tool blank proportions. The smallest average lengths of the transverse scrapers and denticulates may testify to a considerable secondary distal treatment that decreased their overall length, although the prevalence of blanks with transverse proportions among these tools (69.2% and 85.7%, respectively) makes blank selection a more cogent explanation here. Also, by definition, double scraper length does not depend upon any distal retouch, so length may have been primarily determined by blank selection. Convergent scrapers, points, and perforators have the largest average lengths and, as the most reduced tool groups (see above), may reflect a selection of the largest blanks for their continuous and multiple reductions. This, however, did not lead to very significant length diminution, in comparison to other unifacial tool groups. On the other hand, the larger than 3 cm average length for simple scrapers may also point to a minimum length for further unifacial tool reduction.

The mean widths for retouched pieces and flakes are 2.75 cm and 2.89 cm. Not one of the unifacial tool groups has an average width between these parameters. The average widths of transverse and convergent scrapers, points, and denticulates exceed 3 cm (Table 9-5). The other tool groups have smaller average widths. Among the former, there is a notable presence of convergent scrapers and points because these tool groups have the largest average lengths and widths.

Turning to those tool groups with the smallest average widths, they are characterized by low percentages of transverse flakes—from 25% to 41.4% (Table 9-5). Regarding the presence of transverse flakes, it is worth noting that unretouched flakes and retouched pieces have about the same proportion (53.9% and 53.1%, respectively), as do convergent scrapers and points (53.1% and 50%, respectively). This can only mean a very significant reduction of convergent scrapers and points, with multiple rejuvenations of all their retouched edges.

From the average lengths and widths for the unifacial tool groups, retouched pieces, and unretouched flakes, some conclusions may be reached. Convergent scrapers and points are characterized by the largest blanks, which after their formation and rejuvenation were still greater in average length and width than unretouched flakes and retouched pieces. This fact is strong evidence for a basic blank selection for a potentially long "use-life" for unifacial tools. Denticulates and perforators, the most reduced of the unifacial tool groups, partially confirm this conclusion by their own sizable average lengths and widths. On the other hand, simple, transverse, and double scrapers each have different reasons for their varying mean lengths and widths. Simple scrapers, less than half of which are made on transverse blanks, have no distal retouch but do have lateral edge retouch. As a result, their mean lengths exceed their mean widths. Transverse scrapers, with 69.2% on transverse blanks and heavy distal retouch (48.5% semi-steep and 27.3% steep), have greater average widths than average lengths. Double scrapers seem to have been made opportunistically on small blanks.

Because the thickness measurement does not depend upon proportions, blades are included in the present analysis (Table 9-5). First, it is worth noting that the average thickness for all complete unifacial tools is 0.68 cm. Retouched pieces, flakes, and blade debitage all have comparable average thicknesses: 0.55 cm, 0.56 cm, and 0.49 cm, respectively. The other tool groups fall into three cluster for average thickness: simple and transverse scrapers (0.62 cm and 0.65 cm), convergent scrapers and points (0.73 cm and 0.67 cm), and denticulates and perforators (0.91 cm and 0.86 cm). Double scrapers have the lowest average thickness among all the artifact categories (0.42 cm), confirming the suggestion that their blanks were not affected by any sequence of tool reduction. In fact, the increasing order for average thickness of the other tool groups perfectly fits into the proposed unifacial tool reduction sequence: simple types, convergent types, and denticulates and perforators. Indeed, the thickness data show that the most reduced unifacial tools (denticulates and perforators) are characterized by the thickest blanks. Then, by average blank thickness, the next most heavily reduced tools (convergent scrapers and points) occupy an intermediate position for not only thickness but length and width, as well. The simple types (simple and transversal scrapers) are on average the thinnest. Finally, it is worth remembering that the average length and width of retouched pieces are comparable to flakes without retouch. Therefore, it is reasonable to conclude that the retouched pieces are, in reality, merely ad hoc pieces used for short-term tasks and were not the first step in the postulated reduction sequence.

Thus, the thickness data very strongly confirm a selection of large-sized blanks for continuous unifacial tools shaping and reshaping, where the thickest blanks were the most appropriate for multiple tool edge resharpening/rejuvenation.

Bearing in mind the obvious anomalous position of double scrapers in the proposed sequence, it is possible to suggest that double scrapers were not only ad hoc but were actually just double simple scrapers. Accordingly, the transformation of simple unifacial tools into convergent ones did not include an intermediate stage, where simple lateral scrapers were changed into double scrapers and only then, into different convergent forms. Instead, subsequent retouching of a simple lateral or transverse scraper edge resulted in a semi-convergent scraper or point, mainly as a semi-trapezoidal or semi-trapezoidal elongated type. Recognizing this initial semi-convergent unifacial tool type, it is also possible to suppose its further transformation into different varieties of trapezoidal, leaf-shaped, triangular, and crescent scrapers, points, denticulates, and perforators.

Taking into consideration the almost equal representation of normal and transverse blanks among the unifacial tools, as well as all their morphological and retouch characteristics, it is possible to postulate two general unifacial tool reduction models expressed in three different ways.

The first reduction model for normal blanks can follow two different paths. The first path progresses from simple straight and convex scrapers into sub-triangular/semi-crescent scrapers and points and then into triangular/sub-crescent and crescent/leaf-shaped/hook-like scrapers and points. The second path progresses from simple/transverse scrapers into semi-trapezoidal elongated scrapers and points into semi-crescent scrapers and points into sub-crescent and crescent scrapers and points/hook-like points.

The second model is for transverse blanks, where a single path goes from simple/transverse scrapers into semi-trapezoidal scrapers, points, and denticulates into sub-trapezoidal and trapezoidal/leaf-shaped scrapers, points, denticulates, and perforators and/or sub-crescent and crescent/triangular scrapers and points/hook-like points.

These three trajectories sometimes paralleled one another through a considerable size decrease for normal blanks, ending their multiple transformations as transverse flakes and chips. It is also worth noting that the tendency to rejuvenate/resharpen convergent tools resulted, in a few cases, in points being transformed into perforators. Moreover, differential thinning of unifacial tools, with most occurring on convergent forms, provides more evidence that these types were usually heavily reduced—simple scraper types = 2% to 3.4% and denticulates = 0%, on one hand, and convergent scrapers = 20.4%, points = 39.7%, and perforators = 66.7%, on the other hand. A dominance of semi-trapezoidal specimens among convergent denticulates strengthens the already major role of these specimens with pronounced denticulate edges in multiple reshaping processes of unifacial scrapers and points. All in all, of the unifacial tools, 21.0% were differently thinned, while only four pieces had natural backs (all simple scrapers).

The general trends of unifacial tool reduction we have outline for Layer B of Buran-Kaya III agree with the ideas of H.L. Dibble about Middle Paleolithic scraper reduction:

> Larger blanks can be subjected to more reduction...the more reduced types should be thicker on average than the lightly retouched types. Again, all scrapers should be thicker than unretouched flakes....larger blanks are usually chosen for retouch in the first place, and the larger of those are the ones that can be subjected to the most reduction. Thus, it is expected that even the heavily reduced pieces would be, on average, somewhat larger than the unretouched flakes in every dimension, since many unretouched flakes will have been too small for retouching at all. (Dibble 1995:327, 331)

Literally, the only significant difference between the Buran-Kaya III Layer B data and Dibble's construction of scraper reduction (single/double/convergent and single/transverse) is the actual missing link of double scrapers in the Buran-Kaya III operational chains. Yet, the minor role that double scrapers play among the unifacial tools is not a special case in the Layer B assemblage, rather, it is a characteristic common to all facies of the Crimean Micoquian.

The analyzed unifacial tool reduction sequences with the additional data on retouched pieces and debitage are in accordance with those for bifacial tools. It must be recognized, however, that samples sizes are small and conclusions therefore tentative. There is a great emphasis on point shaping and reshaping/reutilization of bifacial tools. Among the complete bifacial points (Table 9-6), most are leaf-shaped (54.5%), followed by trapezoidal (27.3%) and crescent (18.2%). On the other hand, the fewer complete bifacial scrapers (11 versus 9 items) include 4 simple examples (3 single-edged and 1 double-edged) that show no evidence for complex reduction, although they exhibit multiple reshaping from convergent tools. The complete bifacial convergent scrapers do not have any particular shape dominance: 2 trapezoidal, 1 hook-like, 1 crescent, and 1 leaf-shaped. With the addition of their rejuvenation and other modifications, they can be interpreted as having long use-lives. The presence of 2 complete bifacial trapezoidal denticulates and 1 complete and 7 broken bifacial preforms (likely to have been residues of extensively rejuvenated points or scrapers) further confirms multiple reshaping of the bifacial tools.

There are no significant differences among the sizes of the 23 complete bifacial tools (Table 9-7) because all tool groups with retouch (excluding preforms) contain clear reutilized and reshaped examples. Despite their overall exhaustion, there are still two size extremes: one large preform and two small denticulates. At the same time, the average size of bifacial convergent scrapers and points is indicative of their purposeful formation and multiple rejuvenations.

Finally, characteristics such as the prevalence of broken bifacial tools over complete ones (2.2 : 1); the clear dominance of convergent pieces; frequent bifacial tool reutilization; denticulation, thinning, and alternate modifications of the plano-convex reduction technique; and the low ratio of bifacial convergent tools to their rejuvenation pieces (0.5 : 1) (Table 9-8) leave no doubt that there was very intensive on-site production and rejuvenation applied to bifacial tools and that this was greater than that applied to unifacial tools.

The main reason for differences in the high intensity reworking of bifacial and unifacial tools is probably caused by the different nature of their blanks—core derived blanks for unifacial tools and plaquettes, and large, thick flakes for bifacial tools. If the long distance to raw material outcrops is considered, it must be admitted that a significant portion of unifacial and bifacial tools, as well as bifacial preforms, were brought into the rockshelter already formed. Aside from the presence of very high on-site rejuvenation/resharpening levels (Table 9-8), it was necessary to produce a considerable number of new tools on-site from by-products of the imported flint plaquettes and cores. Cores and plaquettes, as well as the reshaping/rejuvenation of the imported bifacial tools supplied blanks for unifacial tools production, while new bifacial tool manufacturing was limited to rare plaquettes and some thick flakes. Therefore, very few bifacial tools were produced on-site, but the on-site reshaping, reutilization, and rejuvenation processes were considerable for bifacial tools and their preforms. Naturally, a high percentage of bifacial tools were broken during the late stages of rejuvenation. Given this, the percentage of convergent tools—unifacial and bifacial—actually recovered probably does not accurately reflect the true number produced. There is a pattern for Crimean Micoquian: the greater the proportion of convergent scrapers and points, the greater is the intensity of tool reshaping and rejuvenation in a toolkit.

In light of the technological, typological, and raw material exploitation seen in Layer B of Buran-Kaya III, it clear that the 17,342 artifacts recovered from just 7 m^2 during the 1966 excavations do not represent just two occupational events, a possibility implied by the two geologically defined sub-levels, B and B1. For the roughly 6.5 m^2 of Level B, with 2,127 artifacts and an average density of 325 pieces per square meter, no more than two to three different occupations are represented, since the average artifact density of artifacts without small chips (< 1.5 cm) and heavily burnt pieces is approximately 125 per m^2. For Level B1, with 15,215 artifacts from almost 7 m^2, the average artifact density is 2,170 per m^2 and without chips, 735 per m^2. Since there were no vertical differences in the densities of artifacts and the highly fragmented animal bones and there was clear evidence of many destroyed fireplaces, it must be supposed there were no fewer than ten short-term human occupations. The proportionately similar artifact class representation for both Levels B and B1 (Table 9-1) also permits the assumption that the same activities were performed at the site during each occupation. These activities were dominated by extensive secondary butchering of animal carcasses using multiply reshaped and rejuvenated flint tools. Accordingly, short, culturally sterile intervals between these recurring and very intensive short-term human occupations at the rockshelter can be assumed, since there are few patinated artifacts.

Buran Kaya-III Layer B and the Kiik-Koba Facies in the Context of the Crimean Micoquian

The Buran-Kaya III Layer B assemblage fits fully within the known variability of the Crimean Micoquian. With the use of a cultural construct to define Crimean Middle Paleolithic industrial variability (Gladilin 1976), several assemblages from Crimean Middle Paleolithic sites have been recognized as belonging to a Kiik-Koba "culture." These include the assemblages from Kiik-Koba upper layer, Prolom-I (Kolosov 1983, 1986; Kolosov et al. 1993; Stepanchuk 2002), Buran-Kaya III Layer B, as well as the Micoquian artifacts from Siuren-I in the lower layer of the 1920s excavations and Units "H" to "G" of the 1990s excavations (Demidenko 2000). While these assemblages are still considered as Kiik-Koba, the Kiik-Koba "culture" is now considered to be a facies within the broader Crimean Micoquian and not a separate culture (e.g. Chabai et al. 2000).

From a techno-typological point of view, locations far from high quality flint outcrops, and the characteristics of the archeological layers, all Kiik-Koba deposits are quite similar. Moreover, these assemblages are very large and constitute a considerable database for analyses of the type presented here. Indeed, the collections (more than 33,000 artifacts) include 4,755 pieces from the upper layer of Kiik-Koba rockshelter, 10,882 from Prolom-I rockshelter, 17,342 from Layer B of Buran-Kaya III rockshelter, and no fewer than 88 artifacts from the 1920s lower layer/1990s Units "H"–"G of Siuren-I rockshelter. Together, these form one of the richest Middle Paleolithic samples of a specific Middle Paleolithic facies, not only in the Crimea but also in the whole of Eastern Europe. Although, as often happens in Paleolithic studies, not all of these assemblages are published in detail, their general typological configurations as well as functional interpretations are available in the literature. With this study, Layer B of Buran-Kaya III is the most completely reported and correlations with the other three assemblages bring to mind a number of thoughts concerning this particular facies and its associated sites.

Based upon recent considerations (Demidenko 2000, 2003), it appears that the following geochronological determinations can be proposed. The upper layer of Kiik-Koba is possibly related to a stadial between the Moershoofd and Hengelo Interstadials (ca. 55–40 000 years BP). The Siuren-I 1920s excavations of the lower layer and the 1990s excavations of Units "H"–"G" and Buran-Kaya III Layer B are connected to Arcy Interstadial (ca. 30,000 years BP). The upper part of the Prolom-I culture-bearing sediments may be dated to ca. 32–30,000 BP. Thus, it is possible to argue a general time range of ca. 55–40,000 BP to ca. 30,000 BP for the presently known Kiik-Koba facies assemblages.

The techno-typological characteristics of the Kiik-Koba facies have been described here for the Buran-Kaya III Layer B assemblage and they do not need to be repeated for the other assemblages because they are all very much alike (Table 9-9). This holds true for the three basic tools groups—simple unifacial tools, convergent unifacial tools, and bifacial tools (Table 9-9). In spite of some proportional variability, they are clearly distinct from the comparable classes in the Ak-Kaya and Starosele facies (Table 9-9). The Starosele facies toolkits show some range within the three tool groups: simple unifacial tools = 41–58%, convergent unifacial tools = 16–43.4%, and identifiable bifacial tools = 9–28.7% (Chabai et al. 2000: table 10). As is evidenced by these data, the Kiik-Koba facies is at one extreme of tool reduction within the three Crimean Micoquian facies (Table 9-9). As was shown by several different reduction sequences for Buran-Kaya III Layer B tool classes, the typological indices cannot be explained by any culturally determined factors; instead, they must be seen as resulting from a complex synthesis of various anthropogenic and natural factors at play within the Crimean Micoquian (Chabai et al. 2000).

Recently, sites with Kiik-Koba and Starosele facies have been called "short-term camps C type" at which the inhabitants mostly carried out full-scale, secondary butchering of hunted animals (Chabai et al. 2000: 88). Because of such activities, the presence of both numerous and mainly heavily fragmented bones of different ungulate species (saiga, horse, and giant deer) and fireplaces and/or solid ashy lenses are understandable. Consequently, the general industrial pattern of the Kiik-Koba facies is also understandable. Intensive

Table 9-9

Basic techno-typological characteristics and variability data for all Kiik-Koba assemblages and selected Starosele and Ak-Kaya facies assemblages

	Kiik-Koba				*Starosele*		*Ak-Kaya*
	Buran-Kaya III Layer B	*Siuren I lower layer/H-G*	*Kiik-Koba upper layer*	*Prolom I*	*Starosele Level 1*	*Kabazi V complex C - Levels III/4a, III/7*	*Kabazi II Levels III/1A–III/3*
Ilam	9.1[1]	?	11.6[2]	11.4[2]	18.0[1]	7.9[1]	6.2[1]
IFl	39.7[1]	?	41.9[2]	36.9[3]	45.7[1]	52.6[1]	?
IFs	13.9[1]	?	21.9[2]	26.1[3]		23.8[1]	?
Simple unifacial tools	38.0%	24.1%	28.3%	31.0%	45.8%	42.6%	48.8%
Convergent unifacial tools	51.2%	63.8%	58.5%	55.6%	41.1%	39.4%	17.1%
Bifacial tools	10.8%	12.1%	13.2%	13.4%	13.1%	18.0%	34.1%
Scrapers	61.0%	38.5%	42.0%	49.5%	64.9%	62.5%	75.0%
simple	*30.5%*	*3 items + ?*	*36.2%*	*41.0%*	*30.6%*	*51.5%*	*45.8%*
transverse	*20.1%*	*1 item + ?*	*13.8%*	*12.3%*	*18.1%*	*11.4%*	*12.5%*
double	*9.8%*	*2 items + ?*	*16.8%*	*13.9%*	*19.4%*	*11.4%*	*25.0%*
convergent	*39.6%*	*6 items + ?*	*33.2%*	*32.8%*	*31.9%*	*25.7%*	*16.7%*
Points	31.2%	59.6%	44.1%	43.2%	18.9%	26.8%	9.4%
Denticulates + notches	5.2%	1.9%	11.6%	2.8%	15.3%	10.7%	15.6%
"Upper Paleolithic" types	2.6%	?	2.3%	4.5%	0.9%		
Bifacial preforms	3.6%	?	?	?	42.9%	63.6%	28.6%
Bifacial points	57.1%	1 item + ?	65.6%	66.7%	50.0%	27.3%	21.4%
Bifacial scrapers	32.1%	2 item + ?	34.4%	33.3%	7.1%	9.1%	50.0%
single- and double-edged	*14.2%*	*1 item + ?*	*13.1%*	*15.6%*			*14.3%*
convergent	*17.9%*	*1 item + ?*	*21.3%*	*17.7%*	*7.1%*	*9.1%*	*35.7%*
Denticulates	7.2%	?	?	?			
All bifacial convergent tools	85.7%	2 item + ?	86.9%	84.4%	100.0%	100.0%	80.0%
Identifiable unifacial tools : core-like pieces	12.8 : 1	10.4 : 1	20.3 : 1	10.5 : 1	12.3 : 1	18.7 : 1	16:01
Identifiable unifacial tools : core-like pieces + identifiable bifacial tools	5.5 : 1	4.3 : 1	5.6 : 1	4.2 : 1	4.8 : 1	4.0 : 1	2.0 : 1
Average density per m² of identifiable unifacial and all bifacial tools	48.9	?	14.6	19.3	4.4	5.7	< 1

1 Counts based on all definable debitage pieces (≥ 3 cm) and blanks of unifacial tools and retouched pieces.
2 Counts based on unifacial tools only.
3 Counts based on debitage pieces (≥ 2 cm) only.
Kiik-Koba and Prolom I data recalculated from Stepanchuk 1994, 2002; Starosele data recalculated from Marks and Monigal 1998; Kabazi V data recalculated from Yevtushenko 1998; Kabazi II data recalculated from Chabai 1999a.

labor during intensive secondary faunal exploitation/utilization required the use of a large number of tools that were not easily available because of large (10–25 km) effective distances to raw material sources. Therefore, the inhabitants had to use the same tools over and over, resulting in extensive resharpening and rejuvenation episodes. The determination of Kiik-Koba facies assemblages as representing "short-term camps" (Chabai 1999a, 1999b) is based upon the aforementioned economic activities that do not correspond to any criteria of ephemeral and/or very specialized sites. On the other hand, the idea that Kiik-Koba facies assemblages represent "base camps" (e.g., Demidenko 1996; Chabai et al. 1995; 1998; Chabai and Marks 1998), is in an obvious contradiction with the following two facts: the impossibility of locating any Middle Paleolithic base camps at a great distance from basic sources of high quality flint as well as structural peculiarities of the archeological layers (low sedimentation rates) that contain the remains of multiple occupational events.

In the framework of "short-term camps C type" for both Starosele and Kiik-Koba facies, because of more occupational intensity and longer durations characteristic of the latter, it has been proposed that Starosele and Kiik-Koba facies should be differentiated with the following terminology: the Starosele facies can be called "short-term camps C1 type," while all the Kiik-Koba facies should be referred to as "short-term camps C2 type" (Chabai et al. 2000:88).

Summing up all the represented general considerations on the Kiik-Koba facies, it is necessary to emphasize the complex analyses of a number of anthropogenic and natural factors involving variability in the Crimean Micoquian, permitting an interpretation of these Middle Paleolithic facies with a tradition of bifacial plano-convex tool production as a single Crimean Micoquian cultural tradition.