

## A Use-Wear Analysis of Some Middle Paleolithic Flint Artifacts from Buran-Kaya III Level B

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This chapter presents the results of a comparative use-wear study of flint tools and their associated rejuvenation pieces from the 2001 excavations of Buran-Kaya III Level B, a Kiik-Koba facies assemblage of the Crimean Micoquian. The principal kinds of activities connected with

this assemblage have been reconstructed, since use-wear analysis makes it possible to explain the peculiarities of both tool morphology and rejuvenation pieces. Most of the artifacts with multiple retouched working edges in the assemblage were used for butchering.

### Varieties of Traces of Wear on the Surface of Flint Pieces

Use-wear analysis is a procedure studying micro and macro surface features. It studies the traces of various kinds of natural surface changes. The ultimate purpose of the analysis is to find the reasons for these changes. Normally, any artifact from a Paleolithic cultural layer possesses a whole complex of surface traces originating from different causes (Semenov 1957; Anderson 1980; Keeley 1980; Schelinskij 1983, 1994; Moss 1983; Plisson 1985).

Apart from the widely known "traces of wear" (i.e., traces of the contact tool to material worked) and "traces of treatment" (where tool treatment causes technological traces in the form or the quality of the surface relief undergoing changes), a few other kinds of natural relief changes can be defined traceologically.

First, there is a group of traces from post-depositional damages, the origin of which is mostly explained by the impact of natural agents when artifacts are incorporated into a cultural layer. These include:

(1) general "gloss," luster of the surface: polishing due to movement of an artifact in a layer, resulting

from contact friction with encompassing rocks and sediments;

(2) spots of polishing, micro "mirrors," "G" type polishing;

(3) linear polishing;

(4) diverse grooves and scratches;

(5) scale-like damage of edges and ridges.

Second, there are changes to the natural surface that occur during the lifetime of the artifact. They are neither connected with artifact use nor with artifact manufacture. Various actions connected with flint handling, hafting, storage, and transporting artifacts with other objects can bring about micro and/or macro surface changes on the artifact. For flints, this surface wear on ridges and/or edges produces the same kinds of wear traces mentioned above. The morphology and, of special importance in this case, the localization of this type of wear on an artifact is very specific. It is this localization and the co-occurrence of different types of traces on facets and/or interfacet ridges that make it possible to distinguish them from

traces of a different origin, such as post-depositional damage, manufacture, or use-wear.

When analyzing nearly any flint tool, especially one produced by knapping, it is possible to determine the sequence of various operations applied in the course of its manufacture. Even a non-experienced lithic archeologist can ascertain that manufacture of a flake precedes its retouching, retouch onto the dorsal face can be truncated by a burin spall or become a platform for retouch onto the ventral side, etc. This makes it possible to compare a traceological image of temporally different surfaces on the same item and to match certain kinds of traces to the technological sequence. Traceological analysis can thereby establish a real stratigraphy of traces of wear on different surfaces of an item. (The term "stratigraphy of traces" is borrowed from V. E. Schelinskij, personal communication.)

Post-depositional damage traces often imitate use traces but, in most cases, they differ from other types of wear primarily in their chaotic and unpatterned distribution across the whole surface of the item. They are not associated with any technological sequence that changes the form of the artifact. Such a correlation when made, on the contrary, determines a natural change in the relief of a rejuvenating surface during the artifact's use-life. In other words, if it is determined that newer scars, which shape the artifact, are not reduced and look much "fresher" than the older scars, and if temporally different surfaces of the same artifact traceologically contrast, then all the wear types existing on older surfaces (and not found on the newer surfaces) belong to an earlier period of the item's existence. That is, these traces were made *during the lifetime of the artifact*, before the latest facets were made and, obviously, before the item became a part of a cultural layer. These kinds of traces undoubtedly are connected to human activities and can be called non-functional or non-utilitarian.

As an exception, it is necessary to mention that people of different epochs might use the same artifacts, by recycling them from cultural layers of earlier times. The traceological appearance of such items is always very unusual: post-depositional traces are overlain by the traces of its later use, rather than vice-versa.

The surface of a freshly made artifact can have only technological traces: accidental facets, abrasion, scratches, and/or grinding. Practically all the ventral and dorsal sides of scars are clear, edges of the pieces are micro-denticulated, and ridges are sharp. For instance, in the case of an average quality flint, it is difficult to measure the width of a "fresh" inter-facet ridge apex, even with the help of a microscope.

At the same time, numerous experiments have shown that in spite of the well known hardness of flint, quartzite, or even quartz, when items made of them are carried in a soft (leather) bag for a couple of days, they may show:

- (1) grinding and/or polishing, especially on the protruding parts of the surface;
- (2) "G" type spots of polishing;
- (3) linear traces, such as diverse grooves and scratches;
- (4) edge damage.

These traces result from numerous, very light contacts among several items, their slight friction, and their collisions. The traces are uniformly positioned on all edges and surfaces, but more developed on all protruding parts: edges, bulbs, and ridges.

When such an item broke when used, or underwent retouch, each new flaking or rejuvenating facet, of any origin, would have an absolutely clear natural surface and clear, fine linear borders. Thus, an item comes to possess two traceologically different types of surfaces related as a "stratigraphy of traces." It makes the simplest kind of stratigraphy complicated if the item concerned is functionally used. Its surface will acquire traces characteristic for this particular kind of work. These "traces of use" can overlap the two types of surface traces mentioned above. Working parts of tools can be repeatedly retouched and tools can be repeatedly transported in contact with other items. Further transportation traces will be formed on new ridges and put on top of previous transportation traces, making them more pronounced. (i.e., the stratigraphy of traces can be repeatedly changed). The occurrence of very badly worn, less worn, and unworn surfaces, ridges, and edges is quite possible. Traces of use can be destroyed, transformed, or truncated.

The possibility of finding wear traces on an artifact depends upon a number of factors. All types of traces, traces of use included, may be unidentifiable if:

- (1) their profile is absent (from buildup to periphery);
- (2) they are underdeveloped (no traces of a complete profile);
- (3) they are damaged in the course of work, due to edge damage and/or edge exhaustion, by other traces developing, by further treatment, transportation, trampling, post-occupational effects, excavation damage, etc.

Establishing different stages of non-utilitarian wear traces on an item facilitates the reconstruction of its manufacture and/or modification sequence. In addition, it takes a much longer time for these kinds of traces to be established than it does for other types of wear traces. That is why the presence on an item of even the simplest stratigraphy of traces (of two traceologically contrasted areas, at least) documents that the item concerned was not created so from the very start; it was used for a long time and was later modified. Thus, each area with a specific non-utilitarian wear shows a comparatively long period of "intermission."

Summing up all the above, one can conclude that by analyzing non-utilitarian wear traces, it is fundamentally possible to single out the kinds of items used

by humans without being modified. This holds true for singling out most stable elements of tools. The information concerning these tools and/or their ele-

ments can substantially complement our knowledge of prehistoric behavior and can serve as a basis for the definition of cultural norms.

## Technical Means and Methods of Material Processing

During the course of the 2001 excavations of Level B, headed by K. Monigal, all lithic artifacts were placed, with sediments, in sterile plastic bags and left unprocessed. At the end of excavations, a sample of 57 artifacts destined for use-wear analysis was chosen out of the complete (unwashed) assemblage by Yu. E. Demidenko. In the laboratory, each artifact was treated with a 7% solution of acetic acid for 5–10 minutes to remove carbonate crust spots, then was washed with a warm solution of washing powder and rinsed with clear water without using brushes. In the course of this work, acetone and ethyl alcohol on cotton wool swabs were used to remove finger prints.

A reflected light small magnification microscope, MBC 10 and МСПЭ-1 (magnification up to 100×), was used for the primary analysis of surface micro-relief. Detailed analysis was carried out by a metallographic microscope Polam P-312 (magnification up to 1600×) and an Olympus BH2 (magnification 50–400×) with incident light. Photomicrography was carried out with an Olympus SC 35 Type-12. Macro photography of artifacts was carried out with a ULARUS photo-

graphical set, with the help of an Olympus E-10 with an MCON-35, a macro supplemental unit.

The composition of the assemblage, based on the typological classification of the flint artifacts by Yu. E. Demidenko, is shown in Table 10-1.

TABLE 10-1  
Typological summary of the traceology sample

<i>Tool type</i>	<i>N</i>	<i>%</i>
Bifacial tools	4	7.02
Retouch chips	11	19.30
Rejuvenations of bifacial convergent tool tip	4	7.02
Rejuvenations of unifacial convergent tool tip	7	12.28
Unifacial denticulated convergent tools	1	1.75
Unifacial points	10	17.54
Unifacial convergent scrapers	11	19.30
Unifacial double scrapers	1	1.75
Unifacial transverse scrapers	4	7.02
Unifacial simple scrapers	4	7.02
Total	57	100.00

## Results of the Analysis

All of the selected artifacts were studied under a microscope to find non-utilitarian wear traces and use-wear. A summary of the salient results is presented in Table 10-2, ordered by their inventory item number, which matches those of the photographs presented at the end of this chapter. [There is no tool no. 36. *Eds.*]

### TRACES DUE TO POST-OCCUPATIONAL BURIAL

Overall, the 57 artifacts (tools and retouch/rejuvenation pieces) from Buran-Kaya III Level B offered for use-wear analysis can be regarded as well preserved and quite suitable for all of our studies.

The general polishing, like a transparent film, that covers all of the surfaces of the artifacts in the sample is caused by burial in the cultural layer. As a very light film of general polishing, it does not crucially change the micro-relief. On flat areas, the film imitates meat polishing when observed under low magnification, although it neither has the characteristic profile nor creates roundedness of edge tips. It is even weaker

than averagely-developed polishing from cutting meat. The edge tips formed by ancient retouch are sharp, saw-like (Photo 30d). (In the following discussion and in Photos 10-1–10-58, tools and other pieces are numbered according to the typological classification list of Demidenko.)

Linear traces and micro mirrors of “G” type polishing (Photo 10-10d) are referred to the same group. They make large, mostly less than 1 mm spots of complete polishing. They are sporadically positioned, sometimes have well pronounced orientation showing areas of linear polishing, accompanied by grooves and scratches of different sizes and depth.

### DAMAGE FACETS DUE TO TRAMPLING

There are no precise criteria for recognizing this kind of damage for the Buran-Kaya III flint assemblage. However, most of the artifacts possess separate areas of small spontaneous bifacial “saw-like” retouch, which removed traces of use and, at the same time, were overlain by general polishing from burial in the cul-

TABLE 10-2  
Sample inventory and summary of results

<i>No.</i>	<i>Typology</i>	<i>Non-utili- tarian wear</i>	<i>Use- wear</i>	<i>Contact material</i>	<i>Kinematics</i>	<i>Abrasion</i>
1	Unifacial simple concave scraper	none	—			+
2	Unifacial simple wavy scraper	none	—			+
3	Unifacial simple concave scraper	none	+	meat	cutting	+
4	Unifacial simple concave scraper	2	+	hide	scraping	—
5	Unifacial double straight-convex scraper	none	—			—
6	Unifacial transverse convex scraper	none	—			—
7	Unifacial transverse convex scraper	none	—			+
8	Unifacial transverse-convex oblique scraper	2	—			+
9	Unifacial transverse convex scraper	2	—			—
10	Unifacial convergent scraper (elong. trap. w/thinned base & end)	none	+	bone	scraping	+
11	Unifacial convergent scraper (semi-crescent)	2	+	meat	cutting	+
12	Unifacial convergent scraper (leaf-shaped w/thinned base and back)	2	—			+
13	Unifacial convergent scraper (semi-trapezoidal)	2	—			—
14	Unifacial convergent scraper (elong. trapezoidal w/thinned base)	none	+	hide	cutting/scraping	+
15	Unifacial convergent scraper (elong. semi-trapezoidal)	3	—			+
16	Unifacial convergent scraper (elong. semi-trap., naturally backed)	none	—			—
17	Unifacial convergent scraper (trapezoidal)	none	—			+
18	Unifacial convergent scraper (sub-trapezoidal)	3	—			+
19	Unifacial convergent scraper (sub-trapezoidal w/thinned base)	2	—			+
20	Unifacial convergent scraper (semi-crescent)	3	+	meat	cutting	+
21	Unifacial denticulated convergent tool (semi-trapezoidal)	none	—			—
22	Unifacial point (sub-triangular)	2	—			—
23	Unifacial point (elong. sub-trapezoidal, naturally backed)	2	—			+
24	Unifacial point (leaf shaped w/thinned base)	2	—			+
25	Unifacial point (leaf shaped)	2	+			—
26	Unifacial point (sub-trapezoidal)	none	—			+
27	Unifacial point (leaf shaped w/thinned base)	3	+	meat/hide	cutting/scraping	—
28	Unifacial point (elongated sub-trapezoidal)	2	+	meat	cutting	+
29	Unifacial point (semi-trapezoidal)	2	+	meat	cutting	+
30	Unifacial point (trapezoidal)	3	+	meat/hide	cutting/scraping	+
31	Unifacial point (sub-triangular)	2	—			—
32	Bifacial tool (sub-trapezoidal point)	3	+	meat	cutting	+
33	Bifacial tool (elongated semi-trapezoidal scraper)	3	—			+
34	Bifacial tool (single-edged straight scraper)	none	—			—
35	Bifacial tool (trapezoidal point)	2	+	meat	cutting	—
37	Rejuvenation piece of unifacial convergent tool's tip	2	+	meat	cutting	—
38	Rejuvenation piece of unifacial convergent tool's tip	none	+	meat	cutting	—
39	Rejuvenation piece of unifacial convergent tool's tip	none	+	meat	cutting	—
40	Rejuvenation piece of unifacial convergent tool's tip	none	+	meat	cutting	—
41	Rejuvenation piece of unifacial convergent tool's tip	none	—			+
42	Rejuvenation piece of unifacial convergent tool's tip	none	+	meat	cutting	—
43	Rejuvenation piece of unifacial convergent tool's tip	none	+	meat	cutting	—
44	Rejuvenation piece of bifacial convergent tool's tip	none	+	meat	cutting	—
45	Rejuvenation piece of bifacial convergent tool's tip	none	+	meat	cutting	—
46	Rejuvenation piece of bifacial convergent tool's tip	none	+	meat	cutting	—
47	Rejuvenation piece of bifacial convergent tool's tip	none	+	meat	cutting	—
48	Bifacial thinning chip	none	—			+
49	Bifacial thinning chip	none	—			—
50	Bifacial thinning chip	none	—			+
51	Simple retouch chip	none	—			+
52	Retouch piece from tool's lateral edge, fine resharpening	none	—			—
53	Simple retouch chip	none	—			—
54	Simple retouch chip	none	—			—
55	Retouch piece from tool's lateral edge, radical resharpening	none	—			—
56	Retouch piece from tool's lateral edge, fine resharpening	none	+	meat	cutting	—
57	Retouch piece from tool's lateral edge radical resharpening	none	—			—
58	Simple retouch chip	none	—			+

tural layer. The presence of these facets is particularly obvious on unifacial tools.

### TRACES CONNECTED WITH KNAPPING TECHNOLOGY

Judging from the dimensions and morphology of the lithics from the Level B assemblage, the overwhelming majority was flaked with a hard hammer technique. Use-wear analysis further confirms this. Thus, many platforms and dorsal sides of tool blanks have groups of closed annular cracks of small diameter: this is how conical cracks, resulting from the impact of a hard object against a small contact area, manifest themselves (Photo 10-30). These micro and macro conical cracks are failed fracture planes; the results of failed flaking attempts. When soft stone, bone, or antler hammers are used, mostly widely open conical cracks form on the surface of the flaking area.

Based on the morphology of the retouch facets on the tools and the shape of chips, retouch was quite often made by a soft (bone?) hammer. However, it is clear that a hard hammer was also used for some retouching. For instance, traces of stone hammer use to produce retouch were found on tool 35 (Photo 10-35).

In some cases, traces of abrasion were observed on the core impact area edge (see e.g., Photos 10-15, 10-20). Unlike normal (e.g., for Upper Paleolithic) abrasion, this was present on the core platform rather than the flaking surface. Judging from the roundedness and crushing of the margins and the coarseness and intensity of linear traces (rather deep grooves of different widths), abrasion was carried out with a hard, coarse abrasive. Most likely, the abrasion resulted from light, slipping blows by the working part of the hammer, produced in the course of difficult (when the flake would not work out) retouch of the core platform. It should be underlined, again, that such an orientation of abrasion (from the dorsal side onto the platform) occurs with exceptional rarity on post-Middle Paleolithic flakes and blades. Normally, such abrasive wear can be found only on core tablets or other pieces from the platform rejuvenation of prismatic cores.

Abrasion also occurs on the tips of tool edges. Of the 35 tools in this sample, 22 (63%) have such traces (Figure 10-1). In most cases, areas with abrasive wear are very small. They are not continuous and are only recorded in between retouch facets. Since this type of wear occurs on the retouched edges of all artifact types, often on two retouched edges, there is no reason to assume that it is a deliberate blunting of the tool's butt. A purely technical explanation for this treatment is much more acceptable. It was produced before the edge was retouched, creating and strengthening a platform for retouch removals. A blunted, thin edge is not

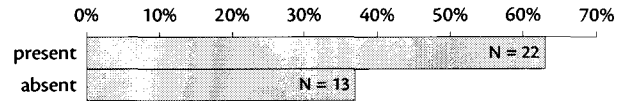


Figure 10-1—Presence/absence of traces of abrasion on thirty-five artifacts (not including chips or debitage).

so susceptible to edge damage during retouching as one that has not been blunted. The blunting also helps to increase the edge angle. However, this explanation does not seem complete. It might also be possible that haphazard areas of abrasion resulted from a failed attempt at edge retouching, brought about by numerous “slips” of a hammer (just like the case of core platform rejuvenation).

Artifacts 2 and 10 are worth special attention. Although, on the whole, their edge blunting is of a different character, in both cases the abrasion is present as an uninterrupted belt (Photos 10-2, 10-10). The left side of artifact 2 has a pronounced roundness, grinding, and polishing (Photo 10-2a, b). It is clear that these traces, as well as the fine irregular marginal retouch onto the dorsal side, are the result of abrasion. The blunted left side of the artifact is opposite its sharpened right side, and may well be interpreted as a butt adapted as a finger rest.

Artifact 10 has a blunted left side. However, the treatment of its edge is strikingly different. In profile it is less rounded and in a number of places the roundness is interrupted by facets of sharpening retouch. The morphology of polishing that accompanies the rounding testifies to bone or antler contact; there is practically no full profile polishing anywhere. The edge is sharp and looks like a broken curve in plan view (Photo 10-10a, b); only separate, very short areas of this side look like a scraper working edge for bone/antler (Photo 10-10c). Judging from the orientation of the polishing, the presence of cracks and badly distinguished scratches, it was caused by spontaneous and aggressive scraping, since there are too many chip facets of edge damage. This suggests that bone was scraped with the artifact: not to treat the bone, but only to blunt the artifact's butt (i.e., using a bone hammer instead of a hammerstone).

If the purpose of abrading the core flaking areas is more or less clear, the purpose of the same treatment on flakes is not clear. Thus, at this stage of research, the meaning of flake and tool edge abrasion is unresolved. There are equally compelling reasons to consider its use both to create elements adapted for use and for technological needs.

### TRACES DUE TO NON-UTILITARIAN WEAR

Morphologically, and being on the surface, traces of non-utilitarian wear found on Buran-Kaya III artifacts

correspond to those obtained during an experiment where flint pieces piled together in a leather bag were transported for a long period of time (compare Photos 10-0a, b and Photos 10-35a, b). On the whole, they are practically identical kinds of wear. On an experimental piece, the surface of a worn area looks looser than that on an archeological item, since the former was not subject to deposition in the sediments of a cultural layer.

Surface wear on non-utilitarian artifacts is represented by the following kinds of traces:

- (1) grinding and polishing of protruding areas;
- (2) rounded tips of edges and ridges;
- (3) linear traces in the form of differently oriented scratches and grooves (Photos 10-3c; 10-30e; 10-33a, b).

"G" type spots of polishing, the origins of which can be connected reliably with non-utilitarian wear, were not found.

At least two clearly distinctive, contrasting areas carrying non-utilitarian wear of different stages were found on 63% of whole artifacts (22 out of 35). On 20% of pieces with wear trace stratigraphy, there are grounds to distinguish not two, but three contrasting areas (Figure 10-2).

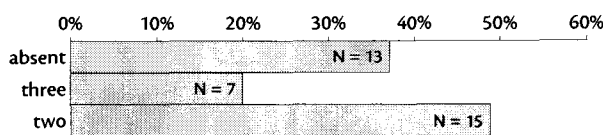


Figure 10-2—Non-utilitarian wear traces: presence or absence of two or three contrasting kinds of micro-relief surfaces.

When tools are formed by retouch, it is quite natural that their lateral edges were the most unstable, often needing rejuvenation. In most cases, retouch did not extend onto the entire ventral and dorsal surfaces: "old," worn-out surfaces remained on proximal areas of tools. It is quite possible that during a flake's use, its working edge was retouched and the item was modified into a scraper, which, upon further retouching (depending on the symmetry of the flake blank), was turned into either a point, or a convergent scraper. Non-utilitarian wear traces on flake surfaces may well be present on the surfaces of tools with retouch (both ventral and dorsal).

Non-utilitarian wear on a core is seen only on the dorsal surfaces of flakes struck from that core. It is contrasted with a "fresh" ventral surface appearance for these flakes. It is therefore not possible to precisely define what stage of artifact life produces non-utilitarian wear. Its origin on a tool can be stated only in relation to the reduction of secondarily treated

surfaces. In the remaining cases, when the surface of a tool includes remains of ventral/dorsal surfaces, non-utilitarian wear initiated on a core or a flake can either remain as such on the tool, or be strengthened, due to accumulation throughout its use-life.

It is of interest that not only tools were used over a relatively long time in the Buran-Kaya III Level B assemblage. Quite a number of observations indicate that cores (Photos 10-13, 10-15, 10-18, 10-20) and some flakes (Photo 10-22) were also used for a relatively long time. It should be noted that the assemblage provided for the use-wear analysis lacked flakes and cores. It is quite likely that their inclusion in this study would have made it possible to obtain even more convincing results. Comparing wear stages on flake/blank ventral and dorsal surfaces can identify which process prevailed at the site: manufacture of tools or only their reshaping. In other words, whether flakes were only imported or if cores were used to produce flakes on-site.

For convergent forms, on their pointed tip areas, where shaping scar removals came together and overlaid one another, virtually none of the tools have traces of non-utilitarian wear. They were removed by edge rejuvenation facets. The presence of a miraculously preserved area of non-utilitarian wear on one of the rejuvenation pieces of a bifacial convergent tool tip should be considered as a special success and very significant (Photo 10-37). Generally, these traces are completely destroyed by retouch on the dorsal surfaces of tools with intense dorsal treatment, while they clearly remain on the ventral sides.

In cases where artifacts have been ventrally thinned, edges and ridges of these facets always have a more expressive non-utilitarian wear than do the ridges of dorsal removals of secondary treatment (Photos 10-33, 10-27). This finding is significant and supports commonly held ideas about the sequence of manufacture of Eastern Micoquian tool forms (dorsal removals are always secondary, which is clear from the truncation of thinning scars). They unambiguously signify that the shaping of tool edges by facet removals onto the dorsal surface was carried out repeatedly. Furthermore, there are grounds to assume that the thinning of ventral surfaces could also have been repeated. For instance, by establishing a stratigraphy of scarcely definable wear, it became possible to ascertain two generations of ventral thinning removals on tool 34 (Photo 10-34).

The distribution (presence/absence) of non-utilitarian wear present on the tools in this study is shown in Table 10-3. In spite of the rather small number of analyzed tools, it is worth noting that there is a very high percentage of artifacts with non-utilitarian wear among the bifacial tools and the unifacial convergent forms (points and scrapers).

The only bifacial tool without distinctive non-utilitarian wear attributes is the badly worked plano-convex

TABLE 10-3  
Presence/absence of non-utilitarian wear traces

Tool type	Present	Absent
Bifacial tools	3 (75%)	1 (25%)
Unifacial points	9 (90%)	1 (10%)
Unifacial convergent scrapers	7 (63%)	4 (36%)
Unifacial double scrapers	—	1 (100%)
Unifacial transverse scrapers	2 (50%)	2 (50%)
Unifacial simple scrapers	1 (25%)	3 (75%)
Unifacial denticulated convergent tools	—	1 (100%)

tool 34, the plano surface of which was retouched two times (Photo 10-34). Surfaces and inter-facet removal ridges in the center of the plano surface from the first generation of retouch retain traces that look like non-utilitarian wear. In spite of their poor recognizability, due to weak development, it is possible to observe their “cutting” by scars of secondary removals (Photo 10-34). This artifact retains some traces that look like the type of wear we are interested in, but they are not sufficiently preserved for reliable conclusions.

The prevalence of non-utilitarian wear on bifacial tools and unifacial points looks even more convincing when compared to all unifacial scrapers and denticulated tools combined (Figure 10-3). The majority of

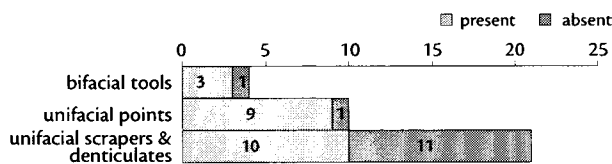


Figure 10-3—Presence of non-utilitarian wear traces on bifacial and unifacial tools from Level B.

unifacial scrapers and denticulates do not have non-utilitarian wear, while a majority of bifacial tools and unifacial points do have it. These tools, compared to the total number of all unifacial scrapers plus the denticulated tools, underwent non-utilitarian wear without a substantial change in form. If our study had included more scrapers, their convergent forms are likely to have added to the group of bifacial tools and unifacial points, although even now the tendency is evident. Such an analytic result is surprising and even paradoxical. It would be quite logical to presume much more non-utilitarian wear in the group of unifacial simple scrapers, since compared to bifacial tools and unifacial points, these items underwent less intensive secondary treatment. Therefore, they should have retained more traces of “old” dorsal surfaces of

TABLE 10-4  
Association of abrasion and non-utilitarian wear traces

	Abrasion	No abrasion
Non-utilitarian wear	14 (40%)	8 (23%)
No non-utilitarian wear	8 (23%)	5 (14%)

the blank-flake or even the core. Dorsal surfaces of unifacial points, to say nothing of the surfaces of bifaces (due to the very fact that they are convergent), theoretically, should have fewer chances to accumulate non-utilitarian wear. If it does not always hold true for the Level B assemblage, the question arises, why?

At the present research stage, it is not possible to carry out a complete analysis of this phenomenon, based on the results of such a small group of artifacts. Some judgments and assumptions are quite appropriate, however. First, the reason for the phenomenon discussed lies in the intensity of wear. It is possible that people constantly carried these tools with them, to use during hunting, for instance, while simpler tools (flakes and scrapers) mostly “stayed at home.” Second, it is possible that this phenomenon is explained by the duration of tool use. In other words, these items could have had longer lives because they did not fundamentally change form, being a more stable type of tool as compared to flakes and scrapers. Third, it is possible that during their long life, they underwent more intense wear than did flakes and scrapers. The coincidence of the number of items with non-utilitarian wear and those with abrasion (63% each) is more likely to be accidental. Rather, a large part of abrasively treated items among those with non-utilitarian wear is worth noting (Table 10-4). Both kinds of traces are recorded on 40% of the tools. It may serve as additional evidence for these items having been used for a long time, and more attention paid to them. A list of these tools is presented in Table 10-5.

Tools 8, 11, 12, 19, and 28 were heavily exhausted and were subsequently retouched (Photos 10-8, 10-11, 10-12, 10-19, 10-28). The position of non-utilitarian wear traces on the other tools is different: they were both heavily exhausted and retouched repeatedly.

Traces of non-utilitarian origin do not come along just once and rapidly. Since every “layer” of such traces means a certain period of stability—an interval in the process of shaping an item—we can pose the question, What were these items in the intervals between retouching/rejuvenating processes? Since there is no evidence that the morphology of the tools was stable throughout their lifetime, if the tools were repeatedly modified, we must ascertain (1) if these complex tool forms were the result of multiple rejuvenations by simple flaking (scalar) retouch or (2) if there existed a transition from one kind of tool into another.

TABLE 10-5  
 Characteristics of tools with both non-utilitarian wear traces and abrasion

No. Tool type	<i>On the surface of a core and/or dorsal surface of a flake</i>	<i>On ventral surface</i>	<i>On the surface of secondary treatment removals (dorsal side)</i>	<i>On the surface of secondary treatment removals (ventral side)</i>
8 Unifacial transverse scraper	+	+	-	-
11 Unifacial convergent scraper	+	+	-	-
12 Unifacial convergent scraper	+	+	-	-
19 Unifacial convergent scraper	+	+	-	-
28 Unifacial point	+	+	-	-
18 Unifacial convergent scraper	+	+	+	-
29 Unifacial point	+	+	+	-
30 Unifacial point	+	+	+	-
24 Unifacial point	+	+	+	+
23 Unifacial point	+	+	+	+
15 Unifacial convergent scraper	+	+	+	+
32 Bifacial tool	+	+	+	+
33 Bifacial tool	+	+	+	+

### TRACES OF USE

Thanks to the good preservation of the flint material from Buran-Kaya III Level B, traces of use were found on 23 artifacts, or 40.4% of sample provided for use-wear analysis. Table 10-6 summarizes the results based on particular categories and character of the traces of use.

In spite of a rather limited number of artifacts, it is obvious that well pronounced traces of use occur most often on bifacial and unifacial convergent tool tip rejuvenation pieces. The surfaces of these rejuvenation pieces, not strictly related to their ventral surfaces, are both fragments of the pointed areas of the tools' working edges and pointed tips of convergent tools themselves. Altogether, such pieces with use traces account for 90.9% of the rejuvenation pieces studied. Such a high percentage is not accidental, and, if we study more pieces of this kind, it is unlikely to substantially change. Undoubtedly, these rejuvenation pieces in the Level B assemblage practically always have use-wear traces on their working edges. For now, we know only of one function for the artifacts from which these fragments come: meat/raw hide cutting.

This observation further confirms an assumption by Demidenko (Chapter 9) about the origin of these rejuvenation pieces. They result from the retouching/resharpening of dulled working edges of convergent tools, since the formation of well pronounced traces of meat/hide cutting is always connected with rounding of the edge. This edge rounding is the main reason that cutting tools became dulled.

The morphological stability and the considerable number of such rejuvenation pieces in this Middle Paleolithic assemblage seem to demonstrate their special, deliberate manufacture. Indeed, they are

identical and quite numerous here. Formally, their origin should be recognized as purposeful. In this case, however, the question of what kind of mental template produced them is not clear. Can it have been a special way of shaping/reshaping pointed/convergent tools? Points and convergent tools are well represented in some Middle Paleolithic industries, but rejuvenation pieces of this kind hardly occur in all in them. A number of observations indicate that the objective was not for these pieces themselves, but rather the standardized process of edge retouching/rejuvenation. That is, convergent tools were retouched and rejuvenated in a special way in Buran-Kaya III Level B. In addition, edge rejuvenation retouch was carried out almost exclusively onto the dorsal face (there are no pieces with a different orientation). Edges of numerous items are retouched in one direction, starting from the base onto the distal part. In the case of convergent tools, they are retouched from the base or one-third of the worked length to the terminal end (pointed tip). Owing to stratified traces, some tools show that resharpening retouch of a dulled edge stopped at the very point, where an expressive wear area remains (e.g., Photos 10-22, 10-29). As the area of application of force shifted towards the pointed tip, the probability of its non-deliberate breakage strongly increased. That is why this area was retouched with special care. Thus, the regularity and recurrence of the morphology of the analyzed rejuvenation pieces is a result of a definite, ordered sequence of retouching tools with edges that converge at an acute angle, and this is reflected in the products of the resharpening process. So, it is not a special way of shaping convergent tools. The recurrent morphology of the rejuvenation pieces should be regarded as very similar to the recurrent morphology of blades/flakes with plunging distal ends. Both these



TABLE 10-6  
Summary of use traces by tool type

<i>Tool type</i>	<i>Traces of use (total)</i>	<i>% of pieces with traces of use within the group</i>	<i>% of the total number of pieces with traces of use</i>	<i>Kinematics</i>	<i>Contact material</i>
Bifacial tools	2 (of 4)	50.0	8.7	cutting	meat
Rejuvenations of bifacial convergent tool tips	4 (of 4)	100.0	17.4	cutting	meat
Rejuvenations of unifacial convergent tool tips	6 (of 7)	85.7	26.1	cutting	meat
Unifacial points	4 (of 10)	40.0	17.4	2 cutting, 2 scraping- cutting	2 meat, 2 hide-meat
Unifacial convergent scrapers	4 (of 11)	36.4	17.4	2 cutting, 2 scraping- cutting	2 meat, 1 hide, 1 bone
Unifacial simple scrapers	2 (of 4)	50.0	8.7	1 cutting, 1 scraping	1 meat, 1 hide
Unifacial denticulated convergent tools	0 (of 1)	—	—	—	—
Unifacial double scrapers	0 (of 1)	—	—	—	—
Unifacial transverse scrapers	0 (of 4)	—	—	—	—
All retouch chips	1 (of 11)	9.1	4.4	cutting	meat
Total	23		100.0	18 cutting, 1 scraping, 4 scraping- cutting	18 meat, hide, 2 hide-meat, 1 bone

kinds of pieces were not made accidentally, but at the same time, they were not made deliberately.

In Table 10-6, judging from the number of items with use-wear traces, unifacial points and convergent scrapers follow the group of rejuvenation pieces of tips of bifacial and unifacial convergent tools. Working areas (lateral edges and the pointed area) in most cases underwent retouch: they almost always possess "fresh" retouch. Both edges of the points were made by sharpening retouch and it is not possible to distinguish any backed areas. One of the convergent scrapers, however, probably shows some backing. Use-wear traces (or their remains) cover the tool from the tip to two-thirds of the length of the edge. Traces of cutting meat and cutting/scraping meat/raw hide occur on points. Traces of cutting meat and cutting/scraping meat/raw hide occur on convergent scrapers and, as mentioned above, there are traces of scraping bone, the reason for which is not quite clear (see Photo 10-10).

Only traces of meat cutting occur on bifacial tools. Their position and distribution is similar to that found on unifacial points and convergent scrapers.

Unifacial simple scrapers complete the set of tools carrying traces of use-wear. In the two cases, preservation of traces is quite unsatisfactory. On one scraper, they represent remains of the working edge, which was probably used for scraping hide. The main area carrying traces of use-wear was removed by subsequent retouch (Photo 10-4). On the second scraper,

there is exceptionally badly developed meat cutting wear damaged by crushing (Photo 10-3). A distal part of the piece had a working area.

Finally, it is worth noting that only a single item among the eleven retouched chips had use-wear traces. A retouched piece on an unifacial/bifacial lateral edge with fine resharpening, piece 56 had a cutting meat/raw hide function (Photo 10-56). The absence of any use-wear traces on the other ten retouched chips is probably connected to their very tiny and thin butts where detection of wear is very difficult, if not impossible.

Meat and/or raw hide work wear is found on the majority of tools with unquestionable wear; it also dominates all the groups, apart from unifacial simple scrapers (Figure 10-4).

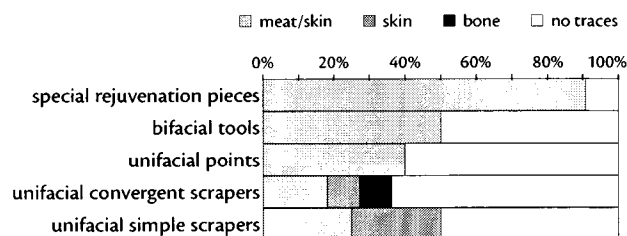


Figure 10-4—Use wear distribution according to the kinds of contact materials.

Buran-Kaya III tools are made of good quality Crimean flint and have a very high degree of preservation. This is probably the reason why meat/raw hide use-wear traces resemble textbook examples (Photos 10-3, 10-11, 10-30, 10-43, 10-45, 10-56). First, they have two-sided, fluid polishing that softly envelopes the micro-reliefs. Well-developed, it concentrates at the very edge and, as it moves away from that edge, it gradually disappears in peripheral areas. The working edge's flange is softened in plan and slightly rounded in profile (Photo 10-43a, b). Only the smallest protrusions are smoothed (Photo 10-56b). No sufficient or clear linear traces were found on the tools carrying meat cutting traces. Grooves and scratches that are very expressive occur only on the tools where hide wear traces predominate over meat cutting ones (Photos 10-30a-c). The predominance of hide treatment wear traces is expressed by intensive (as compared to meat cutting) rounding and smoothing of the working edge's flange in plan and profile. In some cases, the surface of areas with traces of meat/hide wear shows separate spots of different, more compact polishing, probably resulting from repeated contacts with bone (e.g., Photo 10-11d shows a spot of complete polishing on the right side of the edge).

Two scrapers, no. 14 and no. 4, show traces of contact with hide (Photos 10-4 and 10-14). Scraper 14 shows the most pronounced wear (Photo 10-14a-i). It is expressed as two-sided polishing, relatively pronounced, softly, but intensely smoothing micro-relief penetrating practically into all the depressions of the edge-area of the tool, except the smallest ones. In spite of a rather high degree of relief abrasion, the surfaces of the intensely worked areas is loose. The edge is strongly dulled, smoothed in plan, and rounded in profile. The surface carries a large number of linear traces (Photos 10-14b-d, h-i). They are, in part, directed diagonally towards the working edge, which corresponds to the cutting function, and in part directed perpendicularly, which shows scraping. It is significant that both pieces (Photo 10-4 and 10-14) carry traces of wear that were damaged by the subsequent retouch rejuvenation and that tool no. 14 was also used after such rejuvenation.

Cutting use predominates among the tools with defined wear, as well as among most of the groups, apart from simple scrapers (Figure 10-5). Only two tools—no. 4, a simple scraper, and no. 10, a convergent scraper—exhibit scraping traces in more or less

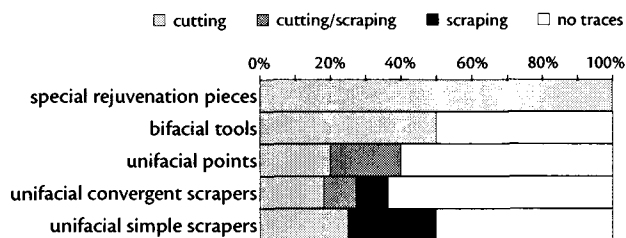


Figure 10-5—Traces of the distribution of use according to kinematics.

pure form (Photos 10-4 and 10-10). However, both pieces have problematic traces. It has already been mentioned that it is not possible to interpret unambiguously scraping traces for tool 10. Tool 4 retains only a small portion of the working edge. That is why, based on these observations, it is practically impossible to get a complete idea about the character of the working edges of tools meant for scraping. Nevertheless, it is enough just to establish the fact of scraping as a kind of reconstructible behavior.

Tables 10-2 and 10-6 show that the simpler the morphology of Level B tools, the more diverse are the use-wear traces as to the kinds of contact materials and kinematics. At the same time, the set of reconstructible functions is not wide. All of the tools show traces of meat and/or hide cutting. Thus, it is possible to argue that an overwhelming number of items with use-wear were connected with butchering animal carcasses (Figure 10-6).

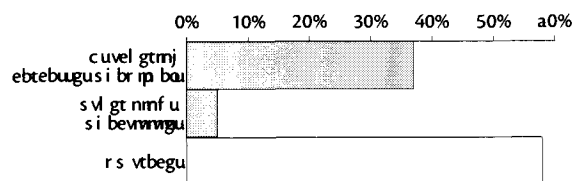


Figure 10-6—Distribution of reconstructed kinds of activities in Level B.

Signs of activities connected with bone and hide treatment are minimal. There is no evidence indicating wood treatment.

## Conclusions

Thanks to the relatively young age of this Middle Paleolithic assemblage and the favorable depositional conditions, artifacts from Buran-Kaya III Level B are rather well preserved for wear analyses. They show the

entire range of traces needed for traceological research. There is no significant post-depositional damage to the artifacts. The presence of some small crushing facets on the edges of the artifacts is due to trampling.

Wear traces connected with knapping technology are represented by an abrasive treatment on the flake edges and on the flanges of core platforms in the area where the blow was applied. The purpose of such abrasive treatment to these edges is not clear. Equally, its use to create adaptation elements of tools for application and/or technological needs can be assumed.

Traces of "non utilitarian" wear occur more often, and in a more developed way, on complex tool forms: bifacial tools, unifacial points, and convergent scrapers, which quite definitely indicate longer and/or more intense use of these particular tool types.

Of interest is the thermal treatment of a flake used as a blank for a unifacial convergent scraper (Photo 10-12). Even given that this thermal treatment could hardly have been deliberate, it is a unique example among the materials of a Middle Paleolithic industry.

Practically all rejuvenation pieces of bifacial and

unifacial convergent tool tips have pronounced wear resulting from meat cutting. They are non-deliberate, specific retouch spalls of reduced tool working edges.

On the whole, both use and wear traces occur more often on morphologically complex tools. In all likelihood, they are "exhausted" tools abandoned at the final stage of their shaping/reshaping and usage. To explain this phenomenon, it is necessary to compare the traceological appearance of separate groups with morphologies of different complexity. That is why, to continue the research, it is necessary to get a more complete idea about the traceology of simple scrapers and flakes without retouch.

The predominant functions of tools in the Buran-Kaya III Level B assemblage were butchering carcasses of animals and probably initial hide treatment. No significant traces indicating any other kinds of activities were found

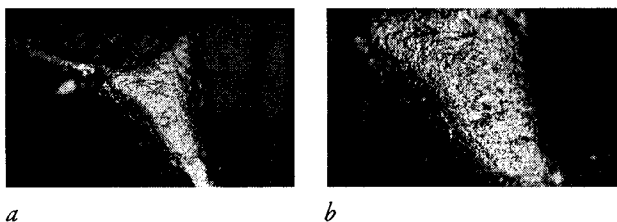


Photo 10-0—Experimental tool: non-utilitarian wear traces on the tool's ridge were caused by transportation in a leather bag, *a*—100x, incident light; *b*—200x, incident light.

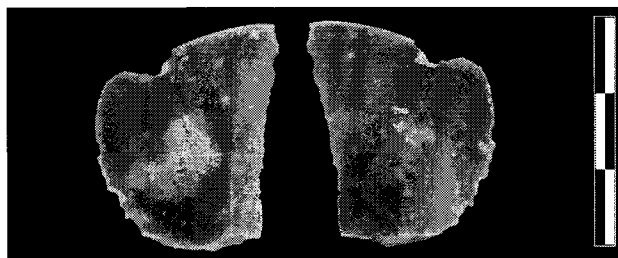


Photo 10-1—Unifacial simple concave scraper. No significant traces of use were found. Weak traces of abrasion occur on the lowest area of the right edge. Convincing traces of non-utilitarian wear are absent. The surfaces of the dorsal side and the flake's butt look more reduced than the ventral side. Preservation: excellent.

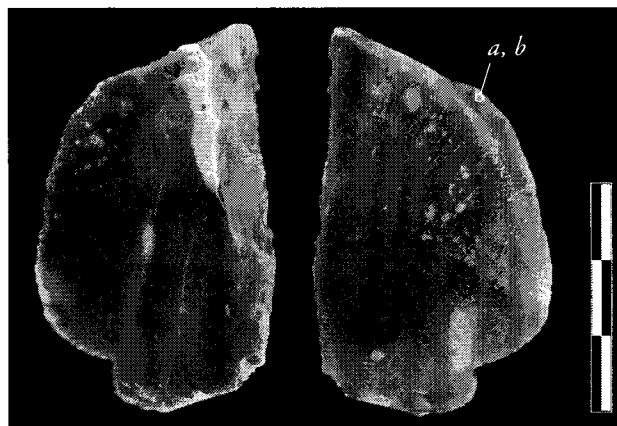
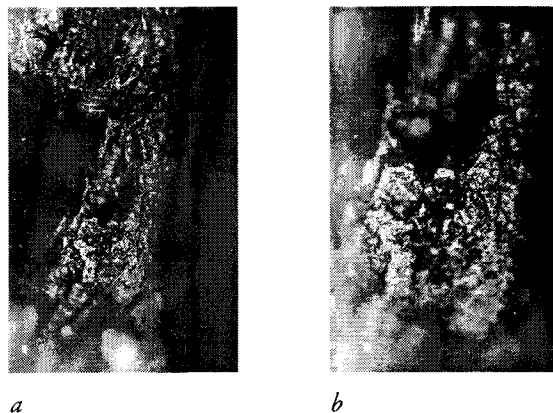


Photo 10-2—Unifacial simple wavy scraper. No significant traces of use were found. Traces of abrasion occur along the whole length of the left edge: *a*—100x, incident light; *b*—200x, incident light. The treatment is very intense, turning into grinding, rounding the edge in profile. It is unclear whether this is preparation of a knapping area before application of sharpening retouch or is an adaptation of the butt of the tool. There are no traces of non-utilitarian wear. All surfaces, edges, and ridges are almost equal and are almost non-reduced. Preservation: excellent.



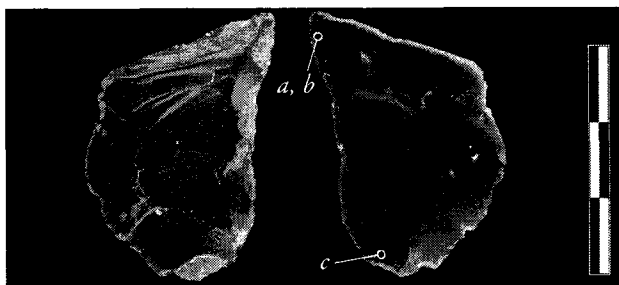
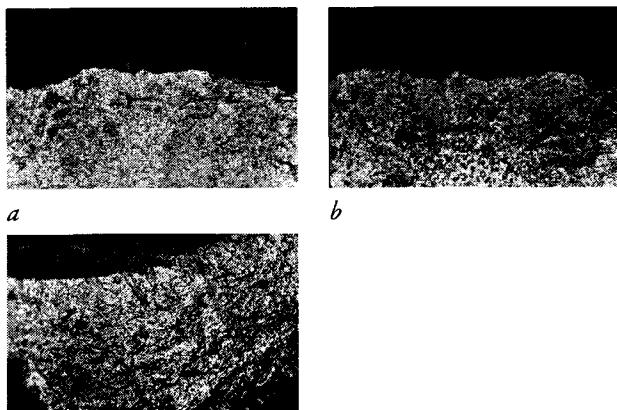


Photo 10-3—Unifacial simple concave scraper. There are very weak “meat polishing” traces on the right edge at the distal end of the tool. There are no sufficiently long, full profile traces. Small, badly pronounced fragments of abrasion occur on both edges. There are no convincing traces of non-utilitarian wear. Surfaces of the dorsal and ventral sides and butt have the same wear as the interfacet ridges of the secondary retouch treatment. Preservation: excellent. *a*—poorly pronounced meat cutting traces, 100×, incident light; *b*—poorly pronounced meat cutting traces, 200×, incident light; *c*—Non-utilitarian wear traces, 100×, incident light.



*c*

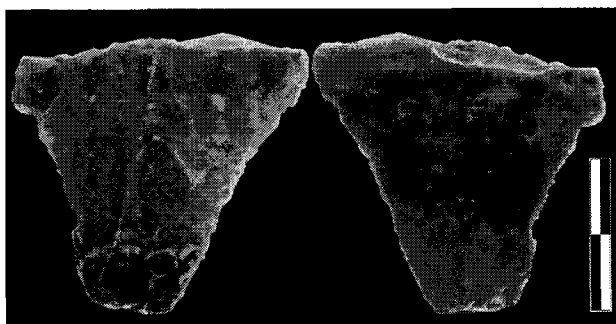


Photo 10-4—Unifacial simple concave scraper. Remains of a scraping edge with slightly pronounced roundedness of

the edge, meat grinding, and “hide” polishing occur in the upper left area of the tool. The remaining parts of use-wear traces were destroyed by the subsequent retouch and edge damage. Slight degree of ridge erasure on ventral and dorsal surfaces and edges. The retouch on both edges retouch has a fresher appearance. Right edge retouch is reminiscent of trampling edge damage. The item, when in the flake stage without any particular retouch, was used for a short time (hide scraping, but there are too few traces for a reliable conclusion), then slightly retouched and abandoned. There are grounds to distinguish at least two stages of use-life for the tool: before and during formation of traces on the left edge, and a succeeding retouch. Preservation: satisfactory.

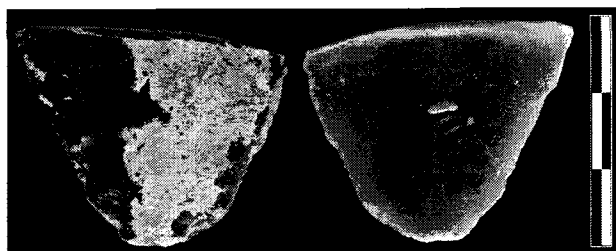


Photo 10-5—Unifacial double straight-convex scraper. Traces of use were not found. Signs of non-utilitarian wear are absent. Preservation: satisfactory.

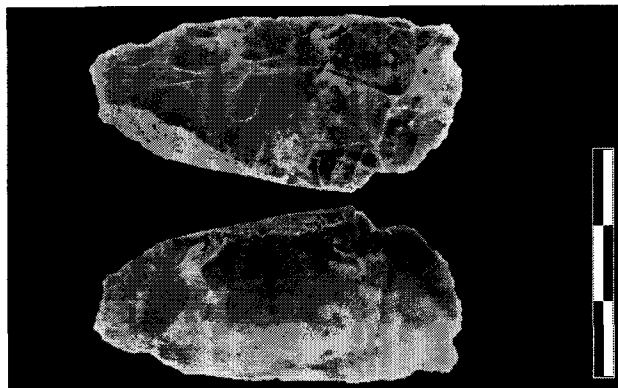


Photo 10-6—Unifacial transverse convex scraper. Traces of use were not found. Signs of non-utilitarian wear were not found. Preservation: satisfactory.

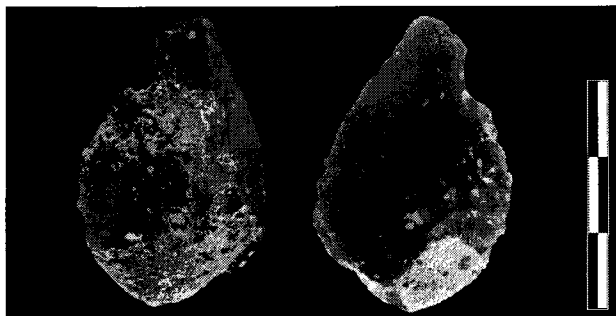


Photo 10-7—Unifacial transverse convex scraper. No pronounced traces of use were found. Areas with a slight roundness of the edge and very slight, non-developed polishing are broken by later damage on both edges. Remains of small fragments of abrasion on the edge. No traces of non-utilitarian wear. The microrelief on the dorsal and ventral surfaces is practically identical. Preservation: excellent.

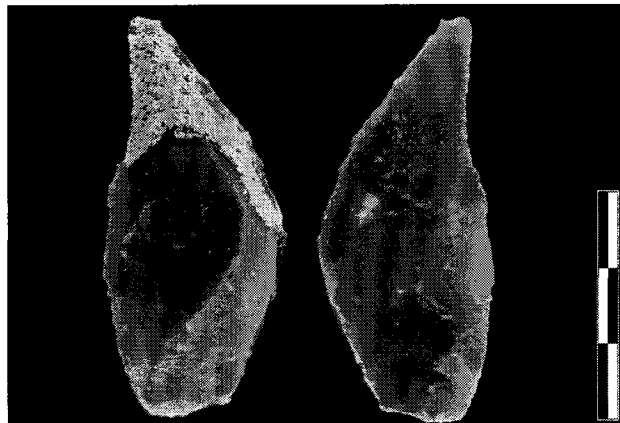


Photo 10-8—Unifacial transverse-convex oblique scraper. No pronounced traces of use were found. There are remnants of edge abrasion on the right side. Traces of non-utilitarian wear were found on both the dorsal and ventral sides. Separate areas of the retouched edge rounded by this kind of wear remain at the base and on the right side. Thus, there are grounds to distinguish (1) the removal of the flake and its primary retouching and (2) secondary retouching. Preservation: excellent.

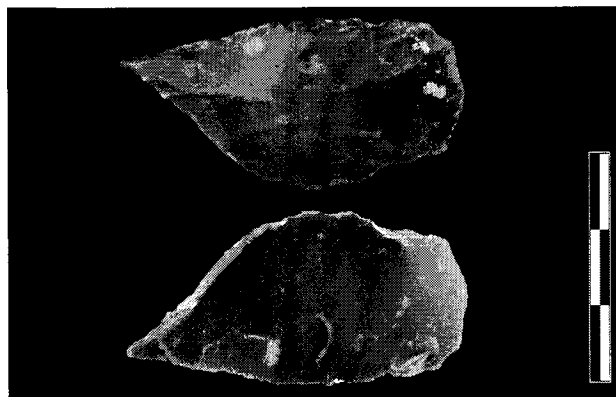


Photo 10-9—Unifacial transverse convex scraper. Not clear polishing was found along the right ventral side. Traces of non-utilitarian wear were found on the dorsal sides. Intensely worn ridges on the dorsal side are removed by secondary treatment retouch facets. Preservation: satisfactory.

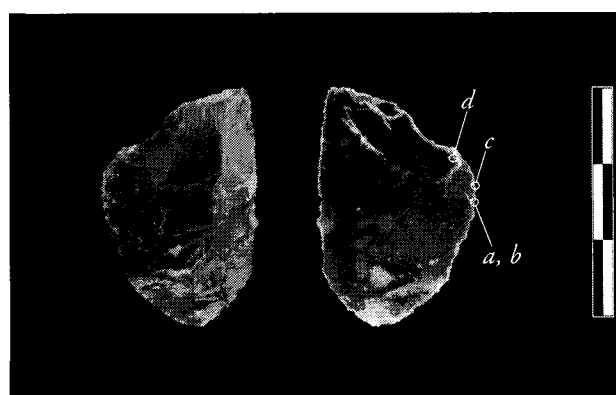
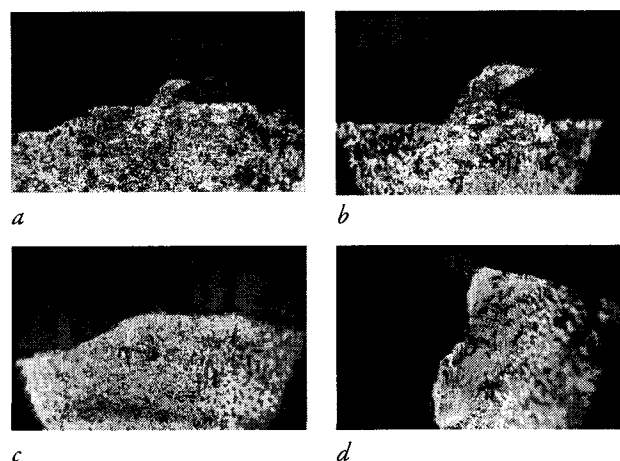


Photo 10-10—Unifacial convergent scraper (elongated trapezoidal with thinned base and distal end). There is bone/antler polishing on the left edge (backing?). Judging from badly defined scratches, and the disposition and directions of cracks, it had a scraping function, but somewhat irregular. It may well be the result of blunting the backing against bone, not scraping bone to shape it. Slightly pronounced non-utilitarian wear was found on the ventral side and



ridges between retouch facets on the dorsal side. All areas of the old surfaces were removed by the tool's retouch facets. Preservation: good. *a*—bone scraping traces, 100 $\times$ , incident light; *b*—bone scraping traces, 200 $\times$ , incident light; *c*—bone scraping traces, 200 $\times$ , incident light; *d*—micro mirrors of "G" type polishing, post occupational burial traces, 100 $\times$ , incident light.

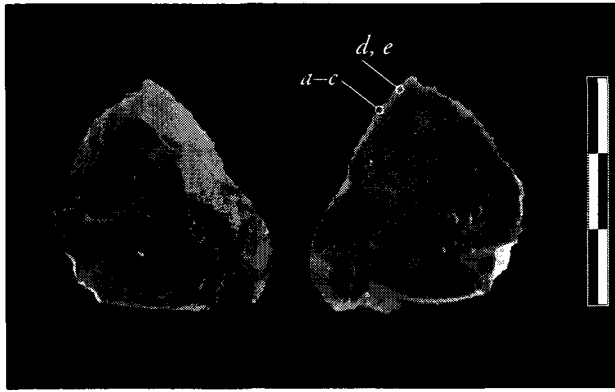
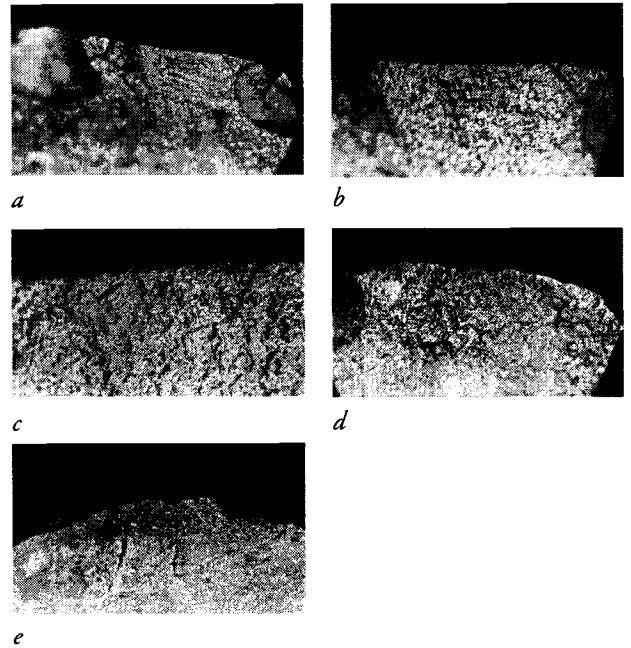


Photo 10-11—Unifacial convergent scraper (semi-crescent). There are remains of well pronounced meat cutting wear on the right edge. There are remains of abrasion on the left edge, situated on the surviving areas of the edge after the last retouch facets were made. Non-utilitarian wear on the dorsal and ventral sides was removed by retouch facets. Thus (1) manufacture of tool and its use, (2) abrasion of the right edge (probably simultaneously with the preceding process), and (3) rejuvenation retouch are distinguished. On the very tip of the dorsal side, there are facets of small lengthwise spalls, reminiscent of spin-off wear or a Kostenki-type knife, since they are removed from a prepared platform by retouch onto the ventral side. Preservation: good.



a-c—meat cutting traces: a-100x, incident light; b-200x, incident light; c-400x, incident light; d, e—meat cutting traces: d-200x, incident light; e-100x, incident light.



Photo 10-12—Unifacial convergent scraper (leaf-shaped with thinned base and back). No pronounced traces of use were found. Areas of edge abrasion remain on the lower part of the right edge. There is well pronounced roundedness of dorsal ridges, particularly on the ventral side. Interfacet ridges and facet surfaces of rejuvenation retouch of the edges have a practically fresh appearance. Thus, it is possible to distinguish two stages of life: before the reshaping of the working edge and after. This tool is made on a thermally treated flake. Nearly all of the ventral surface has a matte "pre-surface" (texture of the surface prior to thermal treatment), the rest of the facets are made after the treatment. They have a smoother texture and a characteristic oily gloss. The morphology of a chip negative detached from the lower ventral part also testifies to a thermal treatment. Most likely, it occurred accidentally. The tool in its present form was made from a thermally treated flake or retouched after thermal treatment. All retouch facets on the dorsal and ventral sides relate to a post-thermal stage. Preservation: good.

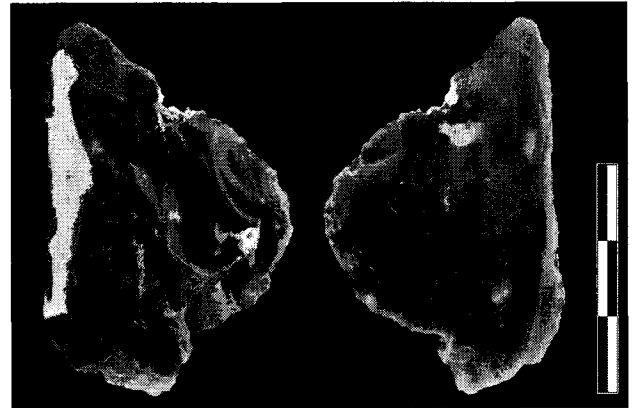


Photo 10-13—Unifacial convergent scraper (semi-trapezoidal). Pronounced traces of use were not found. Well pronounced wear of dorsal interfacet ridges, particularly well developed is the grinding of the ridges existing on the core. New interfacet ridges, as well as ventral ridges, are much less reduced. There are grounds to distinguish only two life stages: (1) non-utilitarian wear of the surface of a core and (2) the flake's removal, retouching, and possible use. Preservation: excellent.

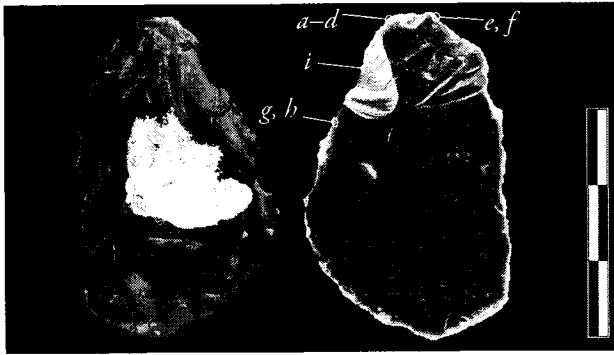


Photo 10-14—Unifacial convergent scraper (elongated trapezoidal with thinned base). Very expressive raw hide cutting/scraping traces were found on the upper part of the tool and on the right edge in the area between the tip and the middle part of the edge. On the very tip and along the edge this wear is partly damaged by later edge damage (trampling?). The intensity of polishing and degree of roundness of the edge's flange are not homogeneous. In the area where trimming retouch removed a part of the edge, this wear is less developed. The tool was likely used for the same function before and after trimming. Traces of abrasion were found on the left side. Most likely, it is not an adaptation of the tool's back, but preparation of a platform for dorsal retouch. Areas with abrasion are retained only in between facets. Traces of non-utilitarian wear were not found. Preservation: excellent. *a-d*—raw hide scraping-cutting traces: *a*—50x, incident light; *b*—100x, incident light; *c*—200x, incident light; *d*—400x, incident light; *e-f*—raw hide scraping-cutting traces: *e*—100x, incident light; *f*—200x, incident light; *g-h*: raw hide scraping-cutting traces, *g*—100x, incident light; *h*—200x, incident light; *i*—raw hide scraping-cutting traces, 200x, incident light.

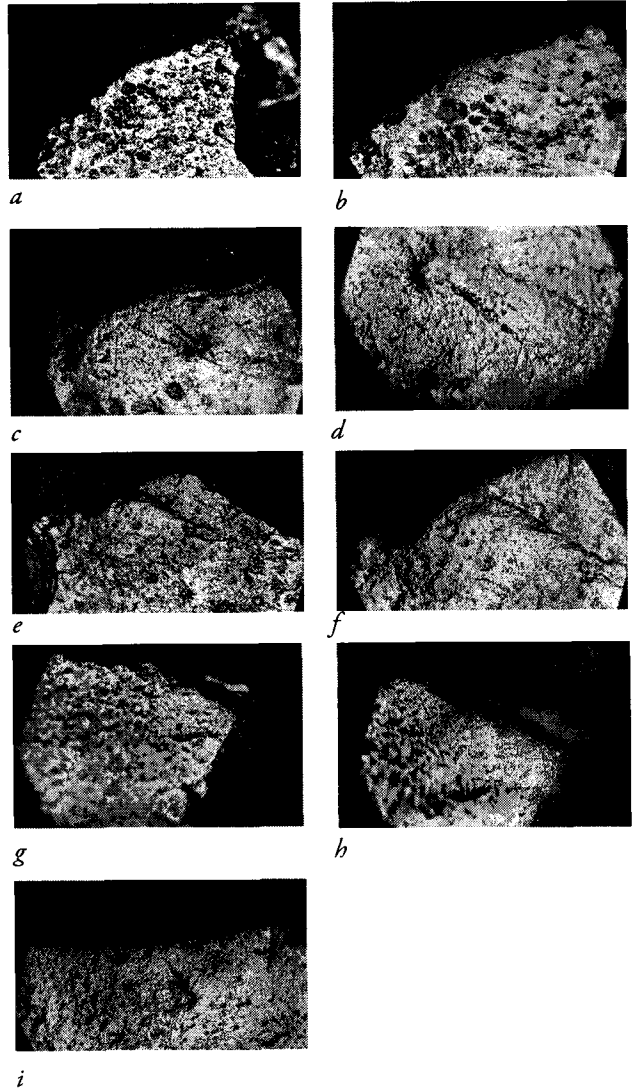


Photo 10-15—Unifacial convergent scraper (elongated semi-trapezoidal). Pronounced traces of use were not found. Areas with abrasion of the edge occur on the right and left sides. On the back, in the proximal part of the tool, there are areas of abrasion, remains of polishing of the contact area on the nucleus. Distinct from normal (e.g., for Upper Paleolithic) abrasion, this was carried out in the direction from the flaking surface onto the platform. Well pronounced

roundedness and polishing of ridges on the fragments of the flake removal surface occur on the back of the flake. Badly pronounced non-utilitarian wear is on the ventral side. Interfacet ridges and retouch facet surfaces of the left edge have a practically fresh appearance. The first row of dorsal facets on the right edge has traces of reduction of ridges. The ventral ridges of facets are also reduced. Thus, the item had three life stages taking place at different times: (1) a core with developed non-utilitarian wear (transportation?), (2) manufacture of the tool and its use (?), and (3) application of new retouch—rejuvenation. Preservation: satisfactory.

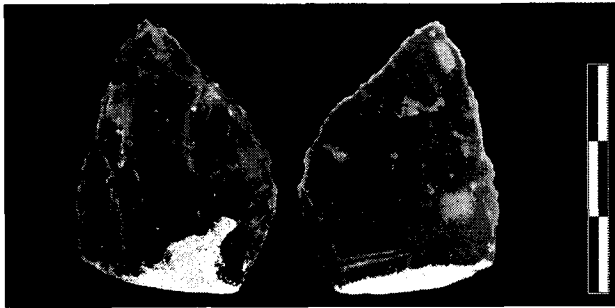


Photo 10-16—Unifacial convergent scraper (elongated semi-trapezoidal, naturally backed). No pronounced traces of use. No non-utilitarian wear. Microreliefs of the ventral and dorsal surfaces are practically identical. Preservation: satisfactory.

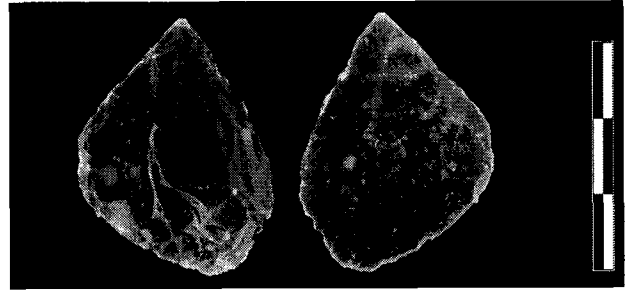


Photo 10-17—Unifacial convergent scraper (trapezoidal). No pronounced traces of use. The left side retains small areas of abrasion of the edge. No traces of non-utilitarian wear. The microreliefs of ventral and dorsal surfaces are practically identical. Preservation: excellent.



Photo 10-18—Unifacial convergent scraper (sub-trapezoidal). No pronounced traces of use. Separate fragments of "meat" polishing are in the upper part of the left edge. There are abrasion areas in the lower part of the left edge. The same, but in a very small area, occurs on the left edge where abrasion is mostly removed by retouch. Well pronounced roundedness of ridges on the flake removal surface occur on the back. Badly pronounced non-utilitarian wear is on the ventral side and interfacet ridges and retouch facets on the dorsal side. Surfaces created at different times are distinguished: (1) core, (2) tool with a succeeding or simultaneous edge abrasion, and (3) secondary retouch. There is a platform on the very tip of the ventral side similar to Kostenki-type knives. No removals from it are seen. Preservation: good.



Photo 10-19—Unifacial convergent scraper (sub-trapezoidal with thinned base). Pronounced traces of use were not found. Abrasion areas are present in the central part of the right edge. On the back, in the proximal part of the tool, there are areas of abrasion, remains of polishing of the contact area on a core. Distinct from normal (e.g., for Upper Paleolithic) abrasion, this was carried out in the direction from the flaking surface onto the platform. Very badly pronounced roundedness of ridges on ventral and dorsal sides. A practically fresh appearance of interfacet ridges and facet surfaces of rejuvenation retouch of the edges was noted. Thus, the item concerned may possess two life stages, which can be stated with a very low probability. Preservation: good.

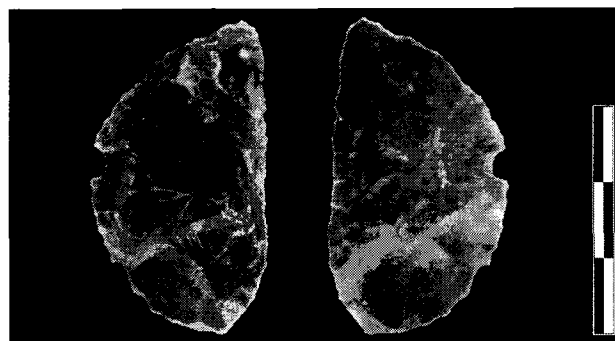


Photo 10-20—Unifacial convergent scraper (semi-crescent). Pronounced traces of use were not found. The presence of separate fragments of "meat" polishing on the right edge (at the distal end) were distinguished. On the back, in the proximal

mal part of the tool, there are areas of abrasion: the polishing remnants of a contact area on a core. Distinct from normal (e.g., for Upper Paleolithic) abrasion, this was carried out in the direction from the flaking surface onto the platform. There is very well pronounced roundedness of ridges on the fragments of the flake removal surface on the back of the flake. There is badly pronounced non-utilitarian wear on the ventral side. Interfacet ridges and retouch facet surfaces on the working edges have an almost fresh appearance. The item may therefore possess three life stages: (1) a core with extremely strong wear (transportation?), (2) tool manufacture and its use, and (3) rejuvenation retouch. On the very tip of the dorsal side there are facets of small lengthwise spalls, like spin-off wear or a Kostenki-type knife, since they are removed by retouch from a prepared platform onto the dorsal and ventral sides. Preservation: satisfactory.



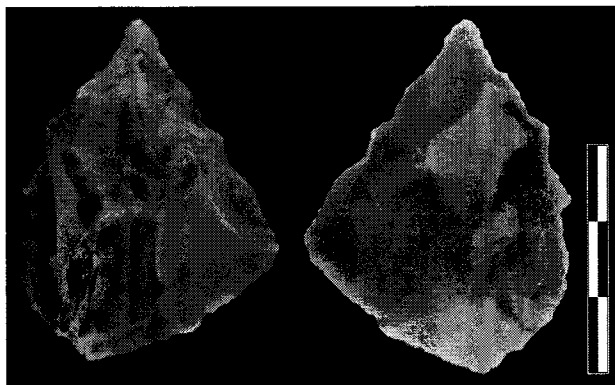


Photo 10-21—Unifacial denticulated convergent tool (semi-trapezoidal). Pronounced traces of use were not found. Traces of non-utilitarian wear were not found. Preservation: good.

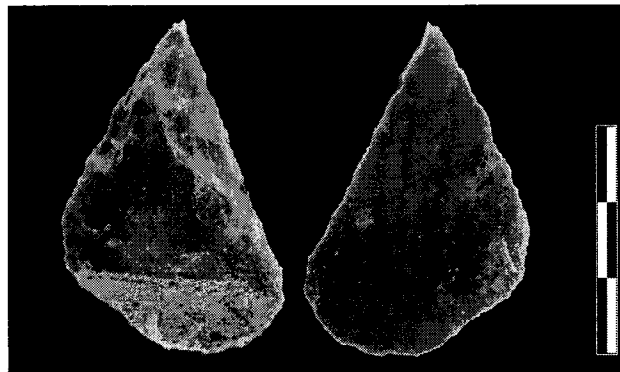


Photo 10-22—Unifacial point (sub-triangular). Pronounced traces of use were not found. There are traces of roundedness of the edge and unclear polishing along the edge of the protruding part of the base. It is very likely non-utilitarian wear of the flake. Left edge retouching was the final act of the tool retouch, and was carried out from the base onto the tip. Preservation: satisfactory.

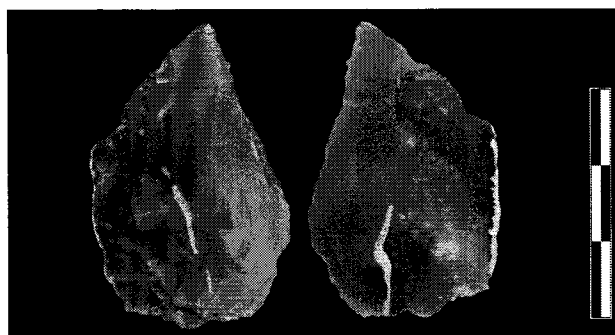


Photo 10-23—Unifacial point (elongated sub-trapezoidal, naturally backed). Pronounced traces of use were not found. In the lower part of the right edge, there are areas of abrasion. According to the degree of wear, it is possible to distinguish at least two generations of retouch on the ventral part and, to a lesser extent, on the back. Preservation: satisfactory.

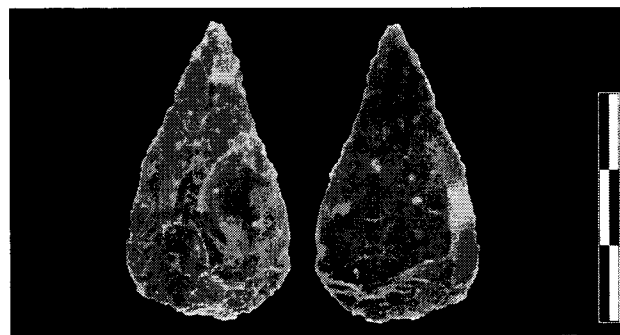


Photo 10-24—Unifacial point (leaf shaped with thinned base). Pronounced traces of use were not found. There are areas of abrasion in the lower part of the right edge. Ridges and protruding areas erasure (exhaustion) is observed at the base on the ventral part. Ridges of thinning removals are reduced. Dorsal ridges of removals are fresher. Thus, at least two phases in the tool's lifetime are distinguished. Thinning of the ventral side precedes the treatment negatives for the dorsal side. Preservation: satisfactory.

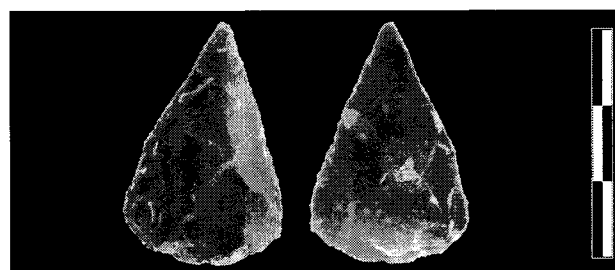


Photo 10-25—Unifacial point (leaf-shaped). There is badly pronounced meat cutting wear on the right edge (less) and left (more). According to the degree of wear, it is possible to distinguish at least two generations of retouch on the ventral part and, to a lesser extent, on the dorsal surface. Preservation: good.

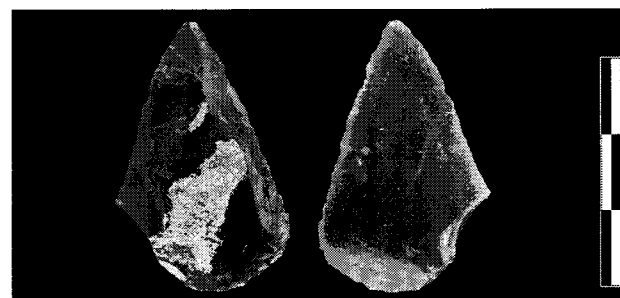


Photo 10-26—Unifacial point (sub-trapezoidal). Neither working edge has sufficiently pronounced use wear, only hinting at weak meat processing use wear. There are areas of abrasion on the lower part of the base on the right side. Weakly pronounced traces of erasure occur on the ventral side. Preservation: satisfactory.

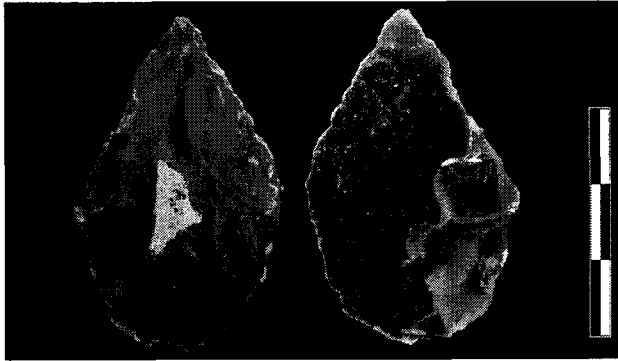


Photo 10-27—Unifacial point (leaf-shaped with thinned base). Well pronounced cutting/scraping hide/meat traces were on part of the left edge. At the very tip, this wear was

removed by edge damage like a micro burin spall, and from the side of the base by a later rejuvenation. Erasure (exhaustion) was observed on some ventral and dorsal ridges (very poor preservation) and on protruding lateral areas. This erasure was removed by shaping removals of the right and left lateral edges, as well as thinning removals made from the base onto the ventral part. Thinning removal negative ridges also have non-utilitarian wear, less developed than the "old" part of ventral and dorsal surfaces, but much more pronounced than the last retouch removals of the edges. The thinning was probably repeated. Spall dorsal ridges are fresher. Thus, three phases in the lifetime of the tool are distinguished: (1) an item to the last ventral thinning, (2) thinning, (3) an item with dorsal resharpening retouch. There is an impression that the left edge was more often retouched in order to sharpen it. Preservation: good.

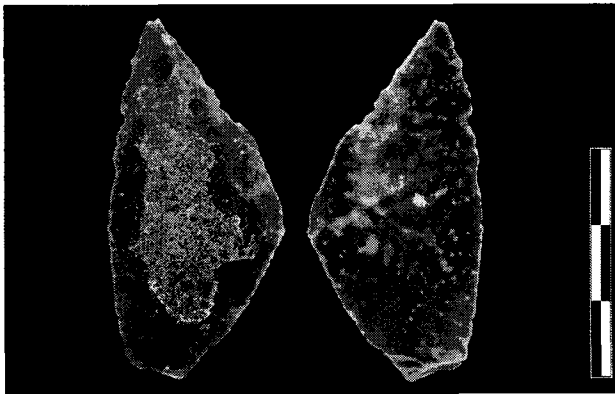


Photo 10-28—Unifacial point (elongated sub-trapezoidal). Well pronounced cutting meat/hide traces were on the right and, particularly, on the left edge, where rejuvenation retouch is more shallow. An abrasion area is in the middle of the right edge. On the ventral and dorsal sides (very poor preservation), erasure (exhaustion) of ridges and protruding areas was observed. This erasure was removed by shaping removals of the right and left edges. Thus, at least two phases in the lifetime of the tool are noted. Preservation: good.

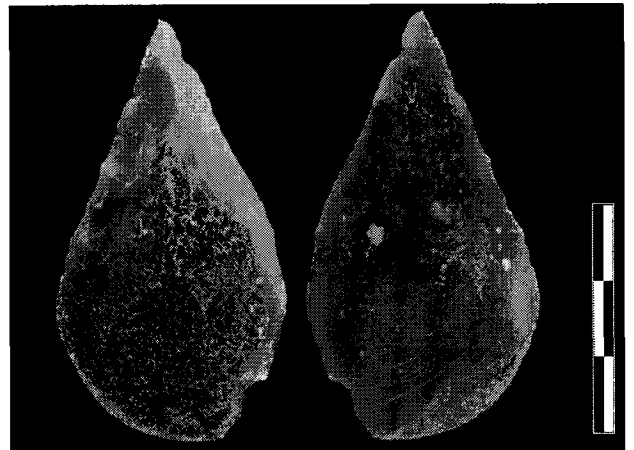


Photo 10-29—Unifacial point (semi-trapezoidal). Use-wear traces were seen on the very tip and separate areas of the left edge. The wear is poor, with fine edge roundedness and meat polishing. Remnants of abrasion areas were on the lower left edge. Non-utilitarian wear is not pronounced, so it is not possible to assume stages of treatment took place at different times. However, an area with cutting traces at the tip of the tool makes it possible to assume that the final act of tool rejuvenation was the retouch of the left edge, carried out from the base towards the point. Preservation: good.

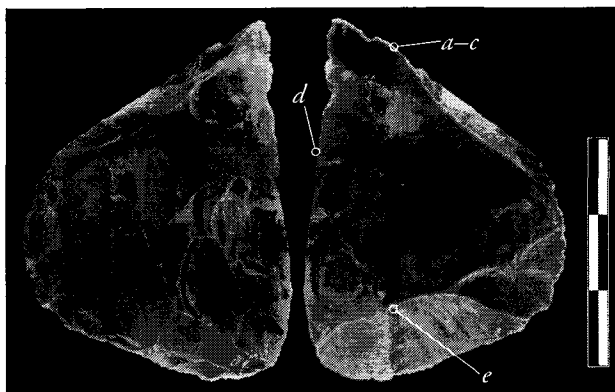
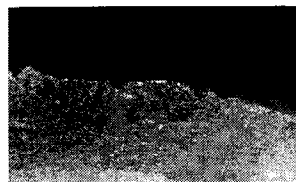
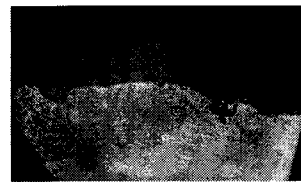


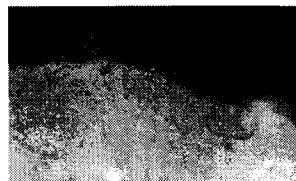
Photo 10-30—Unifacial point (trapezoidal). Traces on the left edge are morphologically similar to scraping/cutting raw hide. Areas of edge abrasion remain. Erasure (exhaustion) was observed on the ventral and dorsal sides at the basal ridges and protruding areas. This erasure was removed by shaping removals of the right and left edges. Thus, at least two, or possibly three, phases in the lifetime of the tool are distinguished. Numerous circular cracks, which are traces of hammerstone treatment, are situated on the dorsal surface of the blank-flake and its butt. Preservation: satisfactory. *a*—raw hide scraping-cutting traces, 50 $\times$ , incident light; *b*—raw hide scraping-cutting traces, 100 $\times$ , incident light; *c*—raw



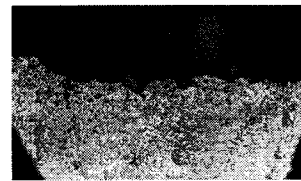
*a*



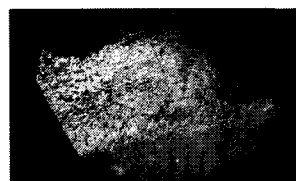
*b*



*c*



*d*



*e*

hide scraping-cutting traces, 200 $\times$ , incident light; *d*—ancient "freshly" resharpened edge, 100 $\times$ , incident light; *e*—Non-utilitarian wear traces, 100 $\times$ , incident light.

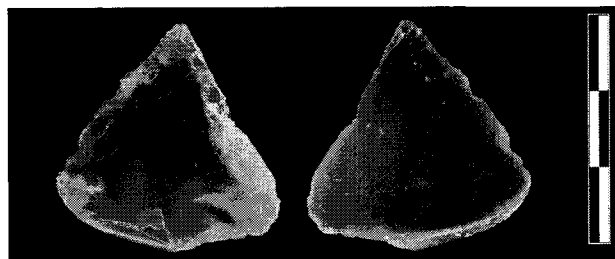


Photo 10-31—Unifacial point (sub-triangular). Neither edge has sufficiently pronounced traces of wear. No abrasion

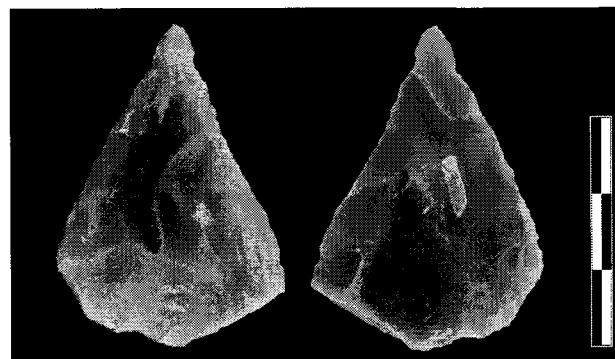


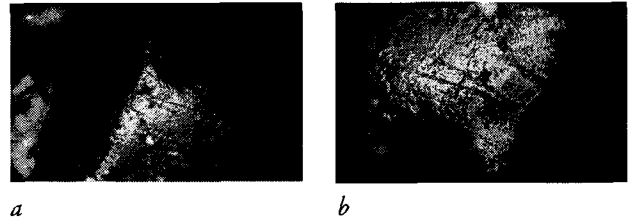
Photo 10-32—Bifacial plano-convex tool (sub-trapezoidal point). No pronounced use traces were found, although separate areas of poorly developed meat polishing on the left edge were noted. The left edge retains small areas of very badly developed abrasion. Both sides of the item display erasure (wear) on ridges and protruding areas. Areas of this kind remain at the very tip on the plano side. This erasure was removed by the retouch of the right and left edges from

traces were recognized on the edges. Traces of soft erasure and roundedness of the edge were on separate retouched areas along the base of the tool; they were removed by the second row of retouch. Dorsal and ventral erasure traces are poorly pronounced. Thus, at least two phases in the lifetime of the tool are established: (1) old retouch, non-utilitarian wear, (2) new retouch. Preservation: good.

the plano side onto the convex side. Retouch goes along edges, and is obviously of the second row. The left edge, considering the plano side as the ventral one, was retouched for the second time almost along the whole length. The right edge was retouched only at the tip, with the new facets covering only  $\frac{1}{3}$  of the length. Thus two, possibly three, phases in the lifetime of the tool are apparent. The oldest surface is the plano side of the biface, it underwent rejuvenation last. There is only a small lengthwise removal from the tip, four very small facets from the left edge at the base forming an angle upwards, and two negatives of flat thinning at the base. The oldest surfaces of the convex side remain in the central part (lengthwise). It is not possible to compare the time of emergence of the oldest areas of the plano and convex sides. Judging from the degree of wear on their ridges, they are almost identical. Later rejuvenation as a multi-row marginal retouch was mostly carried out onto the convex side. At the very tip, there is edge damage reminiscent of spin-off; its length does not exceed 4 mm and it is highly likely that it is retouch and not darting wear. Preservation: satisfactory.



Photo 10-33—Bifacial plano-convex tool (elongated semi-trapezoidal scraper). No pronounced use-wear traces were found. The right and left edges (from the middle to the base of the item) retain areas of abrasion. Protruding parts and ridges are very badly worn on the plano side (the ventral side of a flake) and the massive butt (a wide plane, fracture). On the convex side, the surface with similarly bad wear remains only on a very small area at the base of the item. It is possible to state two retouch stages, both from the plano side onto the convex one, but the older retouch is present only



at the basal part; it was the first to be removed and shaped the major part of the convex side, especially from the center towards the tip. Since it is difficult to prove non-simultaneity of the first retouching and the oldest areas both on the plano and convex sides, two, and only hypothetically, three, attempts of rejuvenation of both surfaces at different times can be asserted. There are facets of small lengthwise spalls similar to spin-off or Kostenki-type knife treatment on the very tip of the back, since they are removed from a prepared platform by retouch onto the plano side; their length does not exceed 3 mm. Preservation: satisfactory. *a*—non-utilitarian wear traces, 100x, incident light; *b*—non-utilitarian wear traces, 200x, incident light.

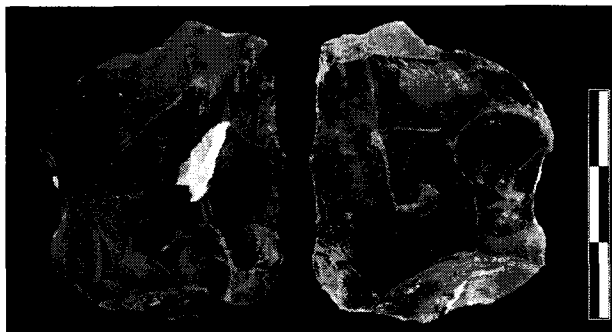


Photo 10-34—Bifacial plano-convex tool (single-edged straight scraper). No pronounced use traces were found.

There are no good reasons to distinguish stages of treatment taking place at different times. Both sides of the item have practically identical, very weak wear, possibly due to embedding in the cultural layer. The item is an intensely worked plano-convex tool. The latest rejuvenation removals were made onto the convex side. The plano side was modified twice, but despite this, there are no truncated large removal negatives on its surface. There is very badly pronounced additional wear that is absent on negatives from the later thinning of this side in the central part of the plano side, on the surface of negatives, and interfacet ridges thinning of the first generation. These wear areas are relatively flat, the traces are not very pronounced, and are very likely to be remains of non-utilitarian wear. Preservation: satisfactory.

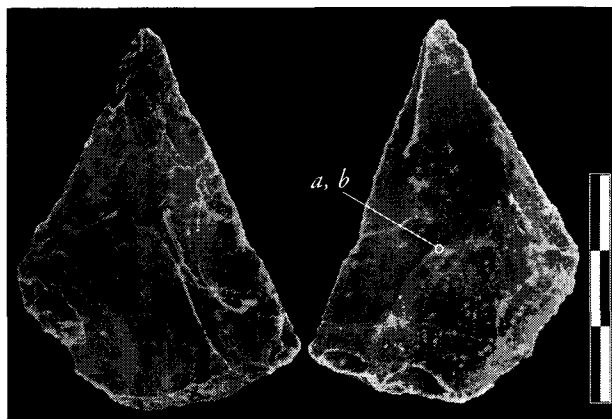
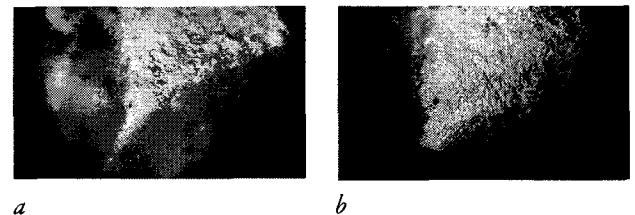


Photo 10-35—Bifacial plano-convex tool (trapezoidal point). Pronounced use-wear was not found. Separate areas retain wear on the right and left edges beneath the center. Wear is



probably meat cutting. Protruding parts and ridges on the plano side and convex side are worn. Retouch of later rejuvenation is present on both plano and convex sides at the base (very little). The latest facets are removed from both edges from the center towards the tip of the tool. It is possible to distinguish two stages of treatment for both edges of the tool. Circular cracks on the plano side are evidence of hammerstone usage. There are facets of micro spin-off at the very tip of the convex side. Preservation: satisfactory. *a*—non-utilitarian wear traces, 100x, incident light; *b*—non-utilitarian wear traces, 200x, incident light.

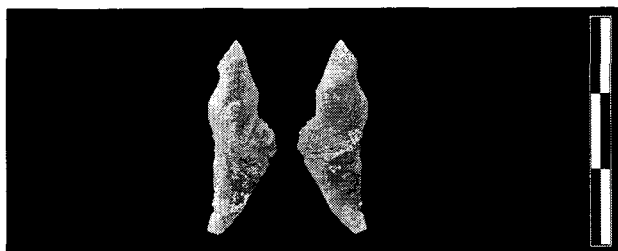


Photo 10-37—Rejuvenation piece of a unifacial convergent tool's tip. Badly pronounced but definable meat cutting polishing traces were found on the edge of the right side. Badly developed non-utilitarian traces were on the back, 1 cm away from the tip. It is quite obvious that these traces are present on this removal only because it is the longest of all. Compared to other similar pieces, it "seized" the biggest part of the dorsal relief, lying under the point of flaking (closer to the base). The very tip of the tool is normally shaped by facets of the latest (freshest) retouch. Preservation: good.

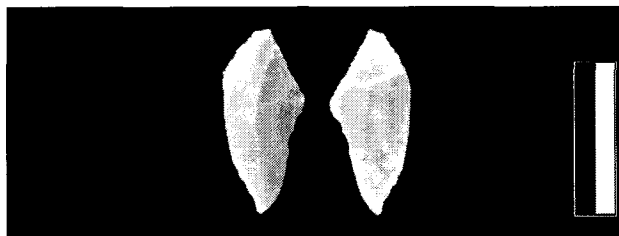


Photo 10-38—Rejuvenation piece of a unifacial convergent tool's tip (2× natural size). Well pronounced meat cutting traces were found along the edge of the side at the very tip. Preservation: good.

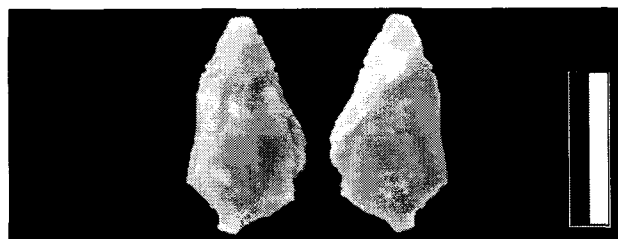


Photo 10-39—Rejuvenation piece of a unifacial convergent tool's tip (2× natural size). Badly pronounced but definable meat cutting polishing traces were found along the edge of the side at the very tip. An area with abrasion remains at the lower part of the right edge. Non-utilitarian traces were not found. Preservation: good.



Photo 10-40—Rejuvenation piece of a unifacial convergent tool's tip. Rather expressive meat cutting/raw hide polishing traces were found along the edge of the piece, as well as a fragment of the right edge. Similar traces were very likely present on the left edge, but were removed by fresher micro-retouch. Non-utilitarian traces were not found. Preservation: good.

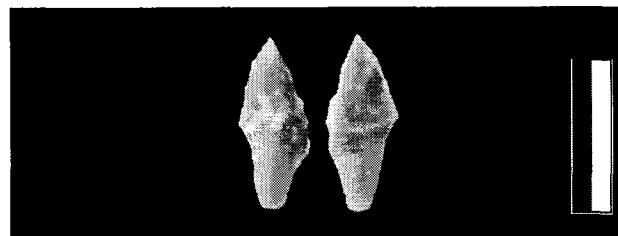


Photo 10-41—Rejuvenation piece of a unifacial convergent tool's tip (2× natural size). Expressive traces of use were not found. Very poorly developed abrasion traces were on part of the left working edge. Non-utilitarian traces were not found. Preservation: good.



Photo 10-42—Rejuvenation piece of a unifacial convergent tool's tip (2× natural size). Rather expressive meat cutting/hide polishing traces were noted along the edge of the piece, as well as a fragment of the right and left edge. Non-utilitarian traces were not found. Preservation: good.

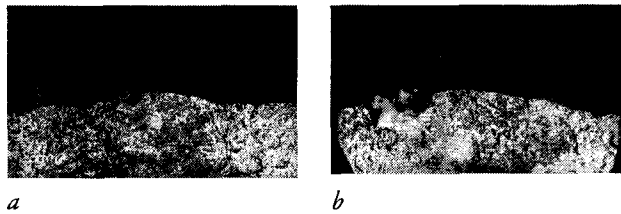
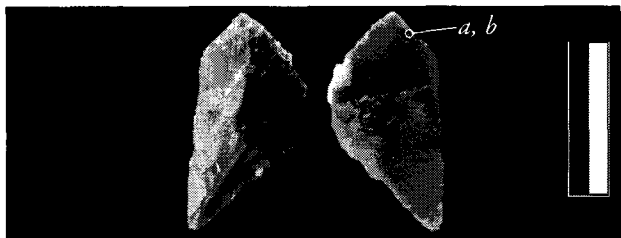


Photo 10-43—Rejuvenation piece of a unifacial convergent tool's tip (2x natural size). Poorly expressive, but quite definable meat cutting/hide polishing traces were found along the piece's side, at the very tip, on the left edge. Non-utilitarian traces were not found. Preservation: good. *a*—meat cutting traces, 100x, incident light; *b*—meat cutting traces, 200x, incident light.



Photo 10-44—Rejuvenation piece of a bifacial convergent tool's tip. Badly pronounced meat cutting polishing traces were found on the edge of a fragment of the left side. Non-utilitarian traces were not found. Preservation: good.

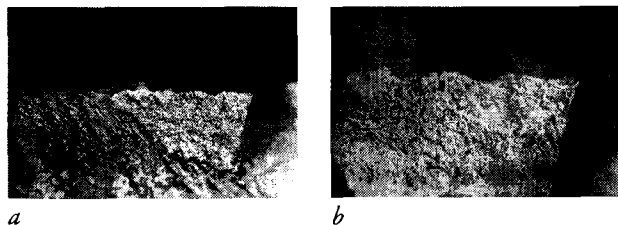
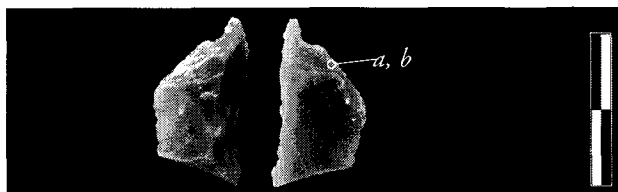


Photo 10-45—Rejuvenation piece of a bifacial convergent tool's tip. Well pronounced meat cutting polishing traces were found on the edge of a fragment of the left blade, on both sides of the tool. Non-utilitarian traces were not found. Preservation: good. *a*—meat-hide cutting traces, 100x, incident light; *b*—meat-hide cutting traces, 200x, incident light.

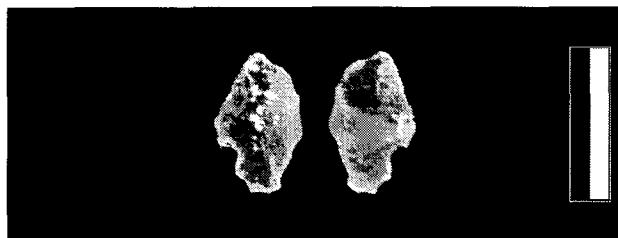


Photo 10-46—Rejuvenation piece of a bifacial convergent tool's tip (2x natural size). Badly pronounced meat cutting polishing traces were found on the edge of a fragment of the left blade, on both faces. Non-utilitarian and abrasion traces were not found. Preservation: excellent.

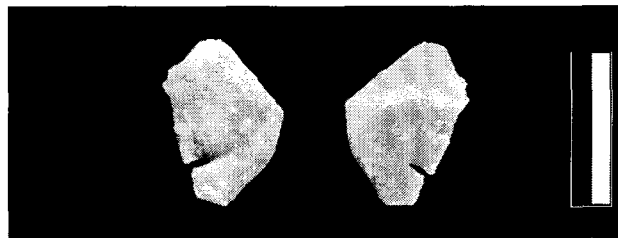


Photo 10-47—Rejuvenation piece of a bifacial convergent tool's tip (2x natural size). Badly pronounced meat cutting polishing traces were found on the edge of a fragment of the right side, on the surface of the plano side, and to a lesser degree, on the convex side. Non-utilitarian traces were not found. Preservation: good.

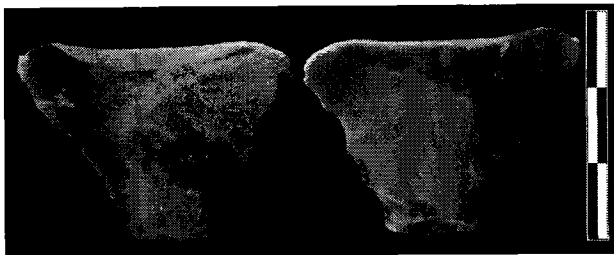


Photo 10-48—Bifacial thinning chip. There are remains of well pronounced abrasion along the edge of a fragment of the working edge. Non-utilitarian traces were not found. Preservation: good.



Photo 10-49—Bifacial thinning chip. No definable traces were found. Preservation: excellent.



Photo 10-50—Bifacial thinning chip. There is well pronounced abrasion along the flange of a fragment of the edge. Erasure of interfacet ridges on the dorsal surface is noted. Preservation: excellent.

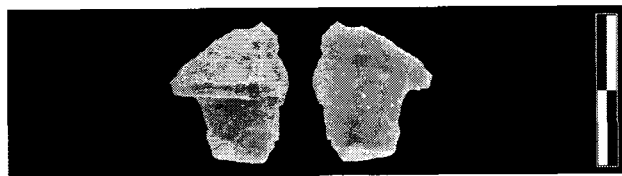


Photo 10-51—Simple retouch chip. There are light abrasion traces on the edge of the butt, which is a fragment of the tool's edge. Preservation: good.

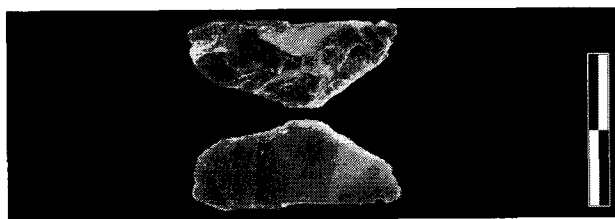


Photo 10-52—Retouch piece on unifacial/bifacial tool's lateral edge fine reshaping. No use-wear traces were found. Preservation: good.

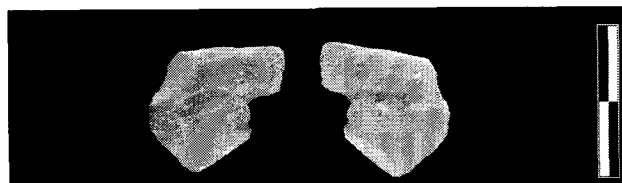


Photo 10-53—Simple retouch spall. No changes of natural surfaces traces were found. Preservation: excellent.

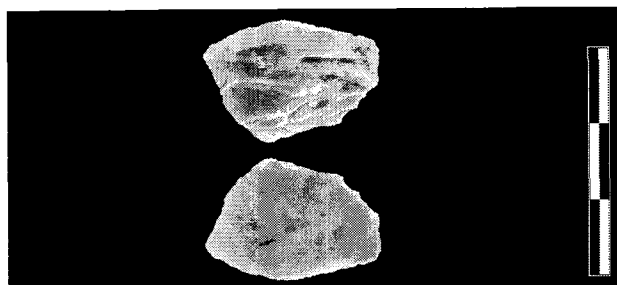


Photo 10-54—Simple retouch spall. No changes of natural surfaces traces were found. Preservation: good.

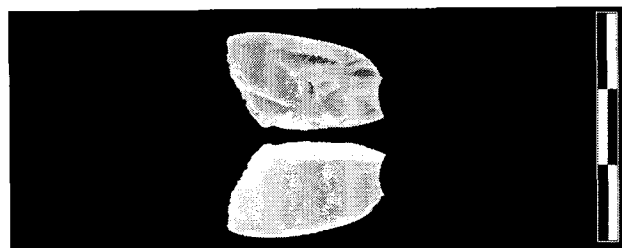


Photo 10-55—Retouch piece on unifacial/bifacial tool's lateral edge radical reshaping. No expressive traces of any kind were found. Preservation: good.

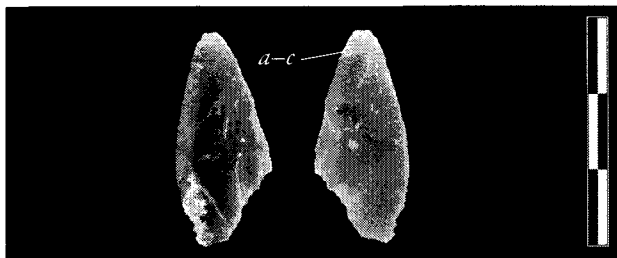
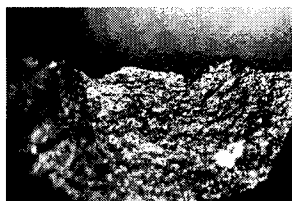
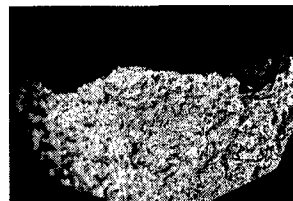


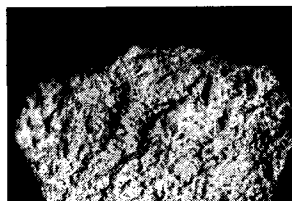
Photo 10-56—Retouch piece on unifacial/bifacial tool's lateral edge fine reshaping. Well pronounced meat cutting wear traces are on the fragment of the left edge and near the point on the right edge. Area of abrasion traces is in the lower part of the piece. Non-utilitarian wear traces are not recognized. Preservation: good. *a*—meat cutting traces, 100×, incident light; *b*—meat cutting traces, 200×, incident light; *c*—meat cutting traces, 400×, incident light.



*a*



*b*



*c*

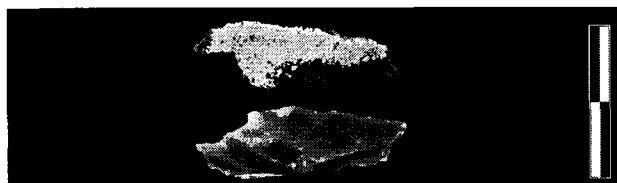


Photo 10-57—Retouch piece on a unifacial/bifacial tool's lateral edge radical reshaping. Possible non-utilitarian traces are along the fragment of the tool's edge—the piece's butt. Preservation: good.

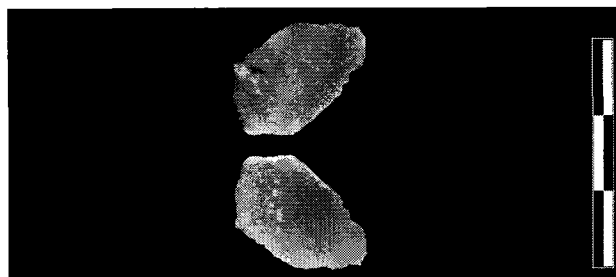


Photo 10-58—Simple retouch spall. There are poorly pronounced abrasion traces along the fragment of the tool's edge—the piece's butt. Preservation: good.