Chapter 7

STAROSELE 1993-1995: THE LITHIC ARTIFACTS

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INTRODUCTION

The lithic artifact assemblages from Starosele will be presented in this chapter. Since the clarity of the stratigraphic and temporal separation among the recognized archeological deposits is without doubt (see Chapter 5), each archeological level will be considered a separate assemblage and treated as such. The only exception will be the few artifacts from Level 0. The uppermost sediments of the recent soil A and B horizons were mixed with the upper Level 1 sediments during the digging of pits and other disturbances in modern times, and contain artifacts originally from Level 1. Those artifacts have been included with those from Level 1; no distinction will be made between them and the Level 1 sample.

The presentation of the assemblages will follow, more or less, the sequence required for a study of a *chaîne opératoire*, with the caveat that only limited success was had in conjoining artifacts and that the very important information derived from residue and use-wear studies is not yet available but will be presented in full by Bruce Hardy and Marvin Kay, respectively, in the next volume of final reports. Thus, this chapter will be limited to data derived from technological and typological studies, and it is fully recognized that there may be little positive correlation between the typological classification of tools and their actual, original use.

HORIZONTAL ARTIFACT DISTRIBUTIONS

Due to the limited extent of the recent excavations at Starosele and the somewhat spotty distribution of artifacts in some archeological levels, there is only a moderate amount of information available from spatial analysis. It does appear, however, that there were probably quite different patterns of horizontal artifact distributions among the levels. As already noted in Chapter 5, Level 1 is a palimpsest, which, in places, reaches a depth of some 30 cm. Although this might suggest that artifact distribution across the excavated area should be rather uniform, this was not the case. Rather, there is a single locus of dense artifact concentration and a gradual falling off in density over 3 to 4 m in those directions where this can be traced (fig. 7-1a). Beyond that, the drop in artifact density is marked to the north and west, but this is the result of erosion of the level and has no interpretive meaning.

While the vast majority of Level 1 artifacts are chips, removing them does not change the density patterning significantly: there is still a single dense locus (fig. 7-1b). This locus, in Squares I and J 22 through 24, also contains the fireplace at the base of Level 1. Tool distribution follows that of the rest of the materials, only at a much lower density (fig. 7-1c). Core distribution is more general (fig. 7-1d), but the limited number of cores makes this pattern of questionable significance.

The single concentration in Level 1 might suggest that artifact discard took place over a fairly small area. Using the artifact distribution toward the east as a guide (fig. 7-1a), one might argue that the total concentration would have been some 12 m in diameter: an area of more or less 113 m2. Yet, such an interpretation is probably not reasonable. While a fall-off in artifact density toward the east is clear, it may have to do with the impending cliff wall, only 3

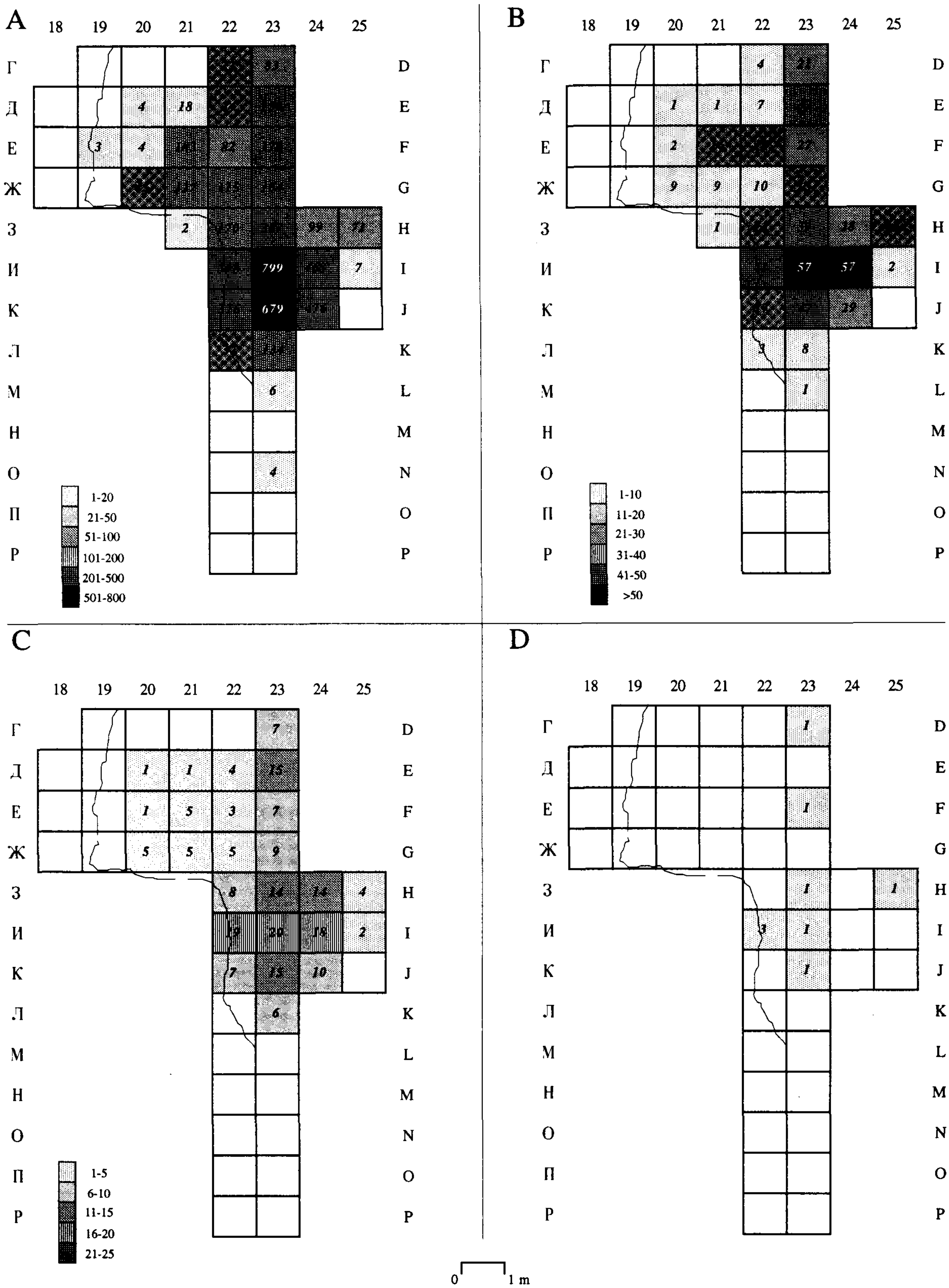


Fig. 7-1—Starosele, Level 1 horizontal artifact distributions: *A*–all lithics; *B*–excluding chips; *C*–tools; *D*–cores. Dashed line indicates erosion of uppermost 40 cm of Level 1.

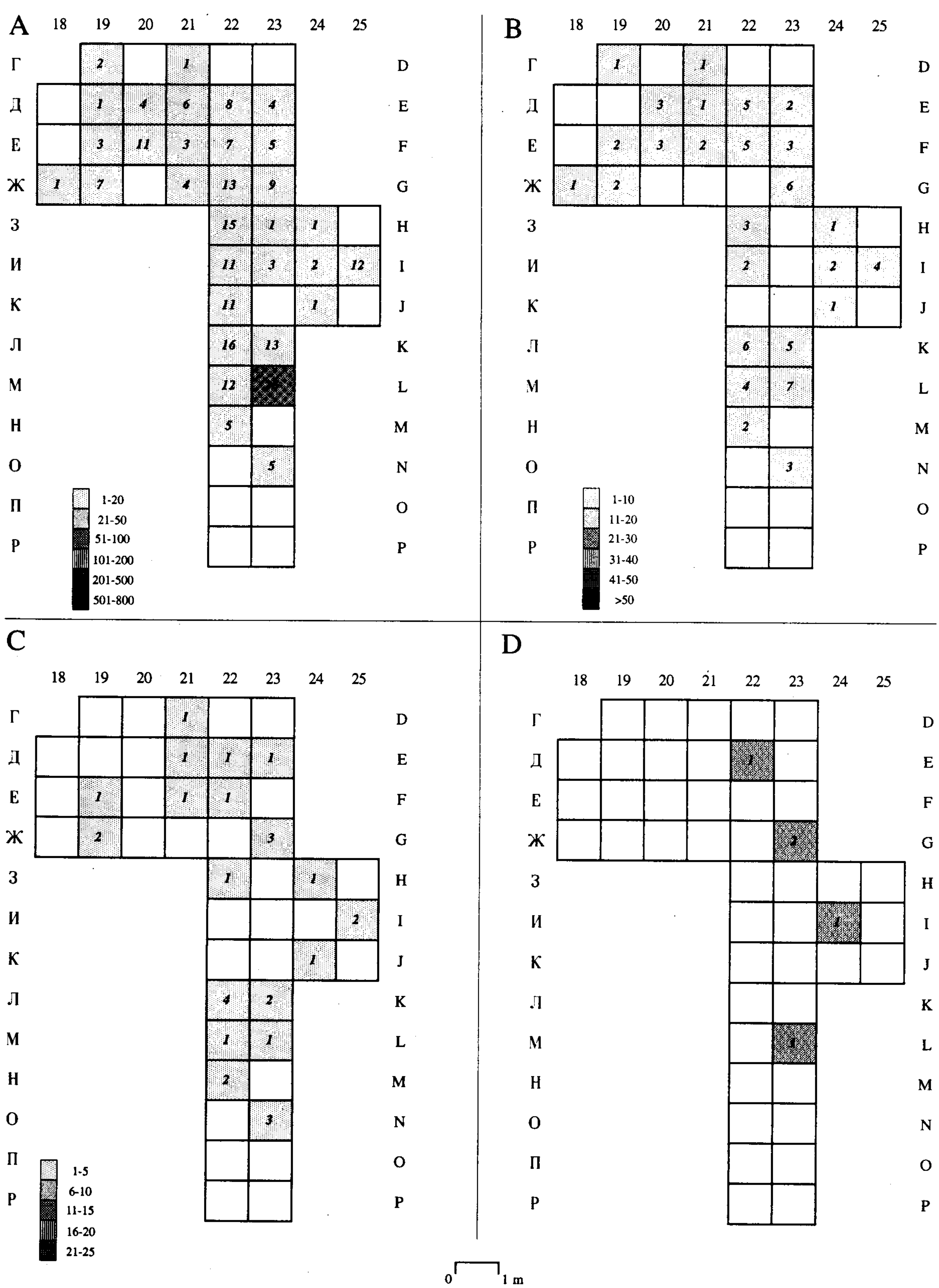


Fig. 7-2—Starosele, Level 2 horizontal artifact distributions: *A*–all lithics; *B*–excluding chips; *C*–tools; *D*–cores.

m further east. Thus, this pattern might not be a reasonable guide for other directions. Furthermore, the large lithic collections from the 1952 and 1953 excavations currently housed in the Bakchisarai Museum are markedly similar to those materials recovered from our Level 1. Since those excavations were between 21 and 13 m to the north of ours, it means that a significant number of comparable materials, were distributed over, at least, an area extending 25 m north/south. Given the erosional pattern along the western edge of the site prior to the Level 1 occupation (see Chapter 5), it is likely that any Level 1 artifact discarded west of line K would have been on a rather steep slope and, thus, would have rapidly been moved to the canyon bottom. It is probable, therefore, that the original Level 1 artifact distribution, the result of multiple occupations, formed a rather dense, elongated concentration about 25 m north/south by no more than ca. 7 m east/west; an area of about 175 m^2.

The Level 2 artifact distribution shows no concentrations, at all. In fact, the number of artifacts is minimal (fig. 7-2a). In addition, those artifacts in Rows K through N had been washed down the slope and do not represent original positions. While there appears to be two slightly differentiated debitage/tool clusters (fig. 7-2b), their low numbers prohibit meaningful interpretations. This can be seen in the distribution of the few tools (fig. 7-2c) and cores (fig. 7-2d). Interpretations are further limited by the absence of burned areas, clusters of bone, etc. It is obvious that Level 2 represents minimal discard/loss of artifacts, over a short period. This is confirmed by the presence of partly articulated mammal skeletons, intact rows of teeth (fig. 7-3), and even a complete *Equus* mandible in Square G22. Certainly, compared with the artifact distribution in Level 1, there is no indication of a central locus. This, of course, may be merely the result of low numbers of artifacts, but it may also reflect the absence of a fireplace or other features around which activities are likely to have concentrated.

Fig. 7-3—Starosele, photograph of *Equus* tooth row in Level 1.

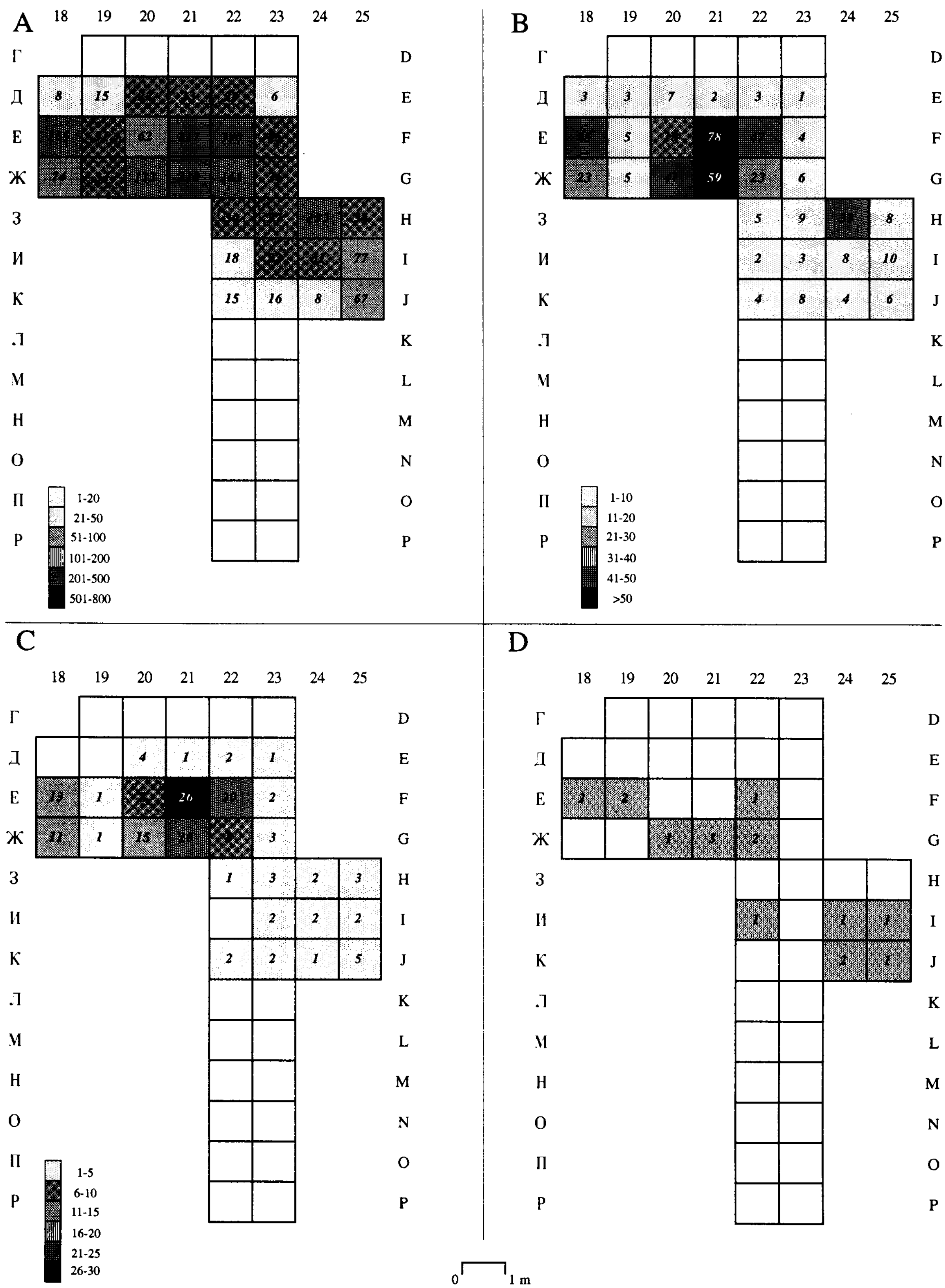


Fig. 7-4—Starosele, Level 3 horizontal artifact distributions: *A*–all lithics; *B*–excluding chips; *C*–tools; *D*–cores.

The artifact distribution in Level 3 is significantly different from those of Levels 1 and 2 (fig. 7-4a). There are indications of as many as three small, somewhat overlapping artifact concentrations (fig. 7-4a), which are clear for the debitage/tools (fig. 7-4b) and the cores (fig. 7-4d). The tools alone, however, indicate only 2 concentrations, suggesting, but not demonstrating, the possibility of different activity areas. In spite of these patterns, there is some evidence for connections between the two northern-most concentrations, based on a limited number of conjoins made on the quite distinctive honey-colored flint (fig. 7-5).

The apparent multiple small artifact concentrations, even within the relatively limited excavation area, has implications for the areas excavated by Formozov (1958) and the samples from Formozov's "under the roof fall" studied by Chabai (Kolosov, Stepanchuk, and Chabai 1993). While it seemed, at first, that the amount of Level 3 excavated by Formozov was probably quite limited (Hedges et al. 1996), upon reflection, these small concentrations might have existed over a large area to the north, and certainly did extend into his excavations adjacent to ours, since the Level 3 artifact distributions go right to the edge of the contact between the new and the old excavations (fig. 7-4). Thus, the Level 3 material was mixed together with lower materials in Formozov's samples, since he put all the materials found below the "roof fall" together. It must be recognized that, to some extent, Formozov's samples from below the "roof fall" consist of, at least, materials from two quite distinct archeological levels. Having established this, however, does not necessarily mean that the mixture was so great as to make his sample invalid. Rather, it suggests that Formozov's sample must be viewed with caution.

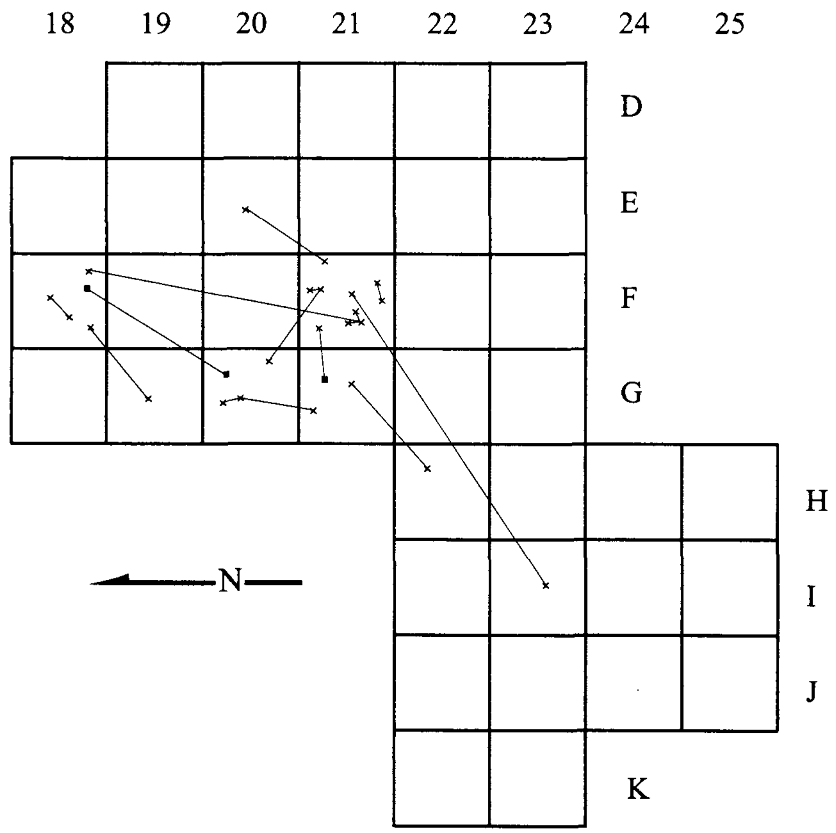


Fig. 7-5—Starosele, Level 3, plan of honey-colored flint conjoins.

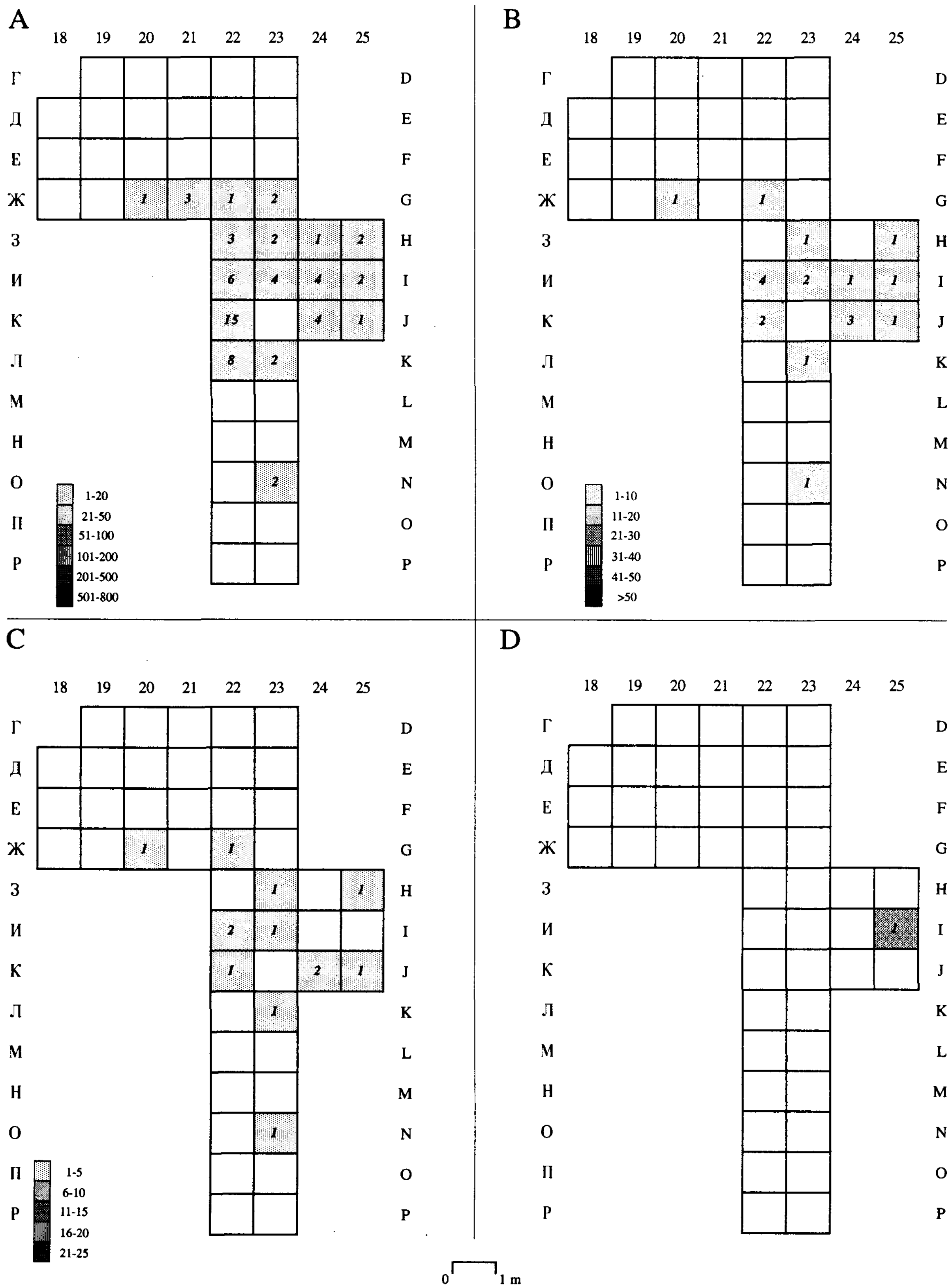


Fig. 7-6—Starosele, Level 4 horizontal artifact distributions: *A*–all lithics; *B*–excluding chips; *C*–tools; *D*–cores.

Little can be said of the artifact distributions in Level 4. First, at best, Level 4 was a rather temporary surface, and the presence of fresh, unrolled artifacts scattered in the sediments below the Level 4 surface (and grouped here together with Level 4) indicate that there were a number of short-lived surfaces, within a general aggradation of alluvial sediments (see Chapter 5). Second, the extremely low number of artifacts of all kinds (fig. 7-6a-d) preclude interpretations, other than that the area exposed in the recent excavations was certainly outside any area of significant artifact discard. Still, the presence of these few artifacts, as well as a small, oval concentration of wood charcoal in Squares L22/23 at the Level 4 surface, suggests the possibility of a larger surface; one where artifact discard may have been greater. This well may have been the case, since Formozov (1958: fig. 33) illustrates a dense concentration of lithics, bone, and "fireplaces" only a few meters to the north of our almost sterile exposures. It is not at all clear from the maps, however, whether Formozov's material came from our Level 4, our Level 3, a combination of both, or from some surface which was not represented in our excavations. A more extensive evaluation of these possibilities will be made in the final chapter, since data beyond those recovered in the new excavations must be used to arrive at a reasonable answer.

RAW MATERIAL AVAILABILITY

Although flint is considered to be essentially ubiquitous along the northern edge of the second range of the Crimean Mountains, its actual distribution is patchy. Without doubt, there are huge exposures of flint in and near the Bodrak Valley and rich, if somewhat smaller sources in the Alma Valley, both more than 10 km east of Starosele. In addition, a honey (tobacco) colored, fine-grained flint has been reported in the Kacha Valley, 7 km south of Starosele.

In the immediate vicinity of Starosele there are two sources of flint: one in the eastern wall of the Kanly-Dere Gorge, just behind and north of the site, and one in the northern wall of the main Bakchisaraiskaya Valley, just one kilometer east of the entrance to the Kanly-Dere Gorge and a few hundred meters west of the site of Bakchisaraiskaya (see Chapter 5, fig. 5-1). In both places, however, the flint occurs as small nodules encased in thick, chalky cortex. Adjacent to Starosele, the flint is a matte gray with white speckles, while the further source is gray-brown with white speckles. No flint nodules or even flakes of these types were seen larger than a few centimeters, although the very thick cortex could increase the overall size of a nodule to over 7 cm in greatest dimension. It is difficult to judge the abundance of these sources during occupation; only a few pieces of the gray-brown flint were seen around some exfoliated boulders on a steep slope in front of the northern cliff wall in the main valley and not a single piece of this flint was found among the assemblages at Starosele. In the Kanly-Dere Gorge, the gray flint occurred as nodules in the limestone cliff, but at elevations some 5 m below and some 20 m north of the top of the Starosele sediments. Thus, it is possible that this source was not fully exposed during the Level 1 occupation at Starosele, although, based on elevations and bottom slope, it should have been fully available during the earlier occupations of Levels 4 and 3. As will be discussed below, it does occur in small amounts in the upper three levels but, just as importantly, a good number of broken nodules, some slightly flaked, were seen in the backfill Formozov used to bury his profiles. While their original provenance is unknown, it is probable they were recovered from the prehistoric sediments and were discarded at the time of excavation.

RAW MATERIAL SELECTION

In spite of the immediate availability of flint at Starosele, very little of it was selected for flaking during any occupation (Table 7-1). Rather, the vast majority of the flint appears to come from sources farther away than the two known nearby sources. Just how far is not sure, since systematic surveys for flint sources have not been carried out in this part of western Crimea, although what is known suggests that much of the flint came from between 7 km and 10 km away.

TABLE 7-1
Starosele, Distribution of Debitage/Debris and Tools by Level and Raw Material Type

	Level 1				*Level 2*				*Level 3*				*Level 4*			
	Debitage		*Tools*		*Debitage*		*Tools*		*Debitage*		*Tools*		*Debitage*		*Tools*	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Black-gray, fine	169	42.4	80	43.2	11	28.9	5	62.5	122	33.6	52	35.1	3	42.9	7	53.8
Opaque white-gray, fine	46	11.5	21	11.4	10	26.3	—	—	35	9.6	9	6.1	—	—	5	38.7
Matte gray, patinated, coarse	137	34.3	72	38.9	17	44.7	1	12.5	94	25.9	51	34.5	1	14.3	1	7.7
Translucent amber gray	23	5.8	7	3.8	—	—	1	12.5	18	5.0	6	4.1	2	29.0	—	—
Honey-colored	—	—	—	—	—	—	—	—	66	18.2	21	14.2	1	14.3	—	—
Black speckled, coarse	24	6.0	5	2.7	—	—	1	12.5	28	7.7	9	6.1	—	—	—	—
N	399		185		38		8		363		148		7		13	

The recognition of different kinds of flints was somewhat hindered by variable amounts of patination. The absence, presence, and degree of patination on any given artifact apparently was determined by extremely local conditions of deposition. Artifacts only a few centimeters apart might have very different surface chemical modification. Therefore, sorting by raw material could be done only at a fairly general level. Because of the large sample size for artifacts of all kinds, only a sub-sample were classified by raw material, including all artifacts from the 1994 field season and a part of those recovered during 1993 and 1995. Because the Level 4 sample was so small, all Level 4 artifacts were included in the study.

The majority of flint artifacts at Starosele were made on a fine-grained, slightly translucent gray/black flint, which, when patinated, became whitish gray and opaque (Table 7-1). With the exception of Level 3, these combined account for over half of all flint recovered in each level. The second most common flint was a coarse, matte gray, patinated flint which does not seem to occur unpatinated. A small number of artifacts in each level were a translucent, amber gray, while the local coarse-grained, gray speckled flint was found in small amounts in the top three occupations only. Finally, there was an unpatinated, honey-colored, fine-grained flint that occurred in significant amounts in Level 3, not at all in Levels 1 and 2, and with only a single piece in Level 4 (Table 7-1).

As noted above, with the exception of the immediately local, coarse, speckled flint, the exact sources of the other flints are unknown. Yet, some information is available. Fresh, unweathered cortex on the fine-grained gray and translucent flints show that they were either actually quarried or, more likely, were collected in front of actively eroding sources. On the other hand, the honey-colored, fine-grained flint found in Level 3, has a weathered, smooth cortex indicative of a gravel source. Based on the cores, it is possible that this latter flint came in nodular packages no larger than 7 cm. In addition, the number of fractured pieces, the common hinge-fracturing and splitting which took place during its reduction, all suggest that it was quite dry when flaked; again, indicating it was in secondary position when collected.

BASIC ASSEMBLAGE PATTERNING

The use of screens ensured the recovery of even the smallest artifacts. While the decision where to draw the line between chips and debitage/blanks is always subjective, a conservative border of 3.0 cm for flakes and blades was chosen to be used in the analyses of all the sites in the project: smaller items were considered chips, larger were considered debitage/blanks. Retouched fragments less than 3.0 cm in greatest dimension, however, were classified into a specific tool class, such as scraper or notch, when their typological attributes were clear. When unclear, they were placed into "tool fragments." In addition, at least at Starosele, a number of complete pieces less than 2.99 cm in greatest dimension were recovered which had been retouched. Therefore, the larger chippage, between 1.99 cm and 2.99 cm were, at times, considered as blanks for tool production. Because of that, chips in that size range will be described, although separately from the blanks measuring 3.0 cm and over.

Although chunks are normally listed under debris and not otherwise considered, at Starosele some chunks were used as blanks for tool production; at least, some showed clear evidence of retouch. Thus, they have been listed along with other classes of debitage, so that the extent to which they were utilized in tool production can be seen (Table 7-2). In all assemblages, there were a number of pieces with multiple breaks which prevented their classification into a specific artifact class. These have been placed along with the chips and preforms to prevent biasing the attribute observations.

TABLE 7-2
Starosele, Assemblages by Major Artifact Classes (>3cm) for Debitage/Tools and Tools

	Level 1				*Level 2*				*Level 3*				*Level 4*			
	All		*Tools*		*All*		*Tools*		*All*		*Tools*		*All*		*Tools*	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Bifacial piece	31	6.7	25	80.6	1	1.4	1	100.0	—	—	—	—	—	—	—	—
Flake	311	67.3	118	37.9	57	77.0	23	40.4	277	72.5	128	46.2	15	75.0	11	73.3
Primary flake	31	6.7	7	22.6	2	2.7	1	50.0	12	3.1	5	41.7	1	5.0	—	—
Blade	71	15.4	40	56.3	8	10.8	4	50.0	49	12.8	20	40.8	2	10.0	1	50.0
Primary Blade	4	0.9	—	—	—	—	—	—	4	1.0	1	25.0	—	—	—	—
Core	9	1.9	1	11.1	5	6.8	—	—	18	4.7	2	11.1	1	5.0	—	—
Chunk	5	1.1	2	40.0	1	1.4	1	100.0	22	5.8	8	36.4	1	5.0	1	100.0
N	462		193	41.8	74		30	40.5	382		164	42.9	20		13	65.0
Unident. fragments†	68	1.3			4	1.8			99	4.2			—	—		
Chips (<3 cm)	4767	89.9			148	65.5			1856	79.4			43	68.3		
Bifacial preforms	6	0.1			—	—			—	—			—	—		
N	5303				226				2337				63			

†These exceed 3 cm in maximum dimension, extensive breakage precludes placement into specific blank classes.

The vast majority of artifacts recovered in each assemblage are chips, with the exception of Level 2, where they are only moderately represented, a result of slope wash to the west (Table 7-2). Aside from the fully predictable numerical dominance of chips on the intact floors, the basic configuration of all assemblages is notable by their shared paucity of cores and the low proportional occurrence of primary elements. This merely reinforces the observation that the low quality, immediately local raw materials were not extensively used and, thus, that most flint was imported into the site during all occupations. In addition, however, it indicates that the importation of raw material in Levels 1, 2, and 4 did not normally include unmodified cobbles/plaquettes, minimally reduced nodules, or even cores.

These conclusions are strengthened by the high percentage of tools in each blank category and even by the number of chunks used as blanks for tools (Table 7-2). It appears that, with the possible exception of Level 3, very little core preparation and primary flaking took place in the areas of Starosele exposed by our excavations. Rather, it seems that the majority of lithic modification took the form of tool production by retouch, tool rejuvenation through the removal of retouching chips, and, for Levels 1 and 2, bifacial reduction of preforms which produced shaping and thinning flakes as by-products. The sample from Level 4 is so small that little may be said with certainty. Yet, the large size of the blanks demonstrates their removal from large cores, while the presence of bifacial thinning flakes and chips among the debitage documents bifacial reduction.

Patterns of Core Reduction

Owing both to the paucity of cores and to the very limited amount of conjoining, little direct evidence is available on core reduction patterns. On the other hand, since no Levallois products were recovered from any level, given the sample sizes, it is safe to say that the Levallois method was not used in Levels 1 and 3 and was unlikely to have been used in Level 2, which is exactly like Level 1 in all other recognizable attributes. The Level 4 sample is so small that it only may be stated that there is no convincing evidence among the recovered materials for Levallois reduction methods.

Since there are major differences between Levels 1 and 3 in the range and kind of reduction patterns, each level will be considered separately. These differences are seen mainly through attribute patterns on debitage, augmented by the few cores and "core tools" which were recovered. This section will deal mainly with broad patterns, as seen from the cores, while their associated attributes on the debitage will be covered in detail when the debitage is discussed.

Level 1

The reduction strategies for this level have already been preliminarily discussed within the context of the overall *chaîne opératoire* for the level (Marks et al. in press). More information is now available, but our understanding has remained the same. Based on the available sample, there is little evidence for habitual on-site true core reduction. The cores themselves consist mainly of small fragments or very small discoidal cores made on the poor, local raw material (fig. 7-7a, b). A single larger core was recovered which exhibits bi-directional removals from one flaking surface, one platform of which is well faceted, while the other is unfaceted (fig. 7-7c). While this core, in general shape, is what might be expected from a Levallois method, the absence of supplementary, lateral platforms and the angles between the flaking surface and the undersurface have led some to believe that it is not a core, at all, but an early stage rejected bifacial preform (V. Usik, personal communication).

Based on the cores and possible cores, therefore, there is no evidence for any core reduction strategy other than discoidal, and then only in the production of very small blanks. On the other hand, there is very clear evidence for bifacial reduction of flint plaquettes and large flakes into bifacial foliates, with the resulting production of bifacial shaping and thinning flakes, as well as chippage. In fact, although the proportional occurrence of bifacial tools is relatively low within the tool assemblage, the by-products of their production are numerous (fig. 7-8) and the larger examples were extensively used as blanks for unifacial tools (Marks et al. in press). Those tools seemingly made on blanks from true core reduction appear to have been imported into the site, either as blanks or as finished tools.

The importation of blanks as large flakes and bifacial preforms is logical, since their size vastly exceeds the size of the recovered cores (fig. 7-9a). That these blanks were struck from

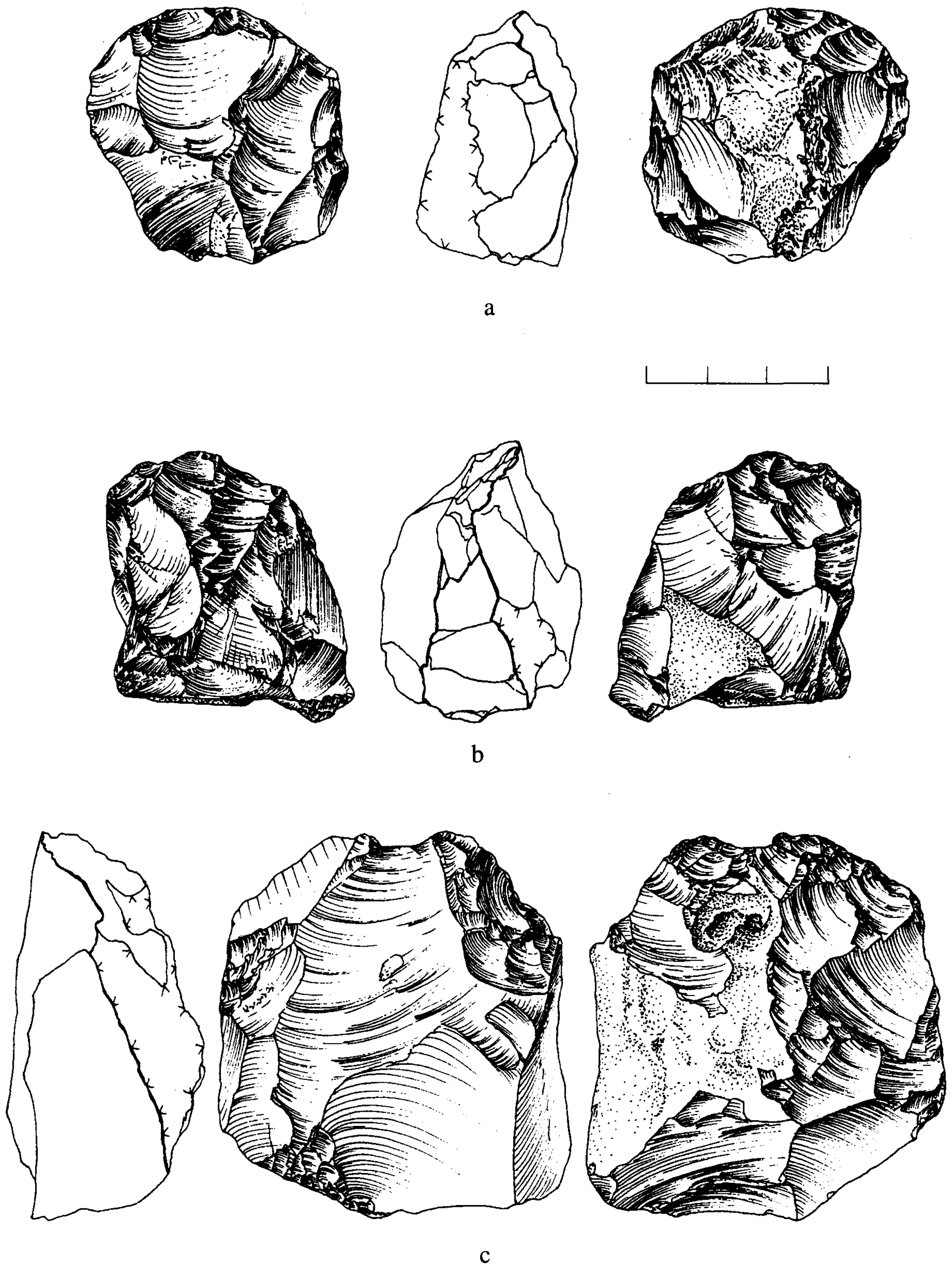


Fig. 7-7—Starosele, Levels 1 and 2, Cores: *a*–discoidal core on poor local flint from Level 1; *b*–partial discoidal core on gray flint from Level 2; *c*–"opposed platform" core on fine-grained flint from Level 1.

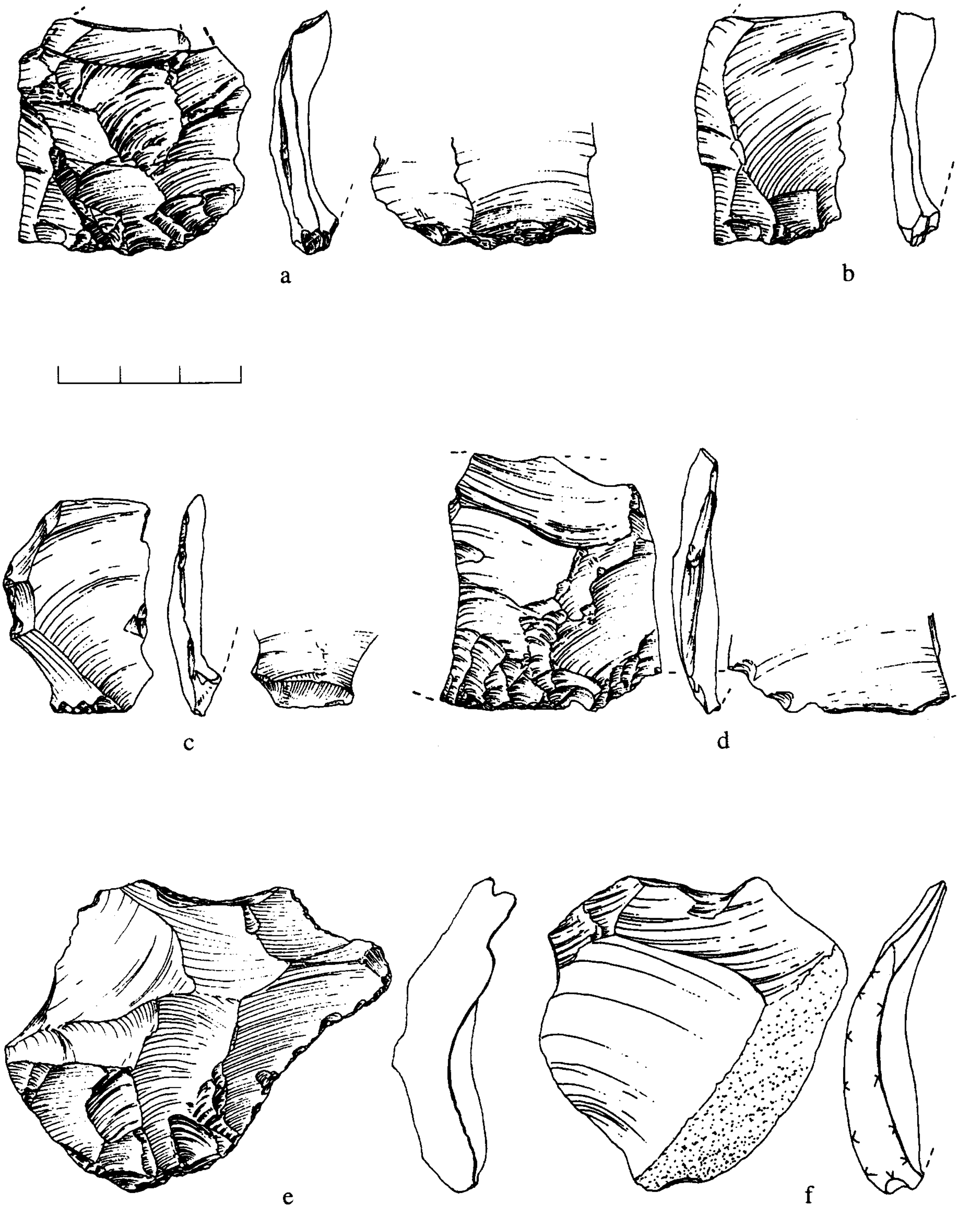


Fig. 7-8—Starosele, Level 1, By-products of bifacial foliate production: *a-d*–bifacial thinning flakes, note obtuse, faceted or unfaceted lipped platforms and the marked convexity of the flakes; *e-f*–bifacial shaping flakes.

true cores is without doubt, although none exhibits original dorsal scars permitting a more exact determination of the core reduction process or processes involved. Certainly, the blank shown in Figure 7-9a did not come from a Levallois reduction method and it is not attributable to discoidal reduction, either.

The presence of some blanks more than twice as long as wide (Ilam = 17.6), might suggest the presence of a purposeful blade technology. There is no evidence, however, for this among the few cores, and the attributes of these elongated pieces indicate that they were almost all by-products of the shaping and thinning of bifacial foliates.

In sum, the data available from Level 1 indicates that the vast majority of on-site raw material reduction was associated with bifacial foliate production and rejuvenation. There is little evidence for the early stages of raw material reduction, even of plaquettes used in bifacial tool production. On-site, true core reduction appears to have been rare and *ad hoc*. Yet, the large blanks used in some bifacial and unifacial tool production show that the reduction of true cores took place off-site and was a necessary part of the *chaîne opératoire* of the group which was responsible for the Level 1 lithic assemblage.

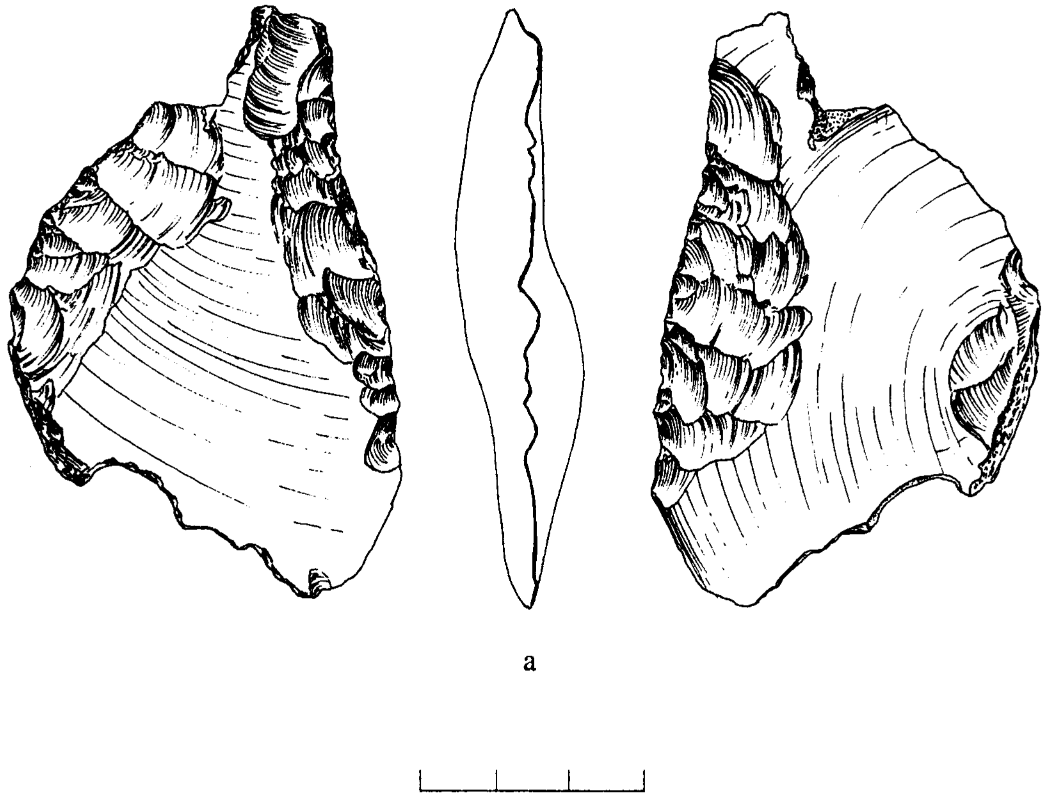
Level 2

The extremely small sample from this level precludes definitive conclusions. Yet, all the available evidence suggests that the patterns seen in Level 1 were repeated in Level 2. The cores, again, are simply small remnants or very small discoidal or partial discoidal cores (fig. 7-9b), mainly on the poor, local raw material. There are numerous bifacial shaping and thinning flakes and even a single distal bifacial foliate fragment, documenting that bifacial reduction was a significant technological element. While elongated pieces are somewhat less common than in Level 1 (Ilam = 12.3), their attributes are fully comparable and, they too resulted from bifacial tool production.

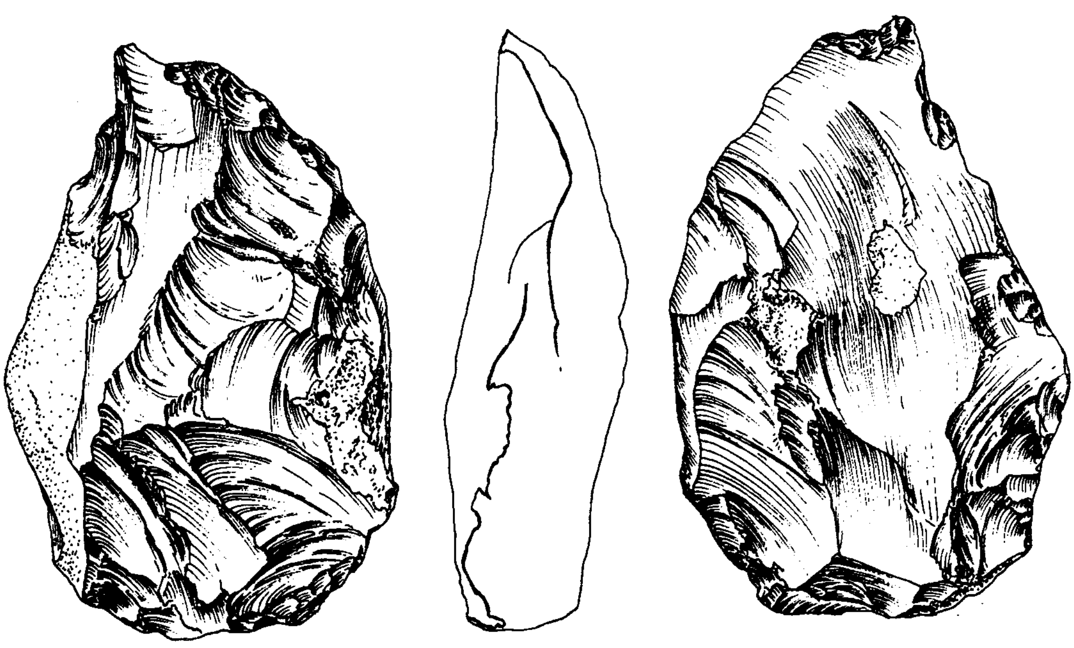
Level 3

Although the percentage of cores here is not significantly greater than in any other level except Level 1 (Table 7-2), the cores tend to be somewhat less amorphous. This is only relative, however, since none of them suggests any great patterning or even control on the part of the knappers. There are essentially two types which point to two different reduction strategies. The first consists of small globular cores with multiple platforms, each platform being the scar of a previous flaking surface (fig. 7-10c). They produced small flakes and, given the patchy cortex on their surfaces, it appears that they were never much larger than when abandoned. These few tend to be on the poor, local raw material.

The second core type is known only on the honey-colored nodular flint. Basically, it is a single platform core with one wide flaking surface and little, if any, platform preparation. The abandoned cores, however, exhibit a few flake scars coming from the end opposite the main striking platform. This may indicate numerous removals (fig. 7-10e) or only a few (fig. 7-10f, g). In all cases, the backs of the cores are unmodified and the last series of flakes are struck off an unprepared platform. While there are few cores of this type, conjoins and debitage attribute analyses show this pattern to be quite common. Figure 7-10a is a good example where the flake scars show the initial exploitation of a single platform to remove a series of flakes and then the use of an opposed platform to remove more. In this case, both platforms are cortical. Smaller conjoin series (fig. 7-10b, d) show that removals from a single platform occurred in series and tended to be struck either parallel to each other or, as in Figure 7-10b, somewhat converging. This patterning provides an opportunity for blade production. Yet, the proportional occurrence of elongated pieces (Ilam = 14.4) is lower than in Level 1 which had



a



b

Fig. 7-9—Starosele, Level 1, Bifacial preforms: *a*–partly retouched preform on large secondary flake; *b*–very early stage preform, on a partially cortical flake with some inverse thinning.

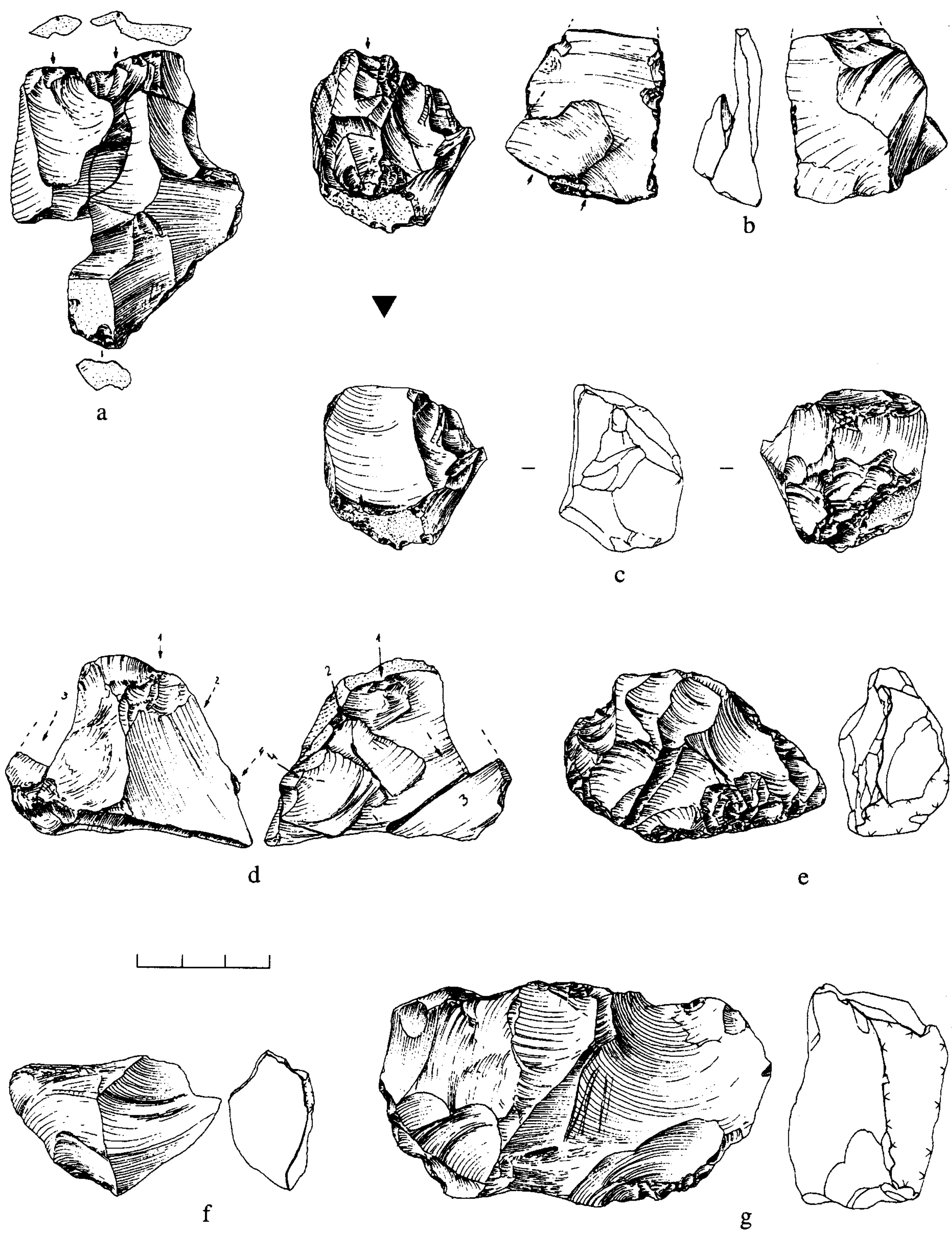


Fig. 7-10—Starosele, Level 3, Cores and conjoins: *a*–conjoins showing opposed platform removal sequence; *b*–conjoin sequence showing slightly converging removals; *c*–globular core; *d*–conjoins showing series of parallel removals; *e*-*g*–cores with mainly one platform but with some indication of opposed platform flaking.

no purposeful blade production and, in the absence of blade cores, it seems unlikely that these elongated pieces were produced with any consistency.

In spite of the apparent patterning in reduction strategies, the blanks produced were usually short, thick, and ugly. Partly, this resulted from the brittle nature of the honey-colored raw material but, mainly, it was the result of the use of hard hammer percussion. Not only are the negative bulbs of percussion large, but the edges which were struck often show crushing (fig. 7-10e, g). At best, the overall impression is one of mediocre workmanship and of an off-hand, if not fully *ad hoc,* approach to blank production. This is in marked contrast with the finely controlled flaking evident in Levels 1 and 2 and gives the whole assemblage of Level 3 a non-standardized, primitive aspect.

Level 4

Only a single core was recovered from just below the Level 4 surface. Apparently made on a plaquette, it has a slightly domed flaking surface and some converging flake scars. Unfortunately, one side has been crushed and another has flake scars resulting from post-depositional movement (fig. 7-11). Thus, while it might be Levallois, no certain characterization is possible. Flake scars on the blanks provide little additional information. Only a single tool may be on a Levallois blank, while the other blanks are either too heavily retouched to permit judgment, or are clearly non-Levallois. Thus, there is really no useful information on the reduction strategies used in Level 4, except that the large size of the blanks indicates the use of even larger cores.

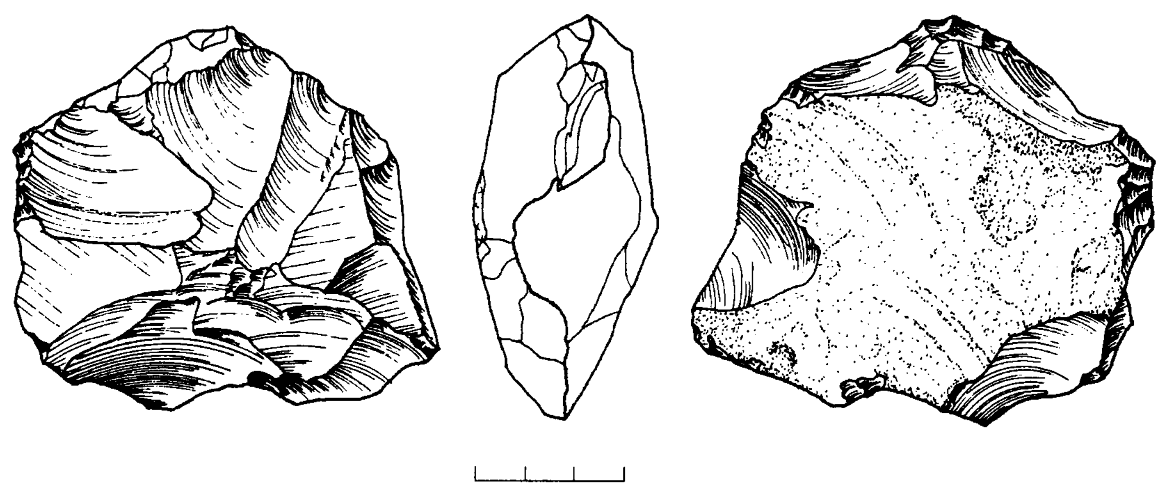


Fig. 7-11—Starosele, Level 4, Core, probably on plaquette. Edge retouch at top is post-depositional, as are the last flakes from the bottom.

BLANK VARIABILITY

All the assemblages produced many more flakes than blades, while primary elements were even more rare. In fact, for most assemblages, the samples of blades and primary elements are so small as to make separate attribute studies meaningless. Therefore, the following discussions of blank morphology are based on combined samples of all debitage and tool blanks, excluding bifacial tools, preforms, chunks, cores, and their fragments. Broken pieces were used to the extent to which they provided information: that is, a proximal flake fragment could be observed for platform attributes but not for length. Each aspect of morphology, therefore, may be represented by a different sample size. In spite of different kinds of occupation, artifact discard, and immediate post-occupational conditions, the percentage of broken pieces in each assemblage is rather similar: Level 1, 35.4%; Level 2, 35.4%; Level 3, 26.4%; and Level 4, 31.6%. As will be seen below, the higher percentage of complete pieces in Level 3 can be explained by an average greater thickness of those pieces, which made them less likely to break.

The emphasis of this section will be comparative among the assemblages. Yet, those from Levels 2 and 4 are too small to be very meaningful. Thus, focus will be placed on the distinctions and similarities between Levels 1 and 3. Given the extensive use of soft hammer, bifacial reduction in Levels 1 and 2, and the use of hard hammer, true core reduction in Level 3, it might be expected that the blanks of Level 3 would be significantly different from those in Levels 1 and 2. While this is true for some aspects of their morphology, the differences in other attributes are not so marked. For instance, in spite of the major difference between Levels 1 and 3 in the dominance of bifacial reduction in Level 1 and its absence in Level 3, the same proportional distribution of on-axis and off-axis blanks occurs, with each having ca. 49% struck off-axis.

Platform Characteristics

Platform attributes reflect both the specific preparation of the platform prior to a blank being struck and the mode of removal (hard vs. soft hammer). While the former is clearly seen, the latter is less so. Hard hammers tend to leave pronounced bulbs of percussion, noticeable éraillure scars, and relatively thick and wide platforms. Of course, this is not always the case, since a hard hammer used softly on a core near the intersection of the platform and the flaking surface may well produce a blank with a small platform, a diffuse bulb, and with little to no éraillure scar. Thus, these observations for any sample must be thought of as tendencies, rather than specifically interpretable for each piece.

While platform size will be dealt with when metrics are discussed, the presence or absence of lipping will be noted here (Table 7-3). Lipping refers to a flange at the contact between the platform and the ventral surface. This occurs only when the force which removed the blank is very diffuse and it is usually, although not always, associated with an absence of a bulb of percussion (e.g., fig. 7-8 a, c) or even crushing (fig. 7-8d) . In the coding, a semi-lipped state was recognized, where the lipping was present but so, too, was a small, diffuse bulb of percussion. It was decided that both the semi-lipped and lipped platforms should be grouped together as representing the probable use of a soft hammer. Experience has shown that classifying the strength of the éraillure scar is highly subjective and, so, this attribute has not been included. In addition, while a series of platform types were coded (following those recognized by F. Bordes 1961), it was decided that three categories were sufficient: unfaceted, multiple faceted (including dihedral and the various complex forms), and those platforms still covered with cortex (Table 7-3).

TABLE 7-3
Starosele, Platform Characteristics of Debitage and Tools

Platform	Level 1 N	Level 1 %	Level 2 N	Level 2 %	Level 3 N	Level 3 %	Level 4 N	Level 4 %
Unfaceted	108	46.2	23	57.5	139	57.4	7	53.8
Multiple faceted	107	45.7	14	35.0	61	25.2	5	38.5
Cortex	19	8.1	3	7.5	42	17.4	1	7.7
N	234		40		242		13	
IFs		42.7		27.5		21.9		38.5
Lipping								
Not lipped	155	53.4	28	58.3	206	75.7	10	66.7
Lipped and semi-lipped	135	46.6	20	41.7	66	24.3	5	33.3
N	290		48		272		15	

Taking into account the possible effects of the small sample from Level 2, both Levels 1 and 2 have very similar patterns of platform preparation. Most notable is the low occurrence of cortical platforms and the relatively high occurrence of faceted platforms. The pattern for Level 3 is quite different: cortical platforms are twice as common, and there are proportionately far fewer faceted platforms than in Levels 1 and 2 (Table 7-3). The Level 4 sample, while extremely small, parallels those of Levels 1 and 2. Some significant degree of lipping occurs on over 4 out of 10 pieces in both Levels 1 and 2, while this falls to only 2.5 out of 10 in Level 3. Level 4 is closer to Levels 1 and 2 than to Level 3 but, again, the sample is so small as to be hard to interpret.

These platform patterns are fully consistent with the data derived from the few cores and from the basic reduction patterns seen in other aspects of the assemblages. The high percentage of faceted and lipped platforms in Levels 1 and 2, among other attributes, are strongly linked to soft hammer bifacial tool shaping and thinning (Callahan 1979; Bradley and Sampson 1986; Whittaker 1994). While soft hammer can be inferred from this, there are also a number of bone retouchers found in Level 1, so soft hammer use is beyond question.

As noted previously, the paucity of cores, the presence of bifacial foliates and bifacial preforms, all suggest that unmodified nodules or plaquettes were rarely imported onto the site during the occupations of Levels 1 and 2. The rarity of cortex platforms in those levels certainly is consistent with a lack of initial raw material reduction. The opposite interpretation for Level 3 is also reinforced by the high percentage of blanks with cortex platforms. On the other hand, the low percentage of faceted platforms in Level 3 would seem to reflect a lack of careful striking platform preparation, rather than any particular type or shape of raw material. What is striking is that Level 3 is markedly different in these aspects from Levels 1 and 2, as well as from Level 4.

Shape Characteristics

These include overall blank shape, as seen from the dorsal surface, the nature of the distal extremity, the cross-section at mid-point, and the shape of the blank profile viewed from the side (Table 7-4). While these aspects of blank morphology often have indirect relationships with the shape of the flaking surface of the core from which the blank was struck, there are only rarely direct relationships between any one attribute state and flaking surface shape. What these attributes show is the overall patterns present in an assemblage of blanks. While these aspects of blank morphology may be significant to some degree, other aspects, such as dimensions, may be even more important, as will be seen below.

Because interest here lies in the universe of blanks which were available for tool production, the sample includes both debitage and those blanks actually made into tools. Again, because of small sample sizes, the proportional occurrences of attributes states for Levels 2 and 4 probably have little meaning and are presented merely for the record. Discussion will be limited to Levels 1 and 3, since their samples are quite large and, therefore, may be taken as characteristic of each assemblage.

Level 1

There is considerable variability in blank shape, although combined trapezoidal and elongated trapezoidal dominate. In fact, trapezoidal and rectangular forms account for 76.7% of all blanks. No other shape exceeds 7.3% of the sample. This might suggest considerable purposeful shape standardization but that interpretation would be unwarranted. Since many blanks produced in Level 1 came from the shaping and thinning of bifacial foliates, it is expected that their lateral edges would be either more or less parallel or expanding. Since these thinning blanks are normally struck off-axis, the distal ends are often oblique to the axis of removal and, therefore, define some trapezoidal shape. What is striking about blank shape

TABLE 7-4
Starosele, Shape Characteristics of Tools and Debitage

	Level 1		*Level 2*		*Level 3*		*Level 4*	
Blank Shape	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Rectangular	67	23.3	6	14.3	54	22.0	2	13.3
Ovoid	21	7.3	9	21.4	35	14.2	1	6.7
Triangular	19	6.6	2	4.8	25	10.2	5	33.3
Trapezoidal	64	22.2	10	23.8	58	23.6	3	20.0
Elongated trapezoidal	90	31.3	8	19.0	38	15.4	3	20.0
Expanding	21	7.3	4	9.5	26	10.6	1	6.7
Crescent/sub-crescent	6	2.1	3	7.1	10	4.1	—	—
N	288		42		246		15	
Profile at Midpoint								
Flat	27	8.5	8	14.3	40	14.9	—	—
Triangular	143	45.1	19	33.9	115	42.8	7	46.7
Lateral steep	58	18.3	8	14.3	47	17.5	2	13.3
Trapezoidal	87	27.4	21	37.5	66	24.5	6	40.0
Lenticular/bi-convex	2	0.6	—	—	1	0.4	—	—
N	317		56		269		15	
Profile at Distal End								
Thinning	172	56.8	29	65.9	99	35.2	8	57.1
Hinged	79	26.1	8	18.2	100	35.6	5	35.7
Overpassed	16	5.3	3	6.8	9	3.2	—	—
Blunt	36	11.9	4	9.1	73	26.0	1	7.1
N	303		44		281		14	
Blank Profile								
Flat	52	12.6	6	9.2	52	15.0	1	5.3
Incurvate	194	47.0	29	44.6	134	38.6	8	42.1
Twisted	117	28.3	21	32.3	79	22.8	6	31.6
Irregular	27	6.5	4	6.2	14	4.0	2	10.5
Convex	23	5.6	5	7.7	68	19.6	2	10.5
N	413		65		347		19	

in Level 1 is the paucity of ovoid/crescent shaped blanks; that is, those with one or two convex lateral edges. In addition, blanks with triangular shape are also rare. These, with the maximum blank width at the platform, would be rare in a technology where the main mode of detachment was a soft bone hammer. Thus, Level 1 blank shapes are consistent with the kinds of reduction patterns seen through other aspects of the assemblage.

This consistency continues when mid-point profiles and distal profiles are considered. As expected from a bifacial technology, there are few pieces with one blunt edge, and those that are present must have come from other types of reduction. The remaining mid-point cross-sections indicate little primary reduction, for those with trapezoidal and triangular (normally flat triangular) sections usually come only after a nodule or plaquette has been initially shaped. The distal profiles are dominated by blanks where the distal end is feathered: that is, these blanks did not reach all the way to the far side of the core or bifacial piece being worked. This is typical for bifacial reduction, but is also usual in normal cores. It is the low number of hinged and blunt distal ends (Table 7-4) which correlates well with both an emphasis on bifacial reduction, as well as the use of a soft hammer.

The blank profiles along their length show that almost half are incurvate. While this is normal for almost any assemblage (most flakes/blades are struck from flaking surfaces which are convex along the axis of the blow, regardless of the core type), when it is combined with those with twisted profiles, they account for some 75% of all profiles, as would be expected when the technology emphasizes bifacial reduction. The low proportional occurrences of convex and irregular profiles indicate diffuse force was used most of the time, as expected.

Level 3

Most striking about blank shape is that, with the exception of crescent/sub-crescent pieces, each shape accounts for at least 10% of the sample (Table 7-4). In fact, while rectangular and trapezoidal account for ca. 20% each, the other shapes are rather evenly represented. Thus, unlike Level 1, there are no dominant shapes. Like Level 1, however, the mid-point cross-sections show the same general proportional distribution, except for having flat pieces at double the rate of Level 1 (Table 7-4). This indicates a higher use of unmodified flaking surfaces in Level 3 than in Level 1, but doesn't suggest that it was typical.

Unlike Level 1, distal profiles exhibit high rates of blunt and hinged ends; over 41% combined. This is associated with hard hammer striking, as well as with rather small cores where the force of the blow was sufficiently strong to go all the way through the core. If the cores were large, such force would have resulted in overpassed pieces, which are very rare here (Table 7-4). It also should be noted that while distal feathering is normal in most assemblages, in Level 3 it stands at only 35%, compared with almost 57% in Level 1.

Compared to Level 1, blank profiles in Level 3 exhibit much higher occurrences of flat and convex ventral surfaces, and significantly lower percentages of incurvate and twisted profiles (Table 7-4). The flat and convex ventral surfaces are associated with hard hammer force in blank removal and, again, suggest that the lengths of core flaking surfaces were not great. In fact, the high percentage of convex ventral surfaces is quite unusual and, in this case, was probably accentuated by the rather dry and brittle flint used for many of the cores.

Blank vs. Chip Variability

As discussed above, the line between blanks and chips was set at 2.99 cm for the whole project (see Chapter 3). While this demarcation had to be maintained in order to make comparisons among assemblages possible, some unbroken tools from Levels 1, 2, and 3, as well as the last scar facets on the discarded cores at Starosele, measure between 1.99 cm and 2.99 cm in greatest dimension. Thus, it is necessary to consider the sample of blanks from which they were drawn to see whether it is significantly different from the universe of larger pieces classified as blanks/debitage. Because of very small sample sizes from Levels 2 and 4 (12 and 10, respectively), only those from Levels 1 and 3 will be considered.

One difference between this chippage and the large pieces is that many more of the former are flakes: Level 1, 80.5% and Level 3, 89.9%. In spite of this, blades do occur, accounting for 13.4% in Level 1 but only for 3.1% in Level 3. Primary flakes occur in about the same proportions as for the larger items. As might be expected, fewer chips are broken: 28.9% in Level 1 and 16.2% in Level 3. Even this lower percentage in Level 1 seems high, but if it is considered that many were biface thinning chips, they probably broke while coming off the bifacial blank, rather than after their removal.

There are few differences between the platform characteristics of the chips and those of the larger pieces. The only marked difference is that in Level 1 only 2.0% chips have cortex platforms, as opposed to 8.1% for the larger pieces. Given the technology, however, this is fully understandable and expected. For both levels, more of the chips are unfaceted, fewer are multiple faceted, and fewer are lipped, but the differences are not great. There are also higher occurrences of unrecognizable platforms among the chips, since crushing is much more prevalent for these smaller and thinner pieces.

Blank shape of the chips follows the proportional distribution of the blanks/debitage rather closely. In Level 1, only ovoid pieces are more common by some 11% and elongated trapezoidal pieces are less common by 15%. Otherwise, the shape categories average changes of no more than 2.8% from those of the larger pieces. For Level 3, again, ovoid pieces are more common by 8% and elongated trapezoidal are lower by 9%. For the other shapes, the average change is in the order of 3.1%.

There are no significant differences at all in the proportional distributions of blank profiles for either level when comparing the chips and blanks/debitage. Distal profiles are the same for Level 1 but there are two fully expected differences in Level 3: there is an increase of 15% for those with feathered ends, and a 10% decrease for those with blunt ends. Otherwise, the differences are in the 2.0% range. Profiles at midpoint show expected differences in both levels: there are fewer pieces with triangular cross-sections (9% in Level 1 and 8% in Level 3) and more with flat cross-sections (11% in Level 1 and 5% in Level 3).

In summary, while there are a few significant differences between samples with greatest dimension of less than 2.99 cm but more than 1.99 cm, and the sample of larger pieces, for the most part, the smaller sample can be distinguished essentially only be size. They appear to be merely the smaller end of an otherwise rather homogeneous group of platform and shape characteristics.

Dorsal Scar Patterns

Dorsal scar patterns are useful as an indirect indication of core reduction: at least, it is a view of what part of the core flaking surface looked like just prior to the removal of the blank. In this context, it is among the prime diagnostic features used to assign a blank either to the Levallois method or to some other reduction strategy (Bordes 1961a). At Starosele, where few cores were recovered, the dorsal scar patterns are a potentially profitable source for reconstructing flaking patterns. Unfortunately, these patterns are relatively uninformative (Table 7-5). There is very little difference in the proportional occurrences between Levels 1 and 3. A few points, however, do suggest some differences in patterning. In Level 1, complex patterns (radial and 3 directions) are twice as common as in Level 3. In Level 3, unidirectional scar patterns are significantly more common than in Level 1, which is consistent with the presumed core types. The cores in Level 3, however, as well as one conjoin series, indicate that opposed platform flaking was common. Yet, Level 3 has few flakes with bidirectional scar patterns. This confirms that, as reconstructed above, the Level 3 cores were

TABLE 7-5
Starosele, Cortex and Dorsal Scar Patterns of Tools and Debitage

	Level 1		*Level 2*		*Level 3*		*Level 4*	
Cortex	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
None	250	60.2	44	67.7	228	65.7	13	68.4
Cortical	165	39.8	21	32.3	119	34.3	6	31.6
N	415		65		347		19	
Scar Patterns								
Lateral crossed	34	9.9	5	8.5	34	11.0	3	25.0
Uni-directional	130	38.0	29	49.2	160	51.9	4	33.3
Uni-directional and crossed	69	20.2	11	18.6	52	16.9	3	25.0
Radial	30	8.8	4	6.8	11	3.6	—	—
Bi-directional	42	12.3	7	11.9	29	9.4	2	16.7
3 directions	37	10.8	3	5.1	22	7.1	—	—
N	342		59		308		12	

flaked one platform at a time. In this way, the abandoned cores have bi-directional scar patterns but only a very few of the blanks show this pattern.

Part of the dorsal scar pattern relates to the presence of cortex. While there are few primary elements (those with 50% of their dorsal surfaces covered by cortex) (Table 7-2), between 35% and 40% of all blanks in all levels have some dorsal cortex. This shows that in Level 1, the imported preforms still had some cortex (which is also seen on some bifacial foliates) and that in Level 3, the raw material used for cores was relatively small and that the cores did not produce large numbers of flakes. In fact, the difference between Levels 1 and 3 in this regard is striking: the core to blank ratio for Level 1 is 1:59.8, while in Level 3 it is only 1:25.9.

Blank Dimensions

The vast majority of pieces recovered were less than 3.0 cm in greatest dimension (chips). Considering those complete pieces with one dimension greater than 2.0 cm, in Levels 1 and 3 there are clear clusters in length/width patterns in which a significant number are wider than long (fig. 7-12). That is why greatest dimension, rather than length, is the significant size dimension. The range in greatest dimension is similar for all levels but Level 4, where the largest piece (not on fig. 7-12) measures 13.2 cm in length. As can be seen in the scatter plots (fig. 7-12), as the pieces become larger, size clustering decreases. In Level 1 this also shows that the largest pieces tend toward elongated forms, while in Level 3, this pattern is present, but less marked.

Mean greatest dimensions for Levels 1, 2, and 3 are very much the same, as is also the case for width (Table 7-6). On the other hand, blank thickness, platform width, and platform height in Level 3 is significantly greater than in Levels 1 and 2 (Table 7-6). While Level 4 greatest dimension is much greater than that of the other levels, overall thickness is about the same. When these dimensions are considered only for tools, however, in Levels 1, 2, and 4 they are significantly larger than the equivalent dimensions for the debitage in the same levels (Table 7-6). Overall, Levels 1 and 2 show no significant differences in any metrical attributes that would indicate differences in blank production, while comparisons between Levels 1 and 3 do indicate statistical differences in blank production. Level 4, which has markedly bigger

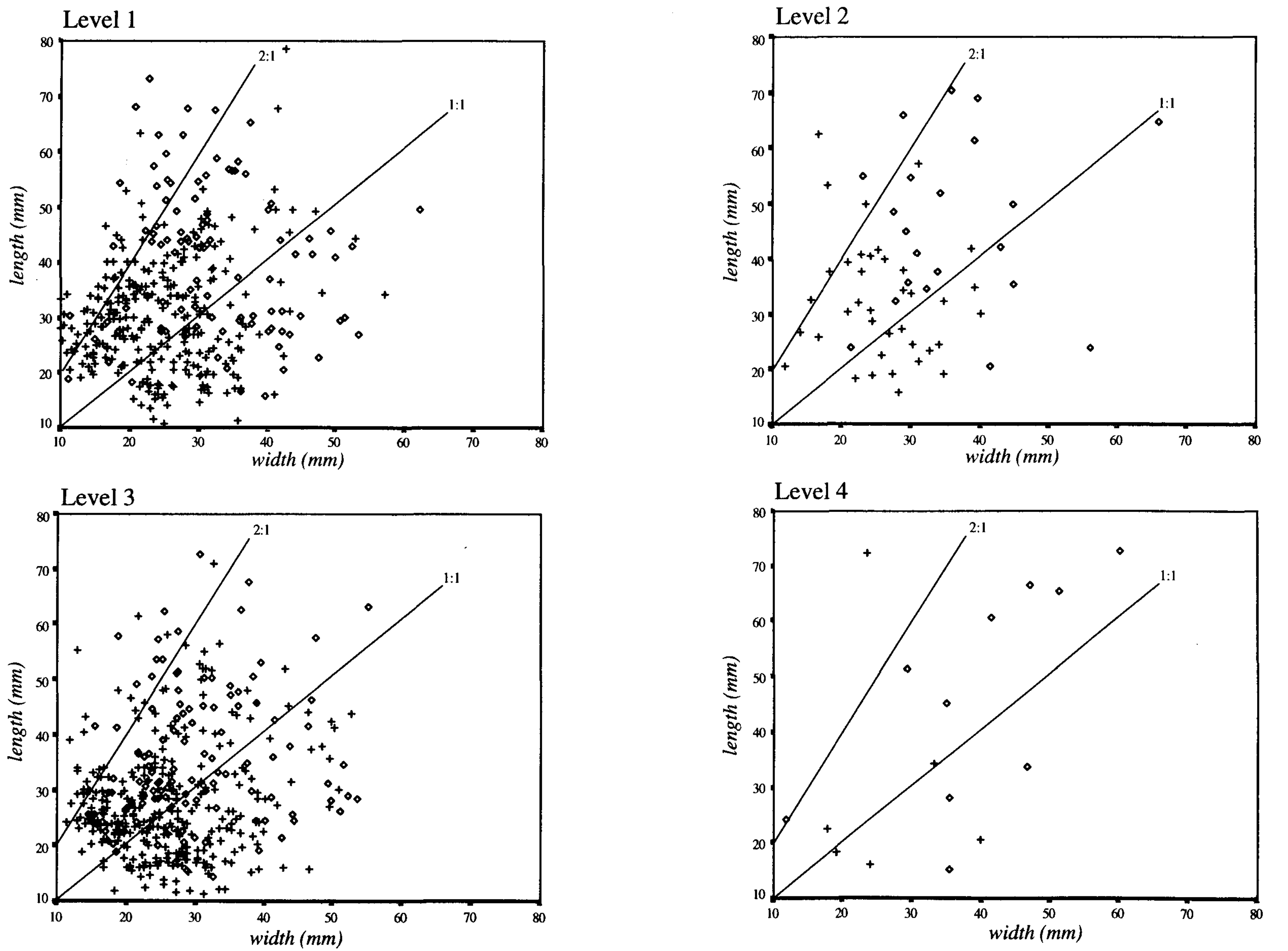


Fig. 7-12—Starosele, Length/width scatterplots of all compete tools (◇), chips and debitage (+) from each level. Note that a good number of all pieces are wider than long and that the larger pieces tend to be tools in all levels.

TABLE 7-6
Starosele, Dimensional Attributes of Debitage (> 2.99 mm) and Tools†, Complete Pieces Only

		Level 1		*Level 2*		*Level 3*		*Level 4*	
		Deb.	*Tools*	*Deb.*	*Tools*	*Deb.*	*Tools*	*Deb.*	*Tools*
Length	Mean	34.9	41.3	36.6	47.2	33.4	36.8	42.7	52.5
	S.D.	10.0	13.2	10.5	15.0	11.4	12.4	26.8	33.6
	N	169	95	27	15	150	105	3	10
	t-value	-4.478	p=.000*	-2.690	p=.010*	-2.300	p=.022*	-0.462	p=.653
Width	Mean	27.3	32.3	27.4	33.9	30.5	29.8	32.3	39.0
	S.D.	8.5	9.6	7.0	7.6	9.1	9.8	8.2	12.7
	N	169	95	27	15	150	106	3	10
	t-value	-4.346	p=.000*	-2.814	p=.008*	0.574	p=.566	-0.849	p=.414
L/W	Mean	1.4	1.4	1.5	1.5	1.2	1.3	1.5	1.4
	S.D.	0.6	0.6	0.7	0.5	0.7	0.5	1.4	0.6
	N	169	95	27	15	150	105	3	10
	t-value	0.213	p=.831	0.093	p=.926	-1.144	p=.254	0.351	p=.732
Max. Dim.	Mean	37.9	45.0	39.1	49.3	38.8	39.9	49.1	56.6
	S.D.	7.5	11.2	8.2	12.8	7.9	11.4	20.6	30.3
	N	169	95	27	15	150	105	3	10
	t-value	-6.194	p=.000*	-3.153	p=.003*	-0.868	p=.386	-0.395	p=.700
Surface Area	Mean	951.0	1314.0	974.3	1601.0	999.9	1115.4	1232.5	2301.7
	S.D.	460.6	511.8	295.9	606.0	451.5	571.7	446.1	2079.8
	N	169	95	27	15	150	105	3	10
	t-value	-5.903	p=.000*	-4.518	p=.000*	-1.799	p=.073	-0.859	p=.409
Thickness	Mean	6.0	6.8	4.8	8.1	7.9	8.3	5.7	9.3
	S.D.	3.7	2.7	1.7	3.2	3.6	4.0	1.8	4.4
	N	169	95	27	15	150	106	3	10
	t-value	-1.678	p=.094	-4.330	p=.000*	-1.382	p=.194	-1.382	p=.194
Platform Width‡	Mean	11.2	13.4	11.4	15.0	15.7	17.0	13.3	21.2
	S.D.	5.3	7.2	5.8	7.2	8.1	8.4	9.8	9.3
	N	194	103	34	14	169	104	3	11
Platform Height‡	Mean	3.7	4.1	3.8	5.2	5.8	5.9	5.7	6.0
	S.D.	2.2	2.4	1.8	3.1	3.2	3.8	2.2	3.9
	N	194	103	34	14	169	104	3	11

†excluding all bifacial and varia tools.
‡ all intact platforms.
* t-value is significant at p < .05.

pieces than the other assemblages, shows similarities in dimensional comparisons only to Level 3, and that only in blank thickness and platform size.

Blank Selection

While it might be expected that blank selection for tool production would be influenced both by the variable quality of the raw materials and by the artifact classes available, neither seems to have be very significant to the groups which came to Starosele. There is virtually no difference between the proportional occurrences of the different raw materials and the proportion of tools made from each material (Table 7-1). The same is true when the total tools in each level is compared with the total blanks in each level: with the exception of Level 4, in each level between 40.5% and 47.9% of all blanks were made into tools (Table 7-2). Sixty-five percent of the blanks in Level 4 were retouched, but with a total sample of 20 items, this doesn't mean much.

There are significant differences between levels and the percentage of certain artifact classes chosen for tool production (Table 7-2). In Level 1, a higher percentage of available blades were selected as blanks for tools (56.3%) than were flakes (38.6%), while only about one out of five primary elements were so used (22.6%). The Level 2 patterns parallel those from Level 1 when class samples are reasonable (Table 7-2).

Selection patterns by artifact class for Level 3 exhibit some marked differences from Levels 1 and 2. Unlike Level 1, blades were selected in a lower proportion (40.8%) than were flakes (47.9%), and primary flakes were a desired blank form; ca. 40% were made into tools. Another aspect of the Level 3 selection was the use of chunks as tool blanks. While each other level has a single tool made on a chunk, chunks themselves are rare. In Level 3, almost 6% of the blanks are chunks and of them, 45.5% were retouched (Table 7-2). This is another facet of the *ad hoc* appearance of the Level 3 tool assemblage.

The proportional occurrence of tools by major artifact class (Table 7-7) shows relatively few differences. In each level, most tools were made on flakes: the somewhat lower percentage in Level 1 than in the other levels is a result of the core/bifacial tools in that level and their paucity or absence in the other levels. Also, blade tools are proportionately more common in Level 1 than in Level 3, or in Level 2, for that matter, but they are not so numerous as to exhibit any strong preference for them. It seems that, in spite of quite different technologies used to produce blanks in Levels 1 and 3, the tool assemblages have similar, if not identical, patterns of blank selection. Levels 2 and 4 have such small samples that they are affected significantly by the small number of artifacts. Still, the proportional distributions of tools by artifact class for those levels are not markedly different from the assemblages with large samples.

TABLE 7-7
Starosele, Tool Assemblages by Major Artifact Classes

	Level 1		*Level 2*		*Level 3*		*Level 4*	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Blade	40	20.7	4	13.3	20	12.2	1	7.7
Flake	118	61.1	23	76.7	128	78.0	11	84.6
Primary Element	7	3.6	1	3.3	5	3.0	—	—
Core/Chunk†	28	14.5	2	6.7	11	6.7	1	7.7
N	193		30		164		13	

†Including all bifacial foliates and their fragments. Those are on flake blanks are treated as cores.

It is probable that the morphological differences among the artifact classes played, at best, a secondary role in blank selection. The primary criterion in blank selection for tool production was size: the larger the blank the more likely it was to have been made into a tool (Tables 7-6, 7-8). In this case, it is not merely length in the traditional sense, but the longest blank edge was considered important, whether it was parallel, perpendicular, or oblique to the axis of the blank. Table 7-8, therefore, is structured so that the longest edge determines where the blank is classified: a transverse flake 5 cm long and 7.1 cm wide is in the 7 cm to 8 cm group. There is not only a positive selection for blanks which have a long edge or edges but also for those which have greater dimensions of all types (Table 7-6). This selective preference for large blanks does not mean that small blanks were not also retouched. It is merely that of the many small blanks available, relatively few were used, while among the relatively few large blanks, most were made into tools.

TABLE 7-8
Starosele, Grouped Maximum Dimension (mm) for Tools and Debitage and Tools Alone

	Level 1				*Level 2*				*Level 3*				*Level 4*			
	All		*Tools*		*All*		*Tools*		*All*		*Tools*		*All*		*Tools*	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
20.0-29.9	114	31.0	10	8.8	12	22.6	1	8.3	187	45.1	28	15.0	4	25.0	—	—
30.0-39.9	135	36.7	18	13.3	19	35.8	2	10.5	125	30.1	27	21.6	3	18.8	2	66.7
40.0-49.9	78	21.2	36	46.2	11	20.8	5	45.5	65	15.7	29	44.6	3	18.8	2	66.7
50.0-59.9	29	7.9	22	75.9	7	13.2	4	57.1	31	7.5	17	54.8	1	6.3	1	100.0
60.0-69.9	10	2.7	8	80.0	3	5.7	2	66.7	5	1.2	4	80.0	3	18.8	3	100.0
70.0-79.9	2	0.5	1	50.0	1	1.9	1	100.0	2	0.5	1	50.0	1	6.3	—	—
80.0-89.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
90.0-99.9	—	—	—	—	—	—	—	—	—	—	—	—	1	6.3	1	100.0
N	368	100.0	95		53	100.0	15		415	100.0	106		16	100.0	9	
Mean	36.1		44.5		40.2		49.1		33.9		39.9		48.9		58	
S.D.	10.7		11.3		12.50		12.9		11.1		13.9		27.5		29.2	

A comparison of tools and debitage showed, however, that while the above basic blank selection criteria hold true, there are some differences in selection among the assemblages. In Level 1, tools are significantly bigger than unretouched pieces in all aspects, except thickness and degree of elongation (length/width index). While tools are marginally thicker in cross-section, they are not significant at the .05 level, and this measurement is highly dependent on their overall size. The mean length/width index is the same in both tools and debitage, suggesting that elongation—as measured on the debitage axis—was not highly important in blank selection for tools. Rather, it is the maximum length of the edge which shows the greatest significant difference between the tools and debitage. Level 2 likewise shows the same preference for larger blanks; here, the tools are significantly larger in dimensional attributes than the debitage, including thickness. Level 3, on the other hand, demonstrates little difference among the tool and debitage groups in their dimensional aspects, except marginally in length ($p=.022$). In part, this is due to the overall limited size range of the Level 3 blanks, but also points to the possibility of more opportunistic use of blanks and less importation of blanks in this level as compared to the others. In Level 4, while the means are certainly larger for the tools (even by excluding the outlying 132 mm long sidescraper), there is no indication that the they are statistically different from the debitage. However, again, the sample sizes are too small in this level to make such tests anything more than indicative.

TOOL ASSEMBLAGES

Tools range in type and quality from extensively retouched bifacial foliates and beautifully symmetrical, well-retouched scrapers to rather amorphous blanks with poorly applied, partly discontinuous retouch. There is no problem recognizing well made tools but, at the other end

TABLE 7-9
Starosele, Tool Assemblages by Level

Tool Type	Bordian Equivalent	Level 1 N	Level 1 %	Level 2 N	Level 2 %	Level 3 N	Level 3 %	Level 4 N	Level 4 %
UNIFACIAL TOOLS									
Points		***21***	***13.2***	–	–	***5***	***3.6***	***1***	***10.0***
semi-leaf	6, 7	–	–	–	–	2	1.4	–	–
distal	62	1	0.6	–	–	–	–	–	–
lateral	62	2	1.3	–	–	–	–	–	–
sub-triangular	6, 7	10	6.3	–	–	1	0.7	–	–
sub-trapezoidal	21	2	1.3	–	–	–	–	1	10.0
semi-trapezoidal	21	1	0.6	–	–	2	1.4	–	–
tip fragment	6, 7	5	3.1	–	–	–	–	–	–
Scrapers		***72***	***45.3***	***14***	***66.7***	***56***	***40.0***	***9***	***90.0***
simple straight	9	8	5.0	2	9.5	5	3.6	1	10.0
simple convex	10	10	6.3	2	9.5	14	10.0	1	10.0
simple concave	11	4	2.5	–	–	6	4.3	–	–
transverse straight	22	4	2.5	1	4.8	1	0.7	–	–
transverse convex	23	6	3.8	1	4.8	–	–	–	–
transverse concave	24	–	–	–	–	2	1.4	–	–
transverse straight oblique	22	3	1.9	1	4.8	3	2.1	–	–
transverse convex oblique	23	–	–	–	–	2	1.4	–	–
transverse concave oblique	24	–	–	–	–	2	1.4	–	–
transverse wavy oblique	23	–	–	–	–	2	1.4	–	–
double straight	12	2	1.3	–	–	3	2.1	–	–
double convex	15	5	3.1	1	4.8	1	0.7	1	10.0
double straight-convex	13	5	3.1	1	4.8	2	1.4	3	30.0
double straight-concave	14	–	–	–	–	1	0.7	–	–
double convex-concave	17	2	1.3	–	–	2	1.4	–	–
semi-leaf	19	2	1.3	1	4.8	–	–	–	–
sub-triangular	18	3	1.9	–	–	1	0.7	–	–
semi-rectangular	21	2	1.3	–	–	–	–	–	–
sub-trapezoidal	21	3	1.9	1	4.8	1	0.7	3	30.0
semi-trapezoidal	21	8	5.0	2	9.5	7	5.0	–	–
sub-crescent	13	2	1.3	1	4.8	1	0.7	–	–
semi-crescent	13	1	0.6	–	–	–	–	–	–
hook-like	17	2	1.3	–	–	–	–	–	–
Endscrapers		***1***	***0.6***	***1***	***4.8***	***3***	***2.1***	–	–
atypical endscraper	31	1	0.6	1	4.8	1	0.7	–	–
on retouched blade	30	–	–	–	–	2	1.4	–	–
Perforators		–	–	–	–	***1***	***0.7***	–	–
inverse	35	–	–	–	–	1	0.7	–	–
Burin/Perforators		–	–	–	–	***1***	***0.7***	–	–
on truncation/obverse	62	–	–	–	–	1	0.7	–	–
Denticulates		***5***	***3.1***	***3***	***14.3***	***21***	***15.0***	–	–
simple	43	5	3.1	3	14.3	16	11.4	–	–
complex	43	–	–	–	–	5	3.6	–	–
Notches		***12***	***7.5***	***1***	***4.8***	***16***	***11.4***	–	–
lateral	42	11	6.9	1	4.8	14	10.0	–	–
distal	54	1	0.6	–	–	2	1.4	–	–
Retouched Pieces		***35***	***22.0***	***1***	***4.8***	***37***	***26.4***	–	–
obverse	62	32	20.1	1	4.8	31	22.1	–	–
alternating	62	1	0.6	–	–	–	–	–	–
inverse	45	2	1.3	–	–	6	4.3	–	–

TABLE 7-9 *continued*

Tool Type	Bordian Equivalent	Level 1 N	Level 1 %	Level 2 N	Level 2 %	Level 3 N	Level 3 %	Level 4 N	Level 4 %
BIFACIAL TOOLS		***13***	***8.2***	***1***	***4.8***	–	–	–	–
sub-crescent scraper	63	1	0.6	–	–	–	–	–	–
foliate, complete	63	6	3.8	1	4.8	–	–	–	–
foliate, distal	63	1	0.6	–	–	–	–	–	–
foliate, proximal	63	5	3.1	–	–	–	–	–	–
RESTRICTED TOTAL		***159***	***100.0***	***21***	***100.0***	***140***	***100.0***	***10***	
Tool Fragments		4		–		6		–	
Foliate Fragments		6		–		–		–	
Discontinuous Retouch		23		9		18		–	

of the spectrum, the problems are many. Just how much retouch must an edge have to be placed into the tool category? How regular and/or strong must the retouch be to keep it out of the "use retouch" or "edge damaged" categories? Even if retouch is well made, if it is on only a small fragment of what had to have been a larger tool, how is it to be classified? These and other questions have no universally accepted answers. In Chapter 3 we have tried to define how these problems were to be resolved. In theory, all the authors in this volume used the same criteria. In practice, it is likely that full comparability was not reached. Even for Starosele, at different times the same piece would be put into different categories by the same person. The problems lay mostly with the partly retouched pieces, the single notches, the marginally retouched flakes, etc. Because of the unavoidable subjectivity involved, these types may not correspond to the reader's classification.

These partially retouched pieces tell us that a fair number of usually small flakes were either lightly retouched or used for short periods of time without resharpening. These are the tools of the moment, rather than those tools which might have been curated or even resharpened. As such, they provide little typological information and are not useful for comparisons among assemblages. They are, however, quite useful in judging the range of activities at one site as opposed to another, since in spite of their minimal purposeful modification, they often exhibit clear use wear and even residues. All of these pieces have been recognized and counted as tools, *sensu lato*. If, however, the retouch is discontinuous or the piece so fragmentary that it merely can be recognized as having some retouch, it has not been included in the restricted tool list but is shown as a separate category below it (Table 7-9).

The typology used for the retouched tools is outlined in Chapter 3. While the principles behind this typology are not Bordian (1961a), there are similarities, and each of the types recognized here can be put into Bordian terms. This is done by including the Bordian number with the type name to aid the western reader for whom our typology may be unfamiliar. It must be remembered, however, that much information is lost when only the Bordian types are used, since much of the variability seen in Crimea is quite distinct from that recognized and defined by Bordes for southwestern Europe.

Because of the small tool sample from Level 2 and its comparability with the larger sample from Level 1, the illustrated Level 2 tools will be included with those of Level 1 and the description of the Level 1 tools applies, as well, to those from Level 2.

Level 1

A major characteristic of the Level 1 tool assemblage is the presence of bifacially flaked tools. This, however, is proportionately a rather small part of the tool kit, *per se*. Yet, the bifacial technology which produced those tools also produced large numbers of blanks chosen for modification into unifacial tools. While the number of such blanks varies from tool class to tool class, overall about 65% of all tools were produced on such bifacial shaping and thinning blanks, while only about 20% appear to have been made on blanks derived from true cores. The remaining examples could not be attributed to one reduction technique or the other.

Since the technology did not tend to produce blanks which were naturally pointed on axis (for an exception see Figure 7-14g), points were formed by retouch. One of the most vexing decisions in Middle Paleolithic typology is distinguishing between points and converging scrapers. Emphasis here (as explained in Chapter 3) is placed on the sharpness of the point but not on the symmetry of the piece relative to the axis of removal. Thus, points may well be off-axis, although on-axis examples are common. While there are relatively few points in this assemblage (10.2%), they tend to be well made, with rather heavy retouch. Triangular shapes (the typical Mousterian point) are usual, but other shapes, such as trapezoidal, also occur.

Within terms of the typology, however, the triangular ones are sub-triangular (fig. 7-13a, g, i-j) or elongate sub-triangular (fig. 7-13f, h), while the trapezoidal are either semi-trapezoidal (fig. 7-13b) or sub-trapezoidal (fig. 7-13k). There are also a few lateral points where only one edge is retouched (fig. 7-13c) or where one edge is much more strongly retouched than the other (fig. 7-13d-e). With these, the blanks appear to have been elongated, perhaps even of blade proportions. Two rather large and crude sub-triangular points also have inverse thinning (fig. 7-13g, j).

The numerically dominant tool class is the scraper. Within class variability is great and it is particularly in this class that the problem of the "lower limit" of acceptability is most vexing. Since many of the blanks chosen to produce scrapers came from bifacial reduction and were not only light and thin, but also small, the question arose of how big must a piece be to be a scraper? How heavy must the retouch be? If the blank is truly small, by necessity, the retouch, even if quite invasive, cannot be very strong. We have tried to be consistent and will document the difference between scrapers and retouched pieces with illustrated artifacts.

Among the scrapers, simple forms (lateral or transverse) account for a significant proportion, some 21.6% of all tools and 46.8% of all unifacial scrapers. The rather important ratio of simple transverse scrapers (36.0% of all scrapers) relates directly to the high number of transverse flakes produced during bifacial tool production. For both the lateral and transverse scrapers, convex edges predominate (fig. 7-14a-d, g-h), but are closely followed by straight (fig. 7-14e-f, i-j, l-m), whatever the orientation to the blank axis. When a concave edge occurs, it is only slightly concave (fig. 7-14k). For the most part, the retouch on these simple scrapers is obverse, sub-parallel or slightly scalar, and rather invasive. Edge angles are low and there is little evidence for resharpening in the form of overlapping lines of retouching scars. A single transverse example has both obverse and inverse retouch along the same working edge (fig. 7-14b), while another transverse scraper has a lateral truncated-faceted side (fig. 7-14i).

Convex forms dominate the double scrapers. If each edge is considered separately, 17 are convex, while 13 are straight and only 6 are concave. Retouch on these scrapers parallels that on the single scrapers; mainly obverse, sub-parallel or lightly scalar, invasive but not strong (figs. 7-15a, k, o; 7-16d). As before, this obviously relates to the light blanks chosen for modification, even the larger examples (fig. 7-15o). There are exceptions: a double straight/convex scraper on a relatively thick flake has strong, almost demi-Quina retouch, as well as truncated-faceted distal and proximal ends (fig. 7-15i). Another straight/concave example, at the very lower end of acceptability in this class, also has a truncated-faceted distal end (fig. 7-15j). A third example, straight/convex, has a short section of bifacial retouch along one edge (fig. 7-15k). One transverse convex oblique scraper approaches a backed knife but the edge which should be sharp is, in fact, perpendicular to the plane of the flake and, so, completely dull (fig. 7-14d).

The complex scrapers, those with two or more converging retouched edges, mainly follow the patterns noted above, but also include a number of heavily retouched pieces made on flakes from true cores. The latter include sub-crescent (fig. 7-15l-m), semi-crescent, two sub-trapezoidal (fig. 7-15g-h), one semi-trapezoidal (fig. 7-16i), and one atypical semi-leaf (fig. 7-16j) forms. Most semi- or sub-trapezoidal scrapers, however, are made on small flakes, at times thick (fig. 7-15c, f) but mainly thin bifacial reduction by-products (fig. 7-15b, d-e).

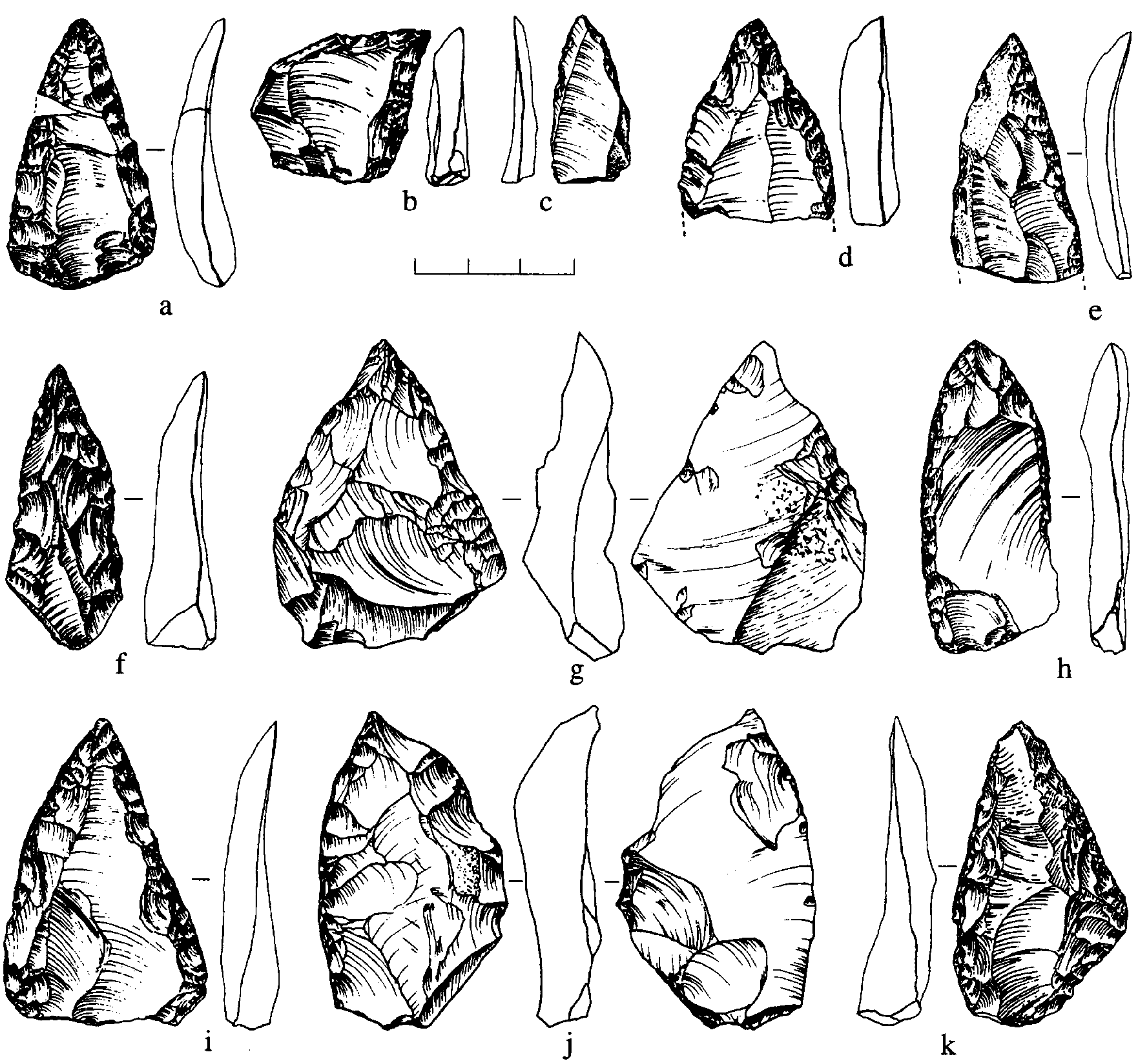


Fig. 7-13—Starosele, Level 1, Points: *a,f-j*–sub-triangular (*g* and *j* are sub-triangular thinned, and *f* and *h* are elongated); *b*–semi-trapezoidal; *c-e*–lateral; *k*–sub-trapezoidal.

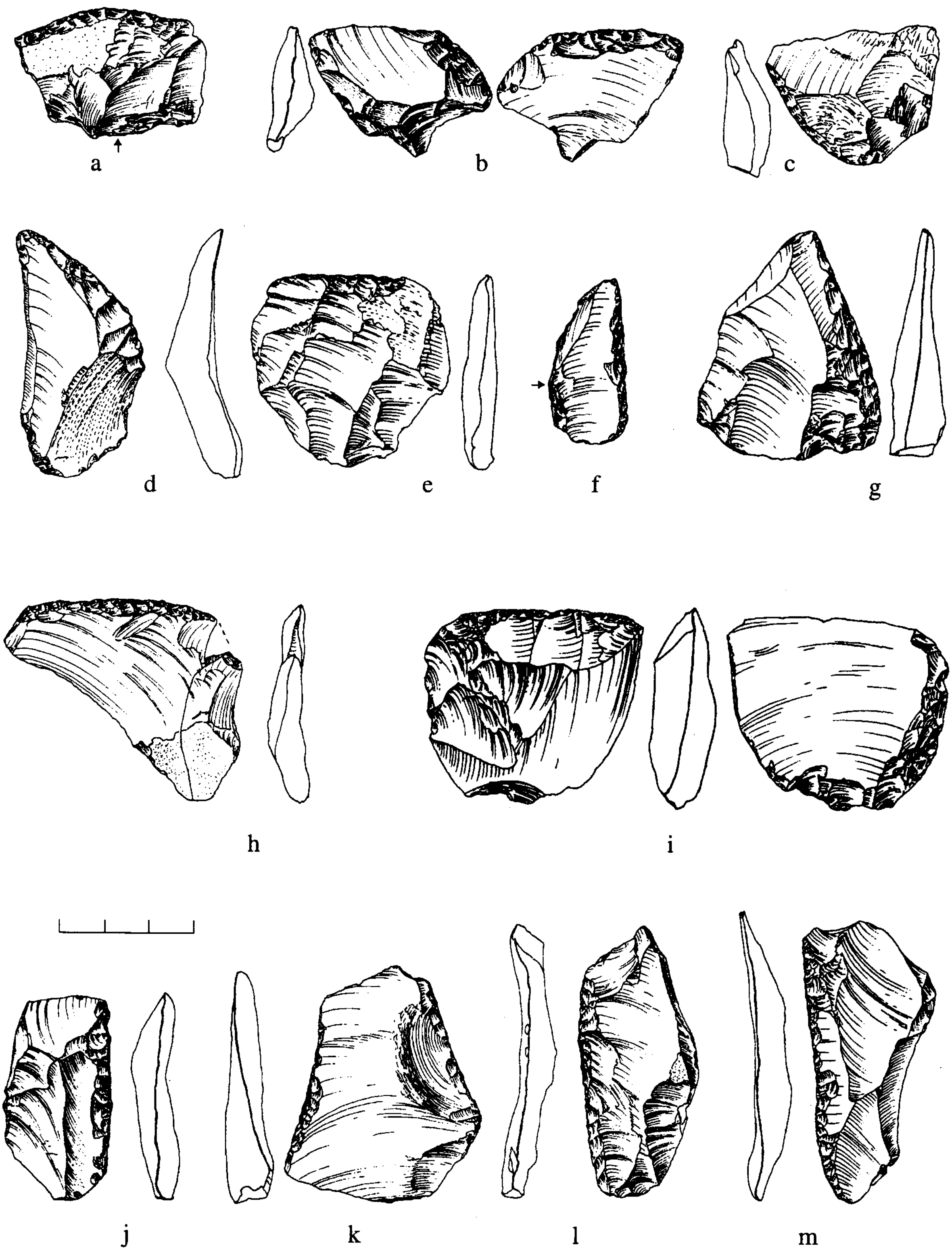


Fig. 7-14—Starosele, Levels 1 and 2, Scrapers: *a-b,h*–transverse convex (*b* has part obverse, part inverse retouch, as well as discontinuous retouch on the left lateral edge); *c,g*–simple convex; *d*–oblique convex which approaches a backed knife in Bordian terms but the unretouched edge is blunt; *e,i*–straight transverse (*i* has lateral truncated-faceting); *f*–simple, straight transverse with inverse retouch; *j,l-m*–simple straight; *k*–weak, slightly concave scraper from Level 2. Note that many of these (*b, h, j, l-m*) are made on bifacial shaping/thinning flakes and blades.

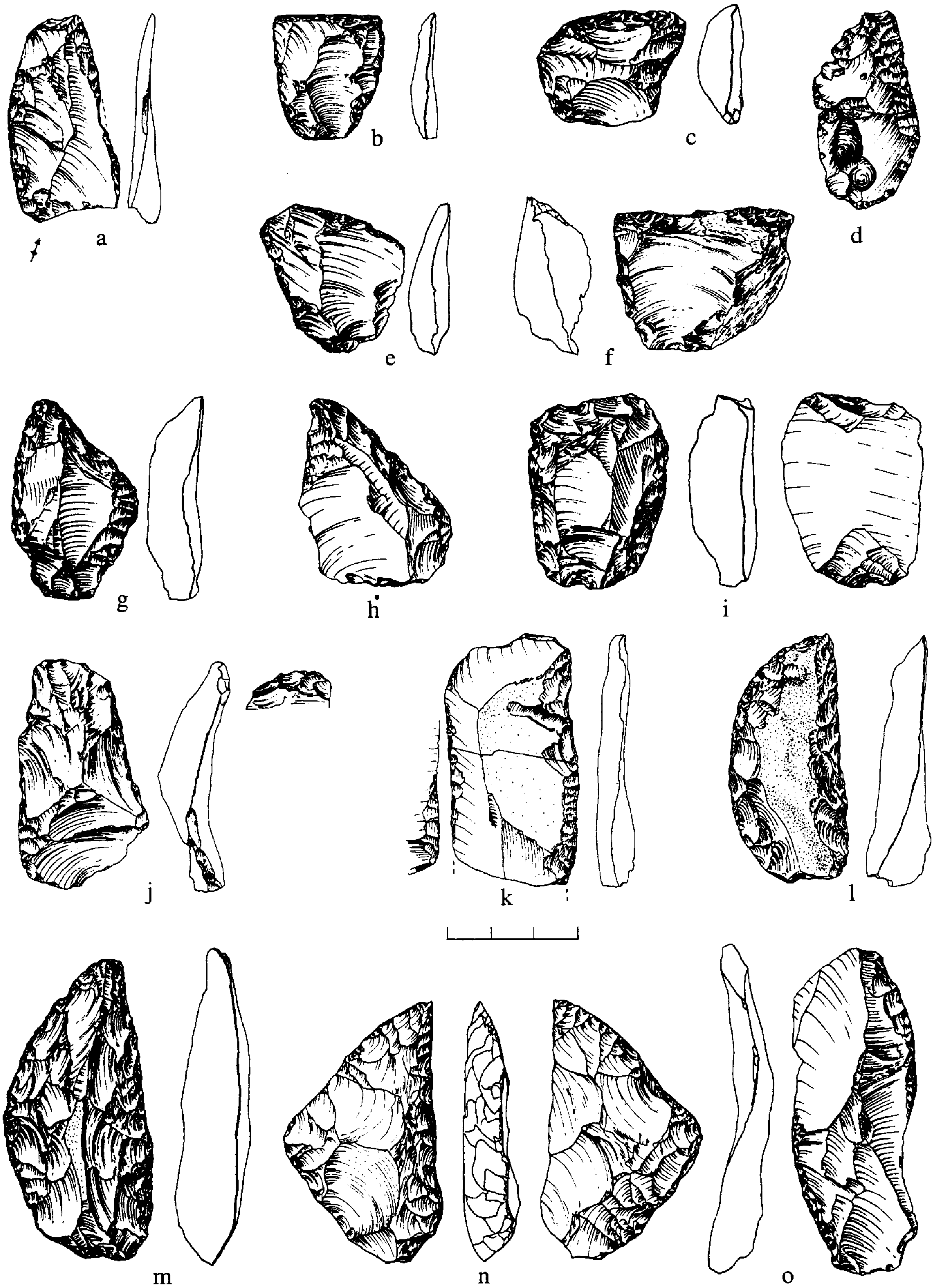


Fig. 7-15—Starosele, Level 1, Scrapers: *a*–double straight/convex; *b-c,g-h*–sub-trapezoidal; *d-f*–semi-trapezoidal; *i*–double straight/convex with truncated-faceting at both ends; *j*–poor straight/concave scraper with distal truncated-faceting; *k*–double straight/convex with minor bifacial retouch; *l-m*–sub-crescent; *n*–sub-crescent bifacial scraper; *o*–double convex.

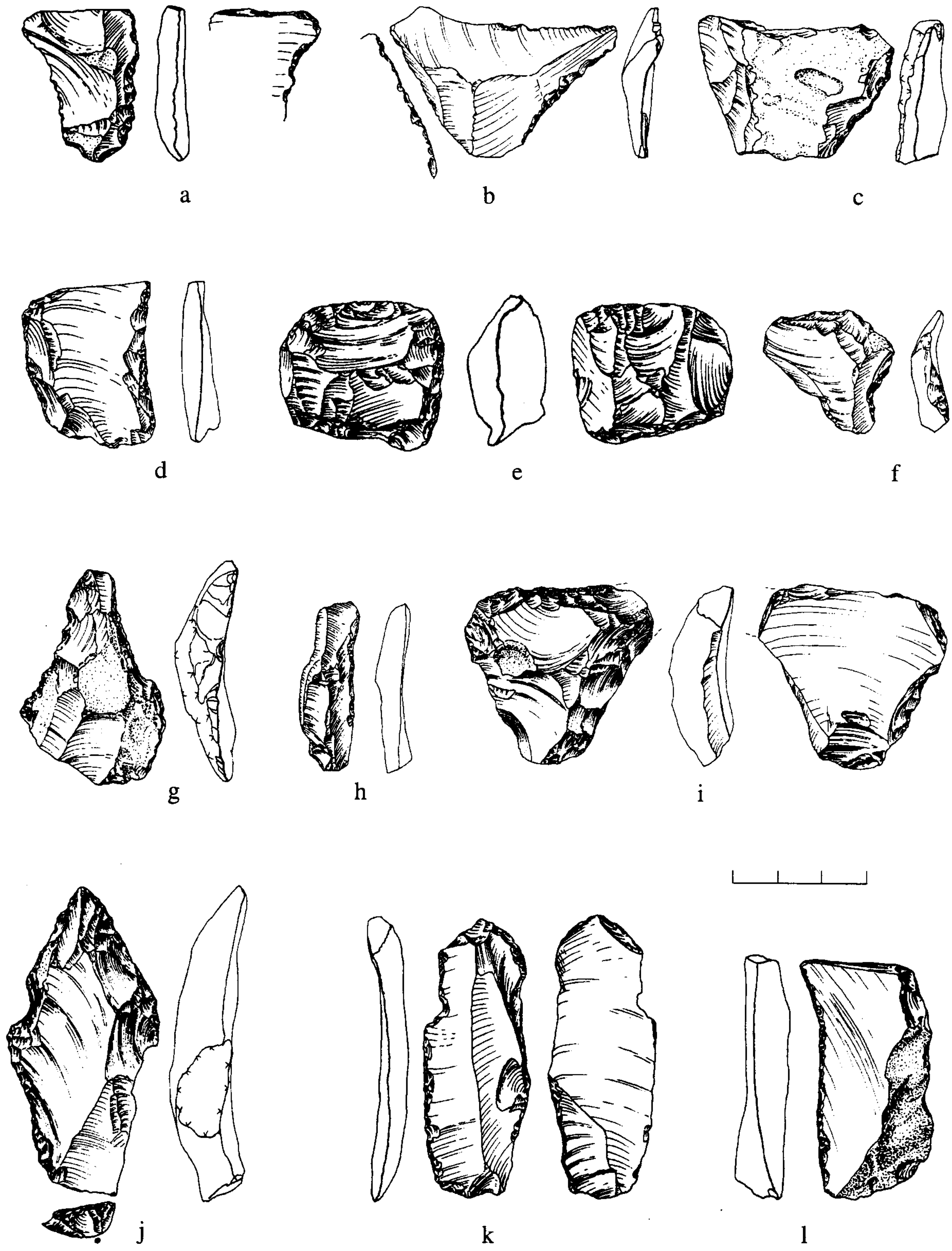


Fig. 7-16—Starosele, Level 1, Tools: *a,g*–denticulates; *b-c,h,l*–obversely retouched pieces; *d*–double convex/concave scraper; *e–pièce esquillée; f*–notch; *i*–semi-trapezoidal scraper with some possible inverse thinning; *j*–semi-leaf scraper; *k*–alternately retouched blade.

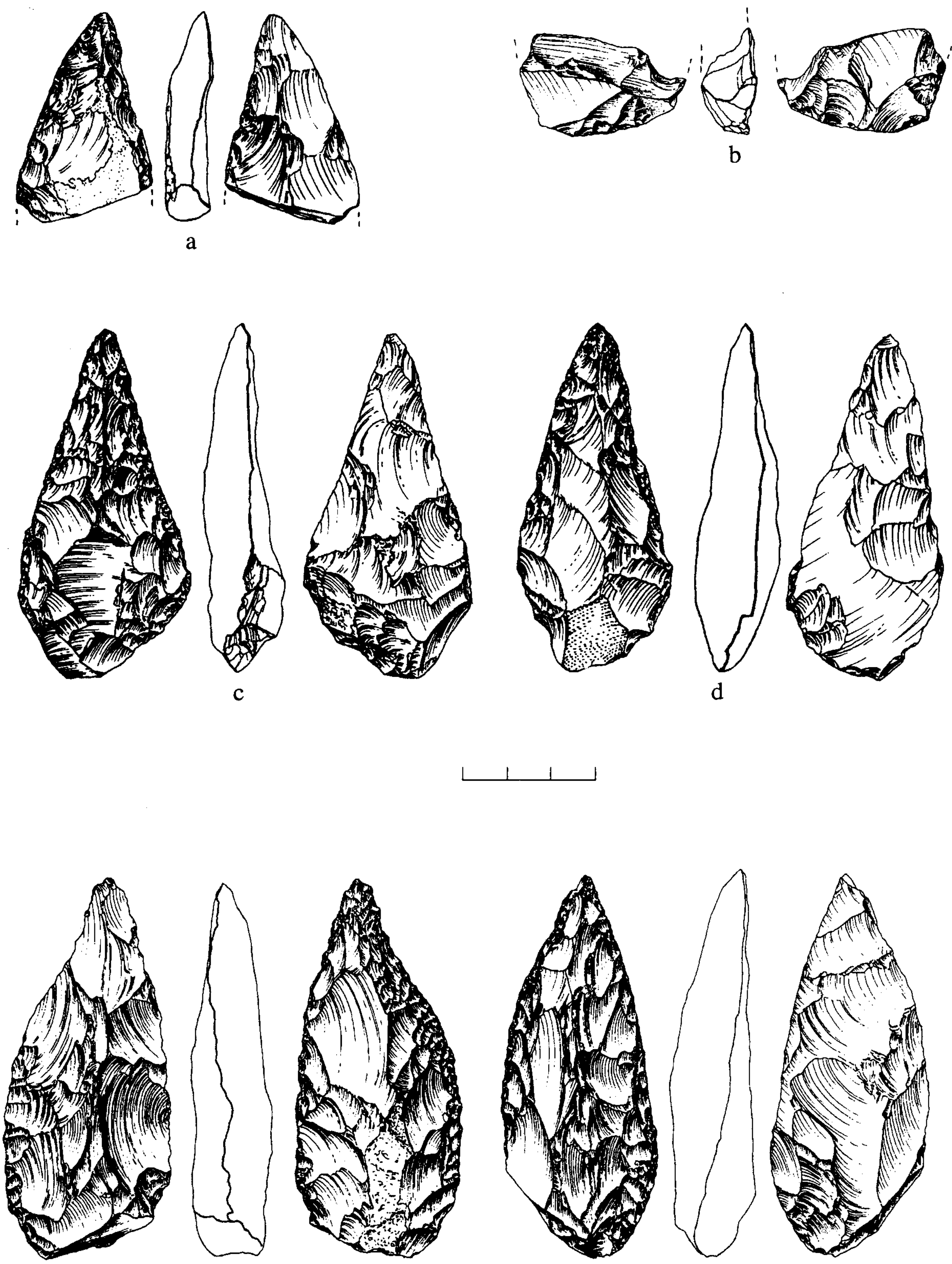


Fig. 7-17—Starosele, Level 1, Bifacial foliates: *a*–distal tip; *b*–proximal fragment; *c-f*–complete examples (*e* shows extensive rejuvenation along the upper half of the right lateral edge).

With the exception of the one illustrated as Figure 7-16i, none has any ventral thinning and even on this one, the inverse scars may relate to a core edge and breakage, rather than to purposeful modification.

Of the remaining unifacial tools, only retouched pieces occur in any number. There are isolated examples of *pièces esquillées* (fig. 7-16e) and an atypical endscraper on a broken flake. There are a few denticulates (fig. 7-16a), including one which is converging bi-concave (fig. 7-16g). The denticulations on the latter are small but clear, although the retouch is so steep as to mask the serrated edges. There are a few notches made by retouch (fig. 7-16f); a paucity of notches is rather typical for the Middle Paleolithic in the Crimea and may relate to the large number of truly *in situ*, undisturbed assemblages.

The retouched pieces are made on a range of blanks but usually occur on bifacial shaping and thinning flakes (fig. 7-16b, h, k). Retouch is usually continuous but not as invasive as on those classified as scrapers. Retouch is mostly obverse (fig. 7-16c, h, l), although a few pieces have alternate retouch (fig. 7-16b, k). In addition, there are pieces with only somewhat discontinuous or somewhat irregular retouch, such as the inverse retouch on Figure 7-16b. These are not listed in the restricted type list but are noted below that list (Table 7-9).

Although they represent a proportionately small part of the tool assemblage, the bifacial tools are a very important and characteristic element of Levels 1 and 2 at Starosele. With a single exception, these bifacial tools are foliates and their fragments. The single scraper is an atypical sub-crescent—it is more triangular than crescent-shaped—and might be a reworked fragment of a broken foliate (fig. 7-15n).

The bifacial foliates are all rather similar. All were produced by the asymmetric reduction of two surfaces, in which one face is first flaked with a parallel plane of detachment so that it is more or less flat. This face is then used as a platform to flake the opposite surface with a secant plane of detachment, resulting in an arched surface—thus, the plano-convex cross-section. In this sense, this is not a true bifacial reduction with alternating removal from opposite faces and a resulting bi-convex cross-section. Rather, it is a sequential unifacial technique, with a final, "bifacial" appearance. It is technologically understandable to use this technique when reducing thin plaquettes; that is, to first create a cortex-free "ventral" surface before tool shaping. The technique is used here, however, on flakes where the ventral surface already exists. Perhaps, the "bifacial" aspect created more effective edges for cutting than would a simple unifacial tool.

Although some bifacial pieces were made on flakes (fig. 7-17d), as were some preforms (fig. 7-9), others may have been made directly from the bifacial reduction of plaquettes. In spite of this, all are about the same size, all are formed by plano-convex flaking, and all have their maximum width near the base (fig. 7-17c-f). Distal tips tend to be very sharp (fig. 7-17a, c-f), while proximal ends have either a "v" shape (fig. 7-17c-d, f) or are only slightly convex (fig. 7-17b, e). One example (fig. 7-17e) shows clear resharpening along the upper right lateral edge, to the point where that section is concave and very steeply retouched. It is obvious that these foliates saw considerable resharpening: there are a number of small distal tips, two broken, two removed by lateral blows during resharpening, and a larger example clearly broken during use (fig. 7-17a). There are also a few small proximal fragments (fig. 7-17b) and a number of pieces which seem to have come off bifacial objects but are too small or amorphous to be securely typed. These have been left out of the restricted typology and are listed below it (Table 7-9).

Level 2

Since only 22 true tools were recovered, their proportional occurrence means little. In the variety of types present, this assemblage is no different from that of Level 1. There is one typical sub-crescent scraper, as well as sub- and semi-trapezoidal scrapers. There are somewhat more convex retouched edges than straight ones, while none is concave. As in Level 1, retouch is generally light scalar (fig. 7-14j), but more heavily retouched tools do exist (fig. 7-15h). There is no inverse retouch, although two pieces have some limited bifacial retouch along one edge. The distal bifacial foliate fragment has a sharp point and is made by plano-convex technique.

Perhaps the greatest difference between the assemblages of Levels 1 and 2 is the paucity of simple retouched pieces in Level 2. Given the seemingly ephemeral nature of the Level 2 occupation, the rarity of such *ad hoc* tools seems appropriate.

Level 3

As in Level 1, scrapers dominate the assemblage. Unlike Level 1, however, there are significant numbers of denticulates and notches, and points are rare. The range of scraper types is wide and their orientation to blank axis is highly variable. Among those scrapers with a single working edge, there are many which are parallel, transverse, and oblique to the axis of blank removal. The more complex scrapers also show a lack of association between the axis of blank removal and the placement of the retouched edges.

The most common scraper forms are obversely retouched, simple convex (fig. 7-18e, h, k, o), concave (figs. 7-18j; 7-19g), and straight (figs. 7-18f; 7-19c). Occasionally, these have additional minor modifications, such as limited retouch on an opposing edge (fig. 7-18f, h), a retouched notch or two (fig. 7-18j), or both (fig. 7-18k). One convex scraper has a hint of bifacial retouch near the base, opposite the scraping edge (fig. 7-18o), but it is more likely that this resulted from minor battering than from any purposeful bifacial reduction strategy.

Obversely retouched transverse and transverse oblique scrapers also show considerable shape variation of the retouched edge: straight (fig. 7-18a, d), convex, concave (fig. 7-18c) and wavy (fig, 7-18b, i). The wavy examples are both dominated by convex sections and would be classifiable as transverse convex in Bordian terms.

Among the scrapers with a single retouched edge, there are a number formed by inverse retouch. There are straight (fig. 7-18l) and concave (fig. 7-18n) among the simple scrapers and straight oblique (fig. 7-19h) and concave (fig. 7-19f) among the oblique forms. The latter example also has a little inverse retouch at the distal end but not enough to make it into a complex scraper.

There is a variety of double scrapers, including double straight, bi-convex, straight combined with either convex (figs. 7-18g; 7-20b) or concave, and one convex/concave example (fig. 7-19d). In this group, all retouch is obverse.

Those complex scrapers, with two or more converging retouched edges, are dominated by semi-trapezoidal forms. One of these is among the largest and best made in the level (fig. 7-18m), another with two concave edges is among the most atypical imaginable (fig. 7-19m). There are also two with alternately retouched edges (fig. 7-19k). There is a sub-trapezoidal scraper fragment and one sub-triangular scraper which approaches a sub-triangular point but the point is too thick to classify it in that category (fig. 7-19l).

There are few points in Level 3. One semi-trapezoidal example has some irregular inverse retouch which appears to have been done at the same time as the more regular obverse retouch (fig. 7-20e). One of the semi-leaf examples has a relatively blunt tip but it is quite flat and, so, marginally fits into the points (fig. 7-20f). The few remaining points are quite typical within their types.

There are significant numbers of denticulated and notched pieces in Level 3. These are not the result of trampling but are purposefully made. All notches are either heavy single blow with additional retouch in the concavity (fig. 7-20d), are single blow notches on thick flakes

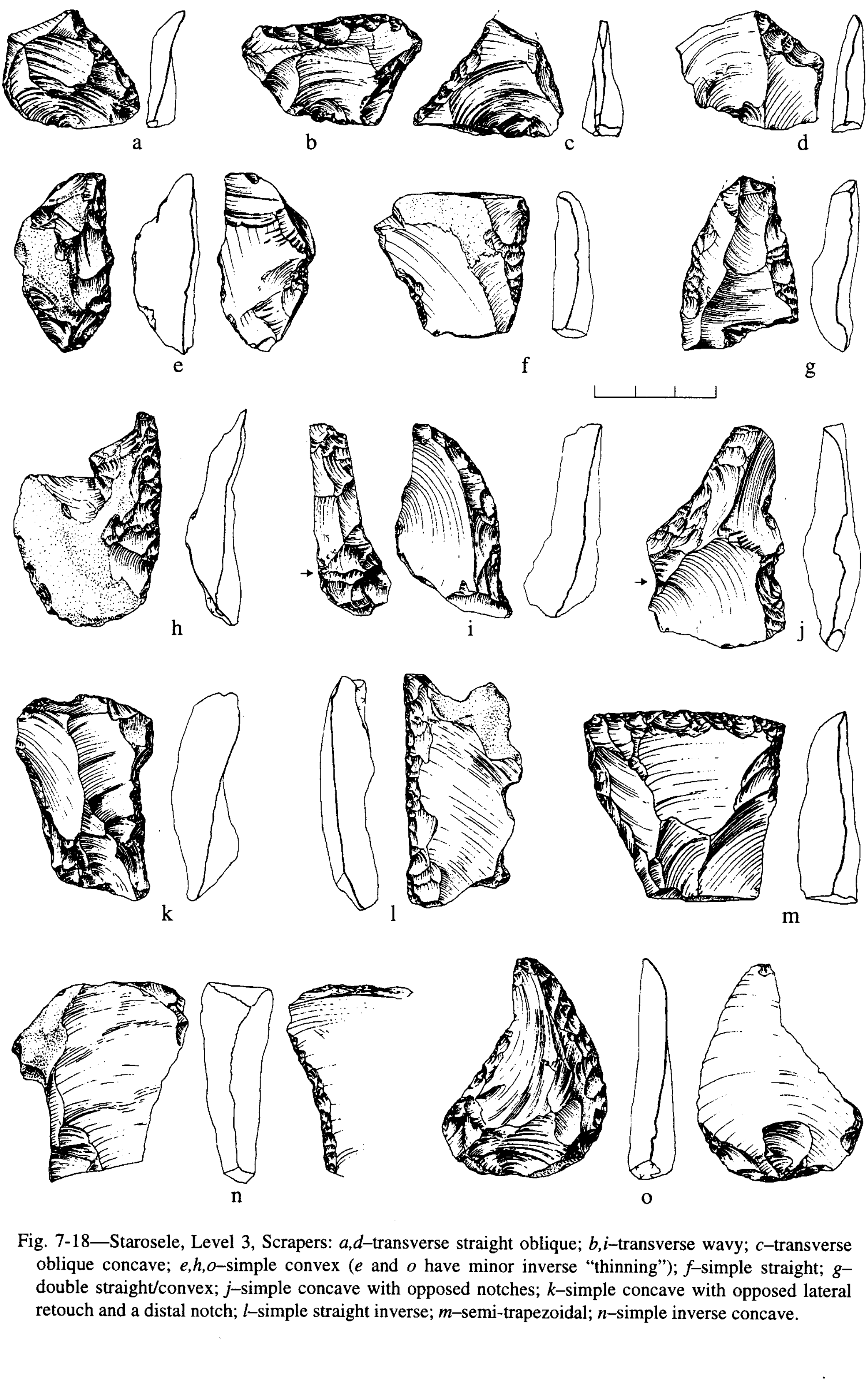


Fig. 7-18—Starosele, Level 3, Scrapers: *a,d*–transverse straight oblique; *b,i*–transverse wavy; *c*–transverse oblique concave; *e,h,o*–simple convex (*e* and *o* have minor inverse "thinning"); *f*–simple straight; *g*–double straight/convex; *j*–simple concave with opposed notches; *k*–simple concave with opposed lateral retouch and a distal notch; *l*–simple straight inverse; *m*–semi-trapezoidal; *n*–simple inverse concave.

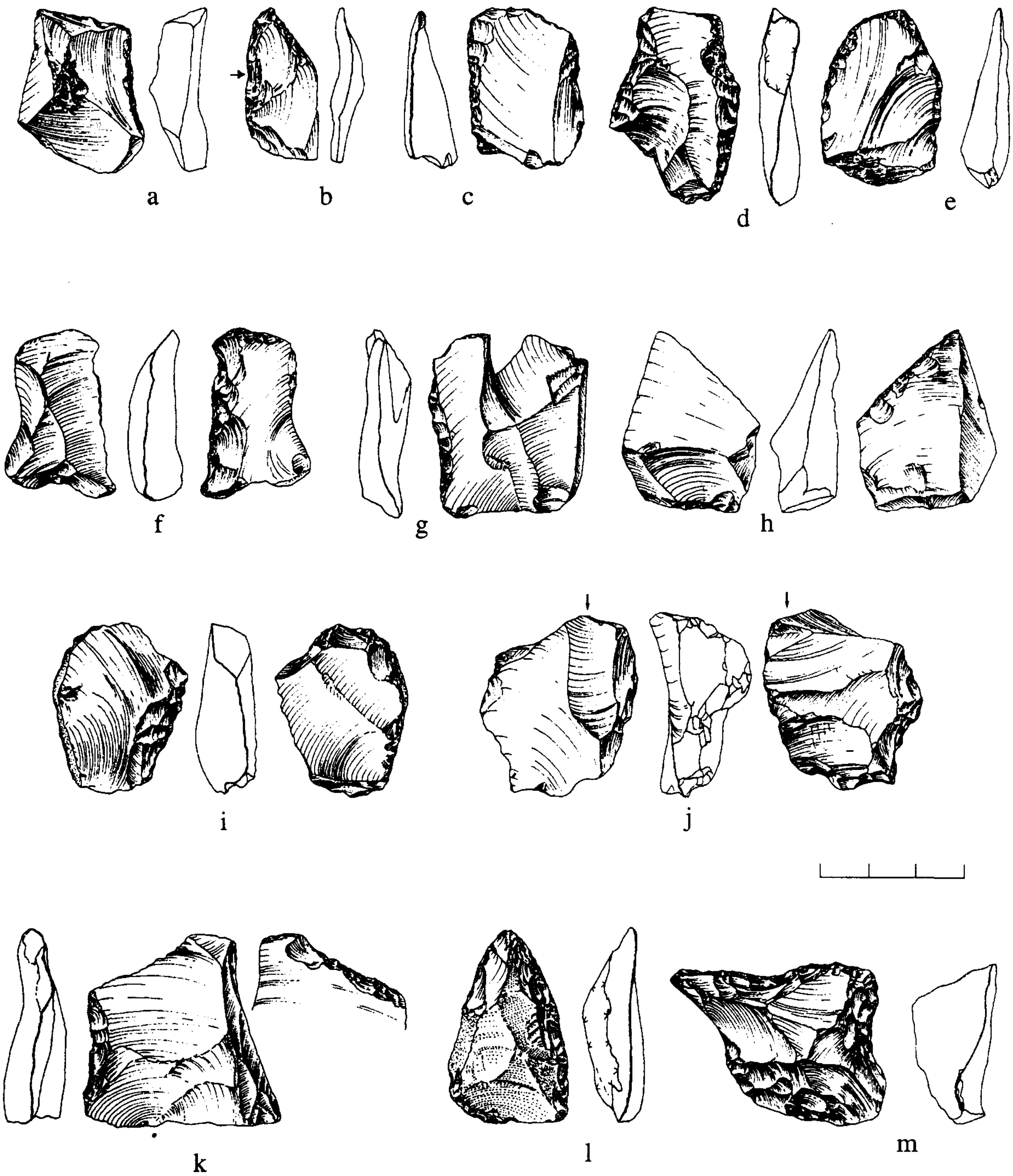


Fig. 7-19—Starosele, Level 3, Tools: *a-b,e*–various retouched pieces; *c*–simple straight scraper; *d*–double convex/concave scraper; *f*–transverse concave oblique inverse scraper; *g*–simple concave scraper; *h*–transverse straight oblique inverse scraper; *i*–lateral endscraper with adjacent straight inverse scraper; *j*–burin and perforator on thick flake; *k*–alternately retouched semi-trapezoidal scraper; *l*–semi-triangular scraper, approaching a point; *m*–highly atypical semi-trapezoidal scraper with two concave edges.

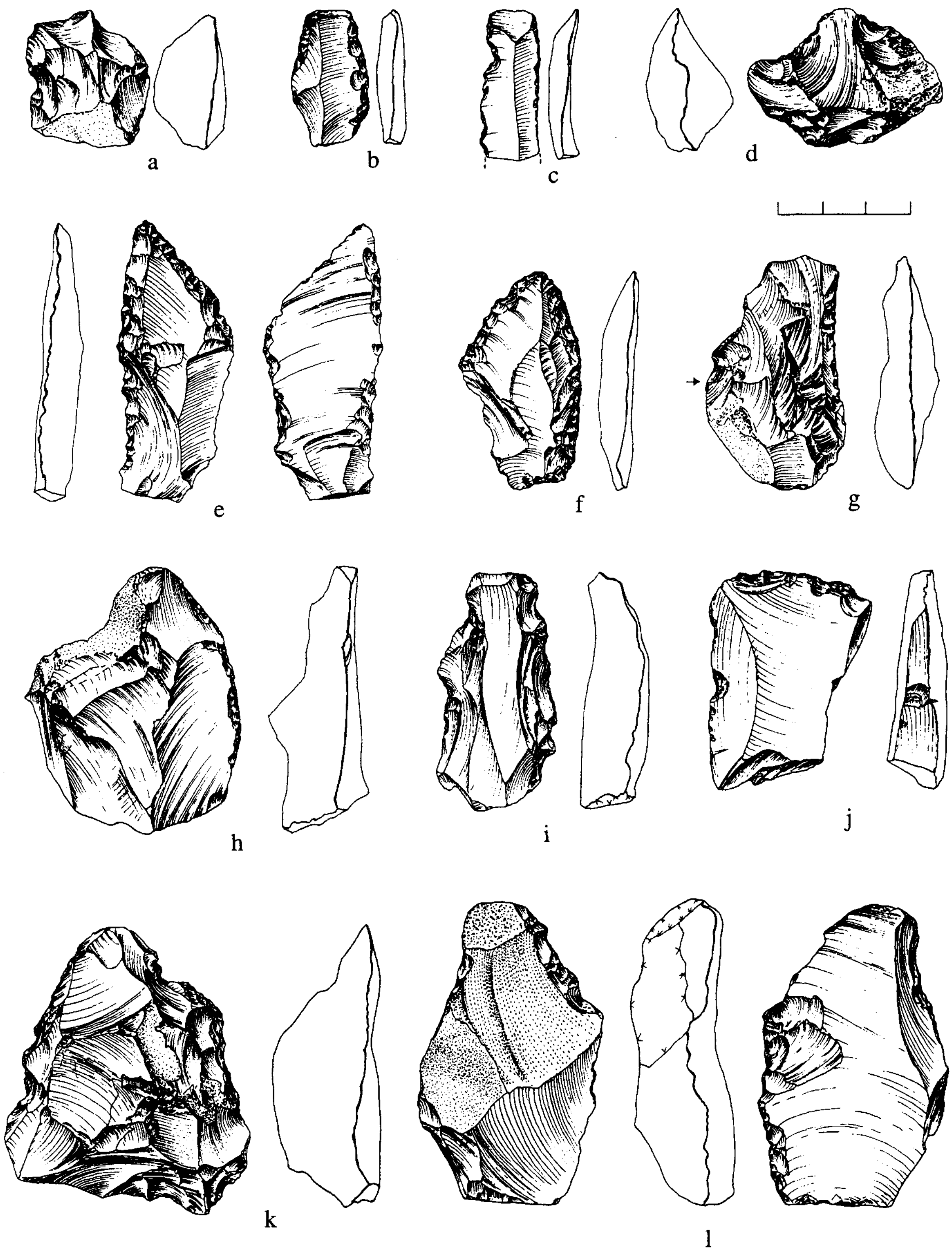


Fig. 7-20—Starosele, Level 3, Tools: *a,d*–notched pieces; *b*–very small double straight/convex scraper; *c*–discontinuously retouched blade fragment; *e*–semi trapezoidal point with irregular inverse retouch; *f*–semi-leaf point with rather blunt end; *g*–transverse flake with light continuous retouch; *h*–simple retouched flake; *i*–bilateral denticulate; *j*–end denticulate; *k*–denticulate with 3 retouched sides; *l*–denticulate with both inverse and obverse adjoining retouched edges.

such that their removal would not likely have been accidental (fig. 7-20a), or they are clearly made by retouch. The denticulates include one small and one large (fig. 7-20k) example where 3 edges are obversely denticulated, 3 where 2 parallel edges are denticulated (fig. 7-20i), one with a distal denticulation (fig. 7-20j), 3 with two adjoining denticulated edges (two semi-rectangular and one small fragment), 9 with simple lateral denticulation (3 inversely retouched), one with lateral denticulation mainly inverse but partly obverse, as well (fig. 7-20l), and one transverse denticulation. The transverse example and one of the inversely retouched lateral pieces could be classified as *racloirs denticulés*. In addition, there are two core fragments, each with an edge finely denticulated.

The continuously retouched pieces tend to be made on rather small and thin blanks. Retouch ranges from a few with light marginal retouch to others with flattish scalar retouch. These pieces parallel scraper forms but the retouch is too light to justify their inclusion into the scraper class (figs. 7-19a-b, e; 7-20g, h). In addition, there are a number of discontinuously retouched pieces not included in the restricted typology (fig. 7-20c).

There are a small number of tools which are atypical of the Middle Paleolithic but typical of the Upper Paleolithic. Two of these have been typed as varia. One approaches an endscraper on the lateral edge of a transverse flake but also has strong, semi-steep inverse retouch across the distal end (fig. 7-19i). The second piece is a thick flake, almost a core section, which has a clear burin facet on one side and a short but very pointed perforator formed by strong, steep retouch on the other (fig. 7-19j). There is another clear perforator made by inverse retouch on the distal end of a small flake and two possible endscrapers on heavily retouched blades. The lateral retouch on both is much stronger than that which defines the working edges of the endscrapers and without the latter, they would have been classified as slightly convex scrapers. Still, the distal ends are well formed—one evenly arched and the other somewhat ogival. It is possible that these are not endscrapers at all: the worked distal ends merely might be modifications to facilitate hafting.

Level 4

Although very few tools were recovered from Level 4 and just below it, some of them stand out from those of the other levels by their size. They are truly large. In addition, a number are of the shape and style traditionally thought of as typically "Staroselian" (Gladilin 1976). Of the 13 tools, there is a single sub-trapezoidal point (fig. 7-21a), 3 sub-trapezoidal scrapers (fig. 7-21e-g), one very large bi-convex scraper (fig. 7-21i), 3 double straight/convex scrapers (fig. 7-21b, d, h), one simple straight scraper, one simple convex scraper with a very rough, crushed denticulation on the opposite edge (fig. 7-21c), and 3 flake fragments with continuous obverse retouch. In fact, all retouch is obverse and, aside from the crushed platform on one double scraper (fig. 7-21b), there is no ventral modification on any tool. Retouch varies from quite flat and invasive (fig. 7-21h) through semi-stepped (fig. 7-21i) to almost steep (fig. 7-21g).

The large bi-convex scraper (fig. 7-21i) stands out from the rest of the Level 4 assemblage, indeed, from all of the assemblages. Its upper surface, which is arched in cross-section, has been entirely shaped by the removal of small flakes, 2-3 cm in length, using the lateral edges of the piece as platforms. This was followed by limited and discontinuous stepped retouch of the lateral edges. In fact, the piece resembles a plano-convex bifacial piece, except that there is no ventral modification whatsoever; even the bulb of percussion of the blank is still present. This piece, along with a few blanks in Level 4 resembling bifacial shaping/thinning flakes (e.g., fig. 7-21e), indicate that the presence of a bifacial reduction technology in Level 4 should not be overruled, although the small sample size from this level precludes any interpretation of its importance to the Level 4 inhabitants.

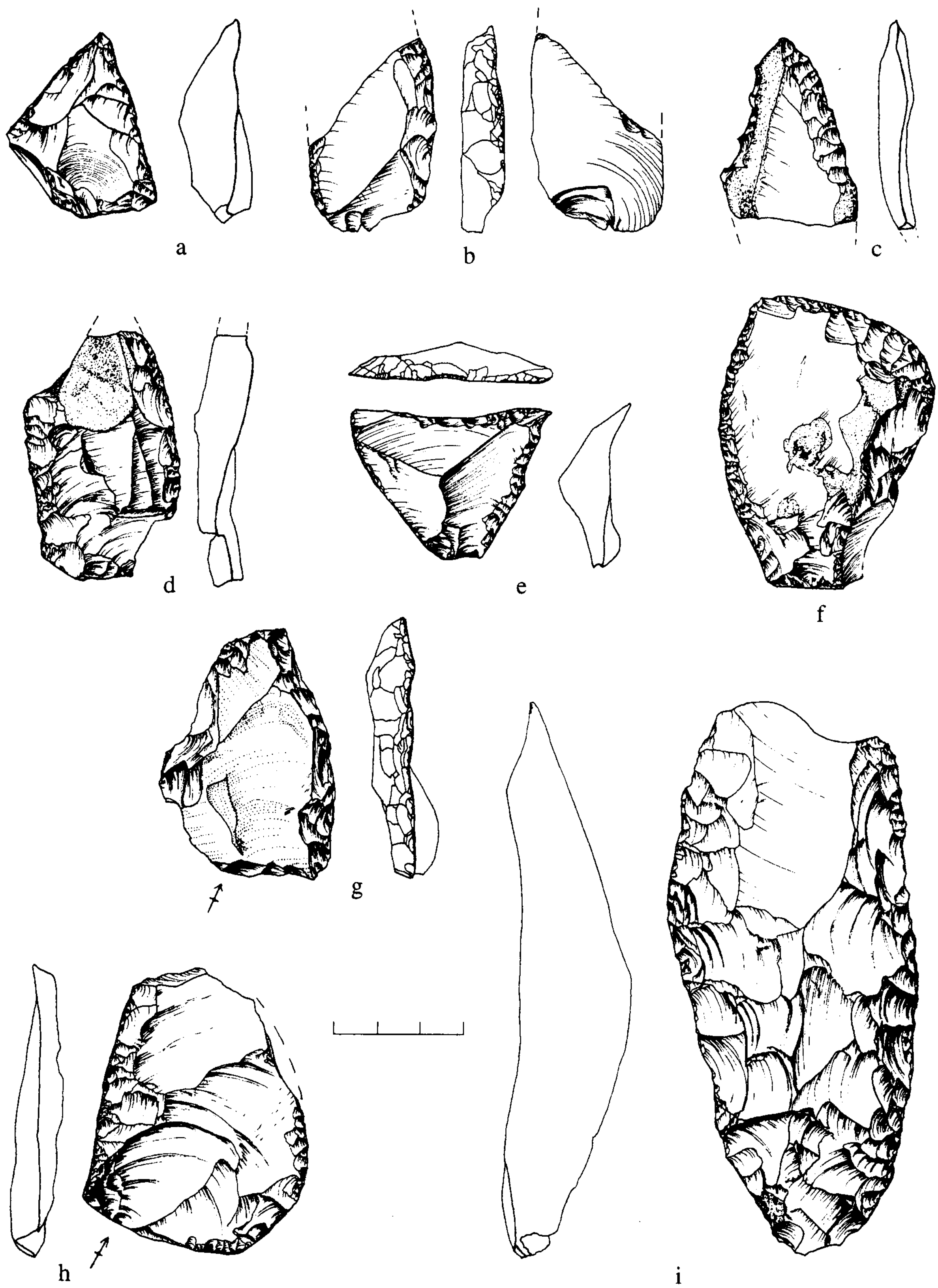


Fig. 7-21—Starosele, Level 4, Tools: *a*–sub-trapezoidal point; *b,d,h*–double straight/convex scrapers; *c*–simple convex scraper with opposed crushed edge; *e-g*–sub-trapezoidal scrapers; *i*–double bi-convex scraper.

INTER-ASSEMBLAGE COMPARISONS

Although the focus of the preceding sections has been comparative, it is useful to summarize the similarities and difference among the four assemblages at Starosele and to see to what extent these assemblages might have derived from the same occupational patterns and, also, whether they are part of the same homogeneous industry, as claimed by Formozov (1958).

Deposition and Activity Patterning

Because only a relatively small area of each archeological level was exposed by our excavations, interpretations of occupation and discard patterning must be tentative. It must also be noted that the interpretations here are based on the lithic artifacts and their distributions. Additional data from use wear and residue studies, as well as from the abundant faunal material from all occupation levels, will add considerably to final interpretations of activity patterning at the site.

Level 1

As described in Chapter 5, the assemblage appears to be a composite of several ephemeral occupations which, together, were as much as 30 cm thick. The stratigraphic distributions of both the artifacts and the bone, however, indicate that these occupations were quite close in time and, perhaps, are only a palimpsest because of fairly slow local aggradation.

It can be inferred from the nature of the assemblage that only a limited number of activities were important during those short site visits (Marks et al. in press). Striking is the absence of primary raw material reduction: unifacial and bifacial tools, as well as bifacial preforms, were mainly imported into the site. In terms of a *chaîne opératoire*, the early stages are missing (fig. 7-22). Those few cores present point to *ad hoc* reduction of usually small pieces of local, poor raw material. From the assemblage, it is abundantly obvious that bifacial tools were made from existing bifacial preforms and that the many by-products of these activities were used as blanks for the production of a number of unifacial tools.

It is also well documented that the bifacial tools themselves were extensively rejuvenated and, given that most of the bifacial foliates were recovered intact, they were discarded not because of breakage, but because of edge angles, shape, or some such attribute which made them unsuitable for further rejuvenation and use. This suggests that activities were mainly focused on the use of the bifacial tools, but that by themselves, they were not sufficient in number and in morphological variety to fulfill all immediate needs.

Since there is little evidence for primary flaking, or even the importation of unmodified plaquettes which would have supplied the blanks needed for bifacial or large flake tool production, it is unlikely that much emphasis was placed on replacing exhausted or broken tools. Rather, bifacial tools were used until no longer serviceable and were then discarded. Just what the activities were which called for tool use can be inferred from the kinds of tools found. The bifacial foliates may well have been used on the ends of thrusting spears (they are too large and heavy to be effective for throwing spears) but, given that their rejuvenation was mainly limited to the distal half of each foliate, it is reasonable to suggest that they were used as hafted knives and were rejuvenated while still hafted. (This interpretation can be derived solely from the morphology of the lithic artifacts themselves, but use wear and residue studies do confirm this conclusion.)

The unifacial tools made on the by-products of bifacial tool production are dominated by lightly retouched pieces and scrapers which have low edge angles and light but invasive retouch. Very few show evidence for resharpening: thus, both the retouched pieces and most of the scrapers may be interpreted as expedient tools used briefly and then discarded. A few

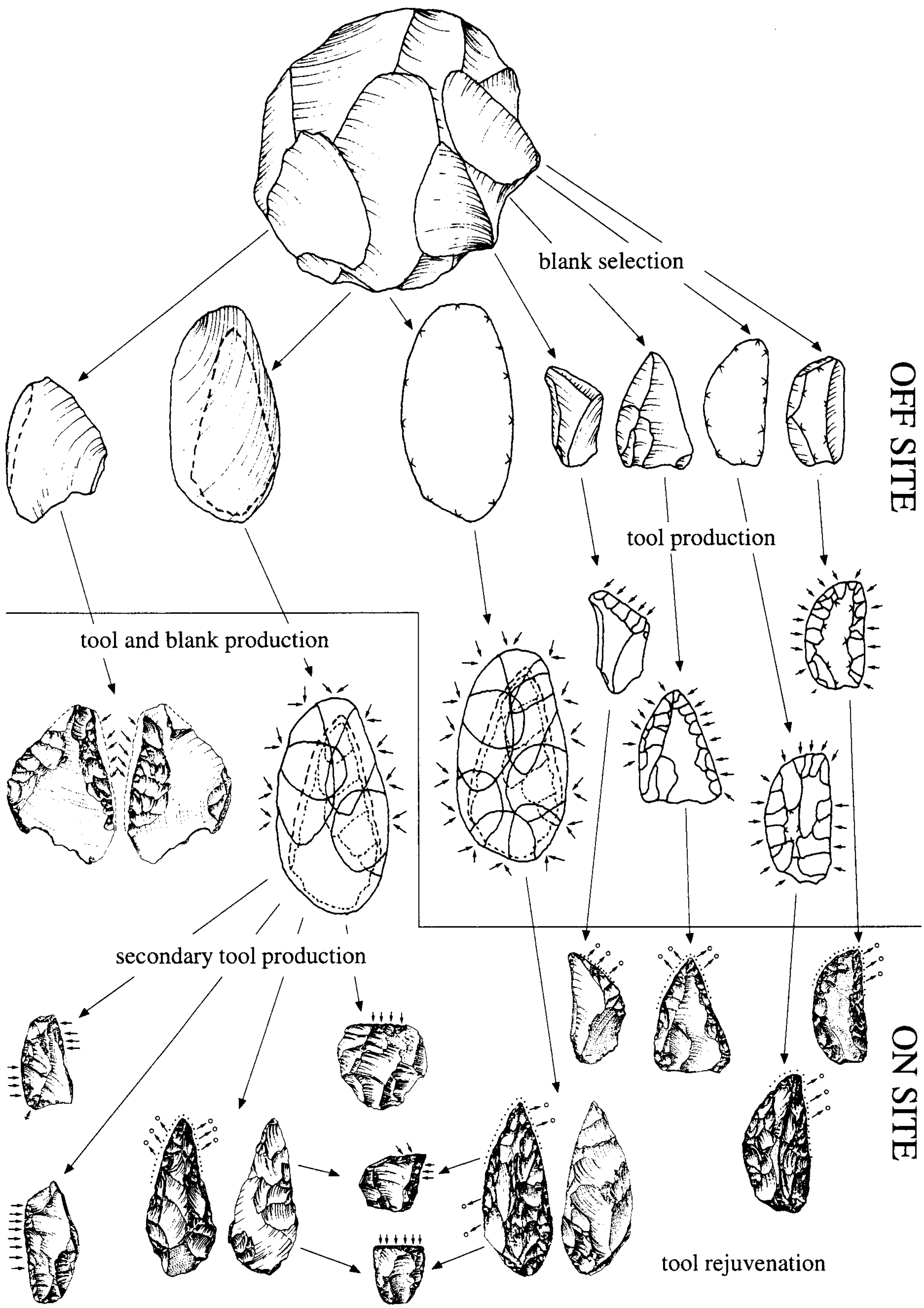


Fig. 7-22—Starosele, Schematic sequence of raw material reduction, showing off-site and on-site work.

of the large unifacial tools (those seemingly imported into the site already complete) do indicate rejuvenation comparable to that seen on the bifacial foliates. These pieces, particularly the sub-crescent scrapers, may also have been hafted and served the same function as the foliates; that is, they may have been used as knives, rather than as scrapers. In fact, although a high percentage of the tool kit is typologically classifiable as scrapers, the rarity of heavily retouched/resharpened examples suggests that scraping, *per se*, was not an important activity.

In sum, the Level 1 assemblage represents a number of ephemeral site visits during which imported tools were used to exhaustion, while a number of expedient tools were produced, used, and discarded. The activities seem to have related more to cutting and, given the number of unifacial points, to killing, as well. It looks as if Starosele was used mainly as a place of hunting and butchering, with little primary production of traditionally curated tools and limited processing of hides, wood, or bone which would have called for much stone tool rejuvenation and would have resulted in high edge angles and serious edge damage on discarded scrapers/denticulates/notches.

The presence of the single fireplace but a good deal of bone charcoal does indicate that, at least, one occupation was sufficiently long to justify a fire. The clear artifact density patterning, both vertical and horizontal, as well as the range and condition of the lithic artifacts, however, preclude interpreting Starosele during the Level 1 period as a home base or base camp of any sort. Using completely different evidence, the same conclusion is reasonable and applies equally to all the levels. Even today, under Interglacial conditions, the site is cold and very windy, and during the summer, the sun does not reach the surface of the site until afternoon. Under glacial conditions, the east side of the canyon must have been far from optimal for prolonged stays.

Level 2

The paucity of artifacts and their spread across a single surface documents very ephemeral and limited human activities, within the area exposed. If typical of the whole original surface, this level is probably comparable to one of the palimpsest components of Level 1 and the range of activities was either the same or even more limited than seen in Level 1. Therefore, there is reason to believe that the interpretations of Level 1 apply to this level, as well.

Level 3

The minimal vertical spread of the Level 3 artifacts and bone indicates that discard took place either entirely during a single occupation or during a number of closely spaced occupations on a stable surface. The horizontal artifact distribution, with its separate concentrations, might lend credence to an interpretation of multiple occupations. The very small size of these clusters and the linkage between two clusters seen through conjoining, however, would argue for a single occupation in the area exposed by our excavations. The highly ephemeral fireplace does not argue for its repeated use and it is possible—even if only a single occupation is represented—that it was not of long duration.

The relatively high proportional occurrence of cores/chunks in the assemblage points to on-site primary reduction of raw materials. The rarity of true primary elements, however, shows that nodules of raw material were not cleaned of their cortex on-site in any consistent manner and raw material might have been partly decorticated off-site. It is obvious that some nodules/cores were brought in and reduced on-site to produce blanks for tool production. In this sense, almost all of the *chaîne opératoire* is present on-site, except for raw material acquisition which, for the most part, took place off-site. Some immediately available raw material was collected and, compared with other levels, proportionately twice as much of it was used in tool production as was the case for the next highest usage seen, in Level 1.

Tool production, relative to the numbers of blanks produced, is comparable to that in Levels 1 and 2: somewhat over 40% of the potential blanks were retouched into tools. The pattern of tool production is indicative of a somewhat different range of activities than those inferred for Levels 1 or 2, in that some tools classes, such as denticulates and notches, are well represented, while points are not. As in all the other levels, however, scrapers are the dominant class of tools. Although few show clear evidence for resharpening, a number have additional typological elements, such as supplementary retouch or notches, so that some seem to have seen a number of different usages during their brief lives.

Thus, based on the overall assemblage composition, the variety and proportional occurrences of different tool classes, and the high number of simple retouched pieces, it can be suggested that activities during the occupation of Level 3 involved a wider range than seen in Level 1.

Level 4

The few artifacts found on the surface of Level 4 and those spread below it, preclude much significant information on artifact deposition and activity patterning. A few observations are possible, however. The sediments below and above Level 4 were deposited on-site by strong fluvial processes, yet the artifacts are not rolled or even slightly water polished. Therefore, it is reasonable to infer that they were dropped in place when the surface was exposed and dry. It is also clear that they were sufficiently covered by low energy deposited sediments that later floods did not wash them away or polish them.

With such a small sample, activity patterning cannot be addressed in any depth. The very high percentage of tools in the recovered assemblage, the almost total absence of debitage, and the presence of chips cannot be explained as resulting of natural causes: rather, these artifacts appear to have been discarded through cultural agencies. It is impossible, with the data collected by us from Level 4, to know whether the artifacts represent an example of an extremely ephemeral occupation or whether they represent an extreme periphery of a larger and denser artifact concentration. The tools which were recovered, however, are mainly scrapers which are generally more heavy retouched and are considerably larger than those found in the other levels. One clue exists. Formozov (1958) described his material from "below the roof fall" as including quite large artifacts, including big sub-trapezoidal scrapers of the type found by us in Level 4. Therefore, it is probable that the recent excavations, in fact, represent the very margin of an artifact concentration almost totally excavated by Formozov.

Technology

Levels 1, 2, and 4 are similar in having various levels of evidence for bifacial reduction. The evidence is strongest in Level 1 which has the whole range of plano-convex bifacial reduction; from preforms through bifacial rejuvenation chips. In Level 2, the evidence is somewhat weaker, owing to small sample size, but the presence of a plano-convex bifacial distal foliate fragment, bifacial thinning flakes and chips all confirm the presence of this technique. The evidence from Level 4 is much weaker. There are a few biface reduction chips and one flake which appears to be a by-product of bifacial shaping. While these items may indicate bifacial reduction, it is impossible to judge whether it was the same technique seen in Level 1 or not.

There is no indication of any bifacial technology in Level 3. There are no bifacial preforms, no bifacial tools, no bifacial thinning or shaping flakes, and no chips derived from bifacial tool rejuvenation. This is a very significant difference between Level 3 and the other levels.

Another significant technological difference between Level 3 and the other levels is the presence of uni-directional and bi-directional core reduction in Level 3, but not in the other levels. Although the cores in Level 3 are crude, in concept they appear quite clear. These reduction pattern differences are reflected in blank attributes, as well. Compared to all other levels, Level 3 shows the least attention to platform preparation, with more than twice the percentage of cortex platforms. Lipping is also rare in Level 3 and, combined with the platform types, indicates that a hard hammer mode of detachment was prevalent in Level 3, while the use of a soft hammer mode was the norm in Levels 1 and 2 and, probably, was common in Level 4, as well.

The use of hard hammer detachment in Level 3 is confirmed by the comparatively high percentages of convex and flat blank profiles, and by the high percentages of hinged and blunt distal ends, as compared with all other levels. Also, unlike Level 1, no bone retouchers were found.

In short, it appears that Level 3 is technologically distinct in its core reduction strategies, its absence of bifacial reduction, and in its mode of blank removal. While there is certainly some variability among Levels 1, 2, and 4, they are more technologically alike than any one is like Level 3.

In spite of the differences in the way blanks were produced, all assemblages exhibit fairly similar configurations in major artifact classes. Flakes are always dominant, blade production appears to be fortuitous, if present at all, and initial on-site raw material reduction is generally limited, resulting in low percentages of primary elements. The differences in the way blanks were produced, however, did result in differences within artifact classes. The bifacial reduction in Levels 1 and 2 resulted in flakes and blades which are smaller, thinner, have smaller platforms and more incurvature than is typical for the blanks in Level 3. While bifacial reduction appears to have been present in Level 4, the blanks differ markedly from those in Levels 1 and 2 in size: they are much larger in all dimensions in Level 4.

Typology

The four assemblages at Starosele share a number of typological features in common. Perhaps most noticeably, all tool assemblages are dominated by scrapers, as are virtually all Middle Paleolithic tool assemblages in Crimea, for that matter (Kolosov, Stepanchuk, and Chabai 1993; Chabai, Marks, and Yevtushenko 1995). Aside from the single bifacial scraper in Level 1, all levels have essentially the same range in scraper types, within the limits imposed by some small sample sizes.

The same range does not mean that the internal patterning of the scrapers is the same in all levels. If each individual retouched edge is classified by shape—straight, convex, and concave—Levels 1 and 2 are very similar to each other and they are quite different from Levels 3 and 4 (fig. 7-23A). The major difference between Level 3 and the other levels is the high percentage of concave edges in Level 3: almost 25% of all edges.

If the scrapers are grouped by the number of retouched edges per piece, again, Levels 1 and 2 are very much alike, while the other two levels are quite distinct (fig. 7-23B). In this case, although the sample size is very small, Level 4 has a much higher percentage of pieces with 3 retouched edges (33.3%) than do the other levels, which range from 3.6% to 7.1%. Level 3 stands out by a proportionately high percentage of simple scrapers (66.1%) compared with double scrapers (30.4%), while in Levels 1 and 2 there is a balance between simple (48.6%) and double scrapers (47.2%) (fig. 7-23B). While obverse scraper retouch is similar in all assemblages—there is very little heavy, demi-Quina retouch or very flat, very invasive sub-parallel retouch—Level 3 has significantly more inverse retouch than do the others levels. In Level 3, 14.3% of the scrapers have at least one edge inversely retouched, compared with only

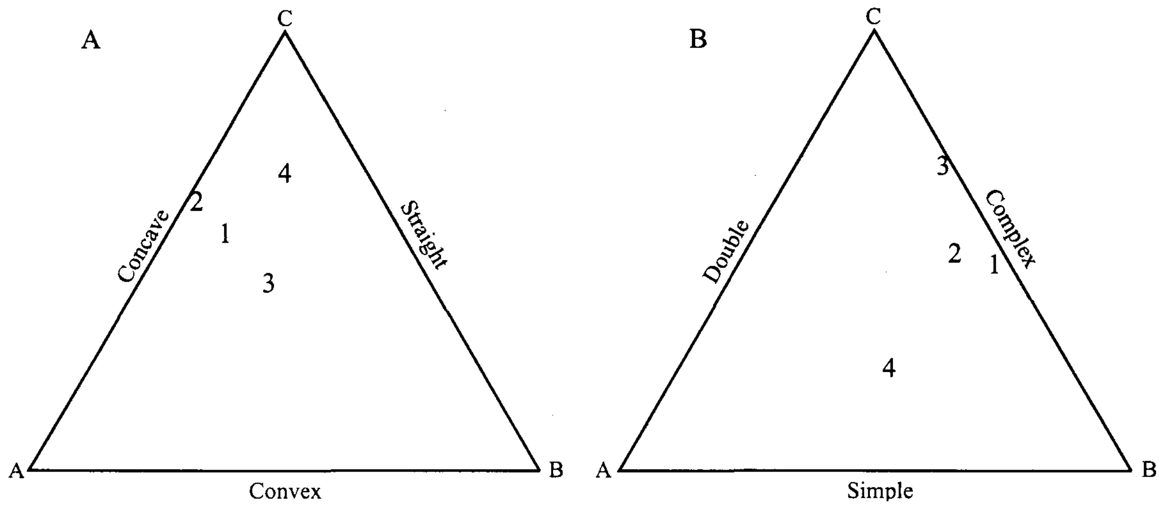


Fig. 7-23—Starosele, *A*–tripole graph of the relationship among shapes of scraper edges (*a*–straight; *b*–concave; *c*–convex) by numbered level; *B*–tripole graph of the relationship among types of scrapers (*a*–complex scrapers; *b*–double scrapers; *c*–simple scrapers) by numbered levels. Note how Levels 3 and 4 stand apart from Levels 1 and 2, as well as from each other.

2.8% in Level 1, while Levels 2 and 4 have none at all. (This tendency is even more strongly expressed in the retouched pieces with 27.0% in Level 3 having inverse retouch, compared with only 3.1% in Level 1.) It is possible to see a unity in Levels 1 and 2, but scraper variability in Levels 3 and 4 separate them from the top two levels, as well as from each other.

Within the tool assemblages, the internal proportional relationships between scrapers and denticulate/notches shows some significant differences. Again, Levels 1 and 2 are similar with scraper to denticulate/notch ratios of 4.2:1 and 3.5:1, respectively, while in Level 3 this ratio drops to only 1.5:1. There are no denticulates or notches in the Level 4 tool assemblage. Other differences are apparent, as well. Level 1 has significantly more unifacial points than any of the other levels, although the small sample sizes for Levels 2 and 4 make this observation tentative. On the other hand, both Levels 1 and 3 have good samples and the difference is marked: 13.1% for Level 1 and only 3.6% for Level 3.

Of course, the presence of bifacial technology in Levels 1 and 2 had an effect on the tool assemblages, particularly for Level 1, where 8.1% of all tools are bifacial. While Level 2 has only 4.8%, the small sample size must be considered. Level 4 has no bifacial tools, but the tool sample is minuscule and there is other evidence for bifacial reduction. It is Level 3 which stands out here with a total absence of bifacial materials.

One of the characteristics of the traditional definition of the Staroselian industry is the use of invasive inverse retouch to thin otherwise obversely retouched points and scrapers (Yevtushenko 1995). This does occur in the present samples but it is quite rare. It is seen mostly in Level 1, where 2 of the 21 points have inverse thinning (fig. 7-13g, j) and where possibly 2 of 72 scrapers have it, as well (fig. 7-16i). In addition, 3 scrapers and one retouched flake are on truncated-faceted pieces. In Level 2, one of the 14 scrapers is modified in this way, and in Level 3 only one of the points and one of the 56 scrapers have what might be considered purposeful inverse thinning (fig. 7-18e). A single scraper fragment and one denticulate are on a truncated-faceted pieces. Level 4 lacks any inverse retouch, at all. Thus, if the tendency for inverse thinning of unifacial retouched tools is a characteristic of the Staroselian, it is strangely lacking from the recent excavations at Starosele. It is possible, perhaps probable, that this tendency was best expressed in Formozov's sample from "under the roof fall," from which we recovered only 13 tools (our Level 4). Thus, our sample might not have been representative in this case. The samples from Levels 1 and 3 are sufficiently large, however, that if such thinning was habitually used by the people who visited Starosele then it should have been present in significantly greater numbers than is the case. It must be concluded, therefore, that this tendency seen by Yevtushenko (1995) would be applicable only to the assemblage of our Level 4.

CONCLUSIONS

The inter-assemblage comparisons make it abundantly clear that the four assemblages at Starosele are neither technologically nor typologically homogeneous. Levels 1 and 2 are essentially the same in all ways and, thus, belong to the same industry. Levels 3 and 4 are another matter. Level 4 certainly has many of the traits seen in Levels 1 and 2 and, in that sense, seems to be related to them. Yet, a number of differences are apparent, as well. Because of the extremely small sample size from Level 4, it is simply impossible to judge whether it is merely a somewhat different facies of the same industry as Levels 1 and 2, or not. If one expanded the existing Level 4 sample, it still would not look exactly like Levels 1 and 2. Certainly, bifacial tools would probably be present and the range of scrapers and points increased. Tool size, however, is so much larger in Level 4 that it cannot be merely a sampling bias. If the hypothesis that our Level 4 is the same as most of the artifacts placed by Formozov into his "below the roof fall," then comparisons can be made using reasonable samples, with the caveat that Formozov's sample includes an unknown amount of material from our Level 3. Until this comparison is made, Level 4 should be considered generally similar to Levels 1 and 2, possibly representing an early phase of the Level 1/2 industry.

Level 3 is technologically unrelated to Levels 1, 2, and 4. It lacks bifacial reduction, its core reduction is based mainly on single and opposed platform flaking, there is very little platform preparation, etc. Even some retouching traits are different: there is a strong tendency for inverse retouch on scrapers, denticulates, and retouched pieces, which is undeveloped in the other levels.

At the broadest typological level, all assemblages are dominated by scrapers. As shown above, however, those from Level 3 are significantly different in their proportional distribution than those in the other levels. In addition, Level 3 has significantly more denticulates and notches than the other levels and significantly fewer points. While all the tool assemblages are clearly Middle Paleolithic in aspect, that from Level 3 is markedly different from those of the other levels.

In conclusion, based on both technology and typology, the assemblage from Level 3 is fully distinct and unrelated to the assemblages from Levels 1, 2, and 4. The four assemblages from Starosele represent, at least, two unrelated industries and, possibly, three. Based on the present situation, it appears that the assemblages from Levels 1 and 2 could fall broadly into what has been defined as Staroselian. Level 4, even with the very small sample, is consistent with the traditional Staroselian.

Level 3, however, is not Staroselian in any traditional or non-traditional sense. What industry it represents, as yet, is unknown. It does share an absence of bifacial technology with the WCM, as found at Kabazi II, Unit II, but the similarities end there. Thus, the Level 3 assemblage, at the moment, stands alone among the defined Middle Paleolithic assemblage variability in Crimea.

While the new excavations at Starosele have not fully resolved which assemblages should be designated as the Starosele industry, the site has produced stratigraphically and temporally distinct assemblages which now can be used in inter-site comparisons.