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THE KREMENICIAN, A MIDDLE TO UPPER PALAEOLITHIC TRANSITIONAL INDUSTRY IN THE WESTERN UKRAINE

(Preliminary results of typological and technological and technological reevaluation of the Kuly Chivka layer III industry)

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Abstract

This paper is devoted to the study of lithic typology and technology of the West Ukrainian Middle to Upper Palaeolithic Transitional site Kulychivka. The site was excavated by V.P. Savych between the years 1968-1987. Discussed in the paper is the lithic assemblage from the III-d cultural layer of the site, the lowermost one recovered during the 1979 field campaign. A limited series of artifacts discovered during subsequent years of investigation of the site is also involved for comparisons. Kulychivka typology comprises common Upper Palaeolithic types, where endscrapers, followed by retouched blades, burins, etc., are characteristic. Typical Levallois points add to originality of the assemblage. Kulychivka technology involves two modes of exploitation of raw materials, namely flat (Levallois) and volumetric (parallel or prismatic; knapping on narrow lateral face). Both modes are characterized by specific traits; though rare, there are examples of combination of the two. The oiginal appearance of the Kulychivka assemblage allows to define a distinct Kremenician industry. The closest analogy of Kremenician of Western Ukraine is represented by the Moravian Bohunician. Regional Middle Palaeolithic records show no clear and doubtless forerunners of Kremenician.

This paper discusses typological and technological aspects of the Kulychivka industry. It is mainly based on analysis of the assemblage of the III-d (lower) Upper Palaeolithic layer from the excavations by V.P. Savych in 1979 conducted on an area of ca. 108 square meters. Additional the materials coming from later V.P. Savych field campaigns were also analyzed, but are represented in the present paper more briefly. According to the excavator, the area excavated in 1979 yielded the hearth (250 x 160 x 6/14 centimeters) and two concentrations of finds, one of which - oval in shape; 4 x 2,5 m in area - yielded up to 78 % of flints (Savych, 1979). The lithic series of the III-d layer of Kulychivka from the Depositories of Ternopil Museum of Local Studies consists of 6408 pieces and were analyzed by the present authors. Additionally, the data on ca. 600 technologically meaningful artifacts from the Lviv Archaeological Museum were also studied for comparison.

KULYCHIVKA SITE: GENERAL INFORMATION

Localisation, history of investigation, taphonomic evaluation, dating, fauna, type of site

- Location of the site

The multilayered open air site Kulychivka (Kremenets) is located in the territory of south-western Volhynia, in the northern part of Kremenician upland, on the right of bank of the Ikva river (basin of Upper Dnieper), in boundaries of Kremenets city (fig. 1). The site is situated on one of steep promontories of the northern fringe of the so-called Kremenician Mts. and associated with Kulychivka Mount. River Ikva is ca. 1.5 km from the site. The site is associated with sediments covering terrace-like area about 40 m up the valley of River Ikva.

- The history of investigation

First worked flints were discovered in so-called "Kulychivka mountain" as early as the 1930s, but regular excavations of the site were started by V.P. Savych only 30 years later and were conducted by him systematically since 1969 up to the end the 1980s. (Savych 1975; 1975a; 1987). Excavations were mainly rescue in character for the necessity to investigate areas which were designed to be destroyed by a local quarry. Geologists and paleontologists sporadically took part in works at the site (Ivanova & Reingartern 1975; Bohucki *et al.* 1974).

- Brief taphonomic evaluation of entirety of cultural remains

At present, Kulychivka is known in the literature as the site with five layers, counting here three Upper Palaeolithic and two Palaeometal cultural layers (Savych 1987; Chernysh 1985). Nevertheless, the unanimous notion in respect of number and exact stratigraphical position of Upper Palaeolithic layers is still absent. During the last years of investigation of the site, V.P. Savych recognized one more - the fourth (lowermost) - Upper Palaeolithic

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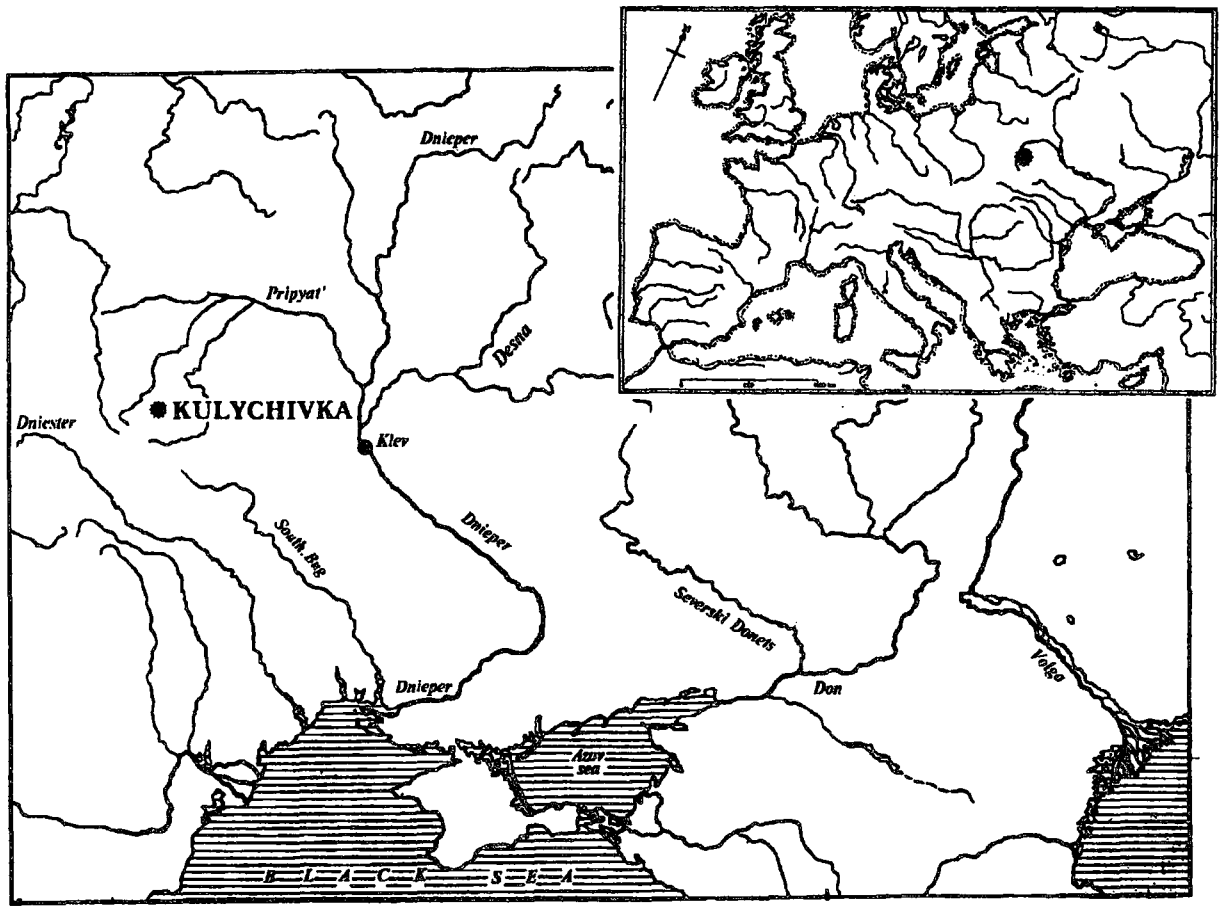


Figure 1 : Kulychivka. Map of localisation of the site.

layer. The uncertain situation with the number of cultural layers is connected with obviously insufficient comprehension of interrelation of artifacts, including lithological layers. This gap in our knowledge, we hope, will be filled by recently renewed works at the site (O.S. Sytnyk; O.B. Bohucki). There are serious arguments for the redeposited character of human activity remains. Processes of redeposition in general are connected with post-Paudorf solifluction, partly moved artifacts from the initial position. There are certain signs of mixed character of upper UP layers, i.e. II and I. The less disturbed geologically and most homogeneous archaeologically series of finds is connected with III layer, studied in 1979 (O. Sytnyk pers. com.). In sum, the disputable character of in situ character of upper UP layers of the site must be stressed. Layer III currently seems to be most homogeneous one and, therefore, valuable for technical and typological study.

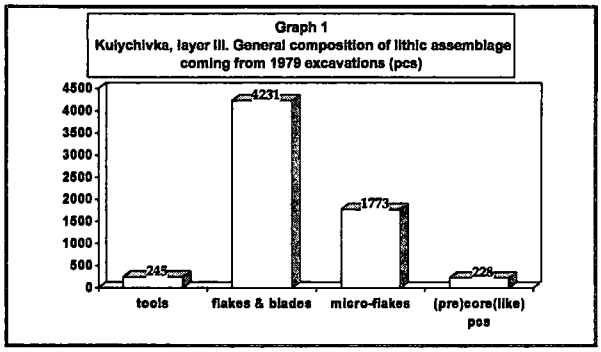
- Geological dating

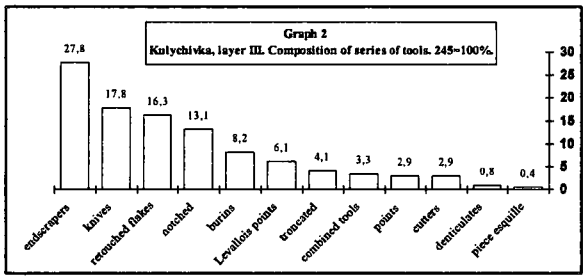
Although there are certain questions with respect to the cultural - chronological sequence of Kulychivka, the geological age of all Upper Palaeolithic remains unanimously is determined by the experts as Paudorf (Dubno episode accordingly to regional scheme).

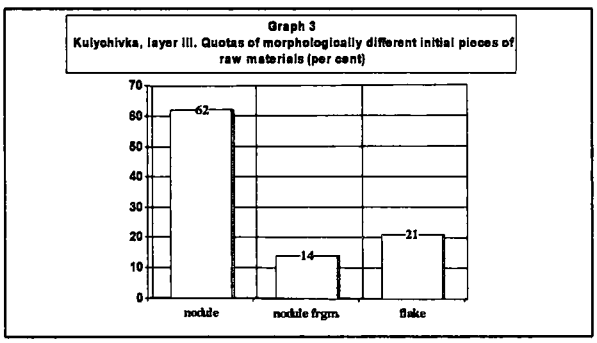
Published by the author of excavations, absolute 14C dates - 31 and 25 Kyr BP for layer III and II, accordingly (Savych 1987) - are not contradictory to this notion. To date, available data provide no solid arguments to the benefit of a reference of the third layer to the interstadial Hengelo, as proposed by J. Kozlowski (Kozlowski 1996). He wrote about an absolute date > 36 thousand years (Kozlowski 1996: 207 with reference to Demidenko & Usik 1993); meanwhile, the latter work provides no information about the absolute age of Kulychivka.

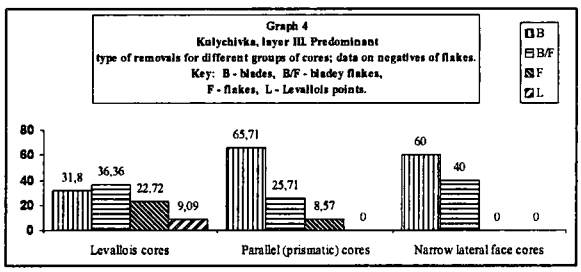
- Faunal series

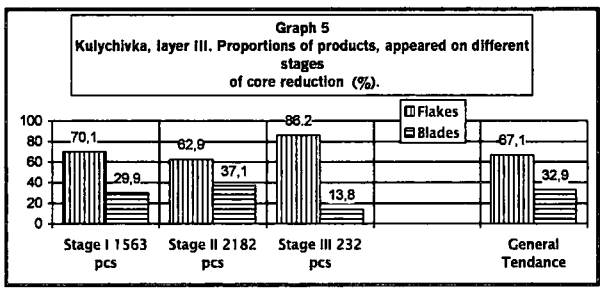
In general, faunal data do not contradict the supposed geological and available absolute dates. According to V.P. Savych (Savych 1975) the Upper Palaeolithic layers provide remains of *Mammuthus* pr. Blum, *Rangifer tarandus* L., *Cervus elaphus* L., *Capreolus* sp., *Bison priscus* Boj, *Equus Pidop.*, *Canis lupus* L., *Crocuta* sp., *Felis spelaea* L., *Lepus* sp., *Ursus* sp. Nevertheless, to learn exactly which species and in what proportions were represented in materials of 1979 excavations is not possible. From the field reports of the author of excavation follows, that the third layer has yielded, mainly, the remains of reindeer, mammoth, and horse.

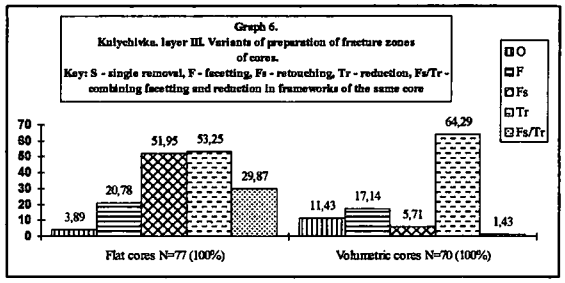


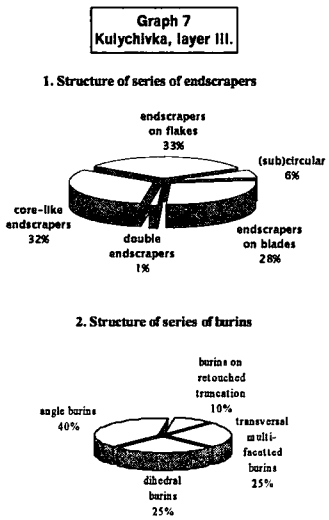


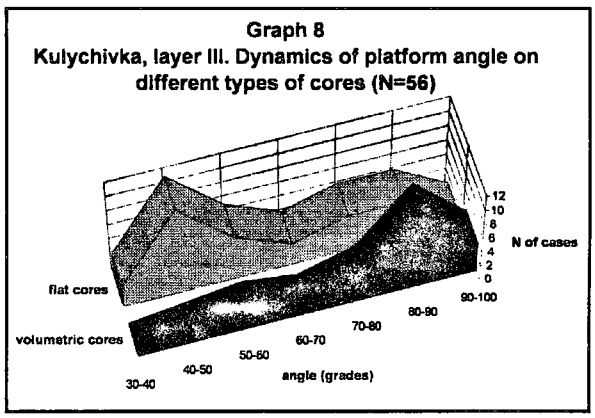












- Functional type of the site

Most preferably Kulychivka might be regarded as a seasonal site repeatedly visited during a long span of time.

A large number of unused flakes, numerous cores, rare wastes of retouching and resharpening of tools characterize the industry of the III-d layer of Kulychivka. All these parameters are characteristic rather for workshops, than for sites, but taking into account the proximity and abundance of raw materials, these traits are quite explainable.

LAYER III: LITHIC SERIES

Structure, characteristic of raw materials, morphology of knapped products, technique and mode of knapping, supporting tools, parameters of "ideal" blank

- The general structure of the lithic assemblage

The assemblage of the III-d layer of Kulychivka, conserved in the Ternopil Museum of Local Studies, consists of 6408 pieces. There are 156 tools, 46 burin spalls, 2860 flakes, 1325 blades (that is 20.1 % of the total number of flints), 1773 chips or micro-flakes, 52 fragments of flint

TABLE 1. Kulychivka, layer III. Varieties of cores

	1 platform	2 platforms	3 platforms	> 3 platforms	Total
Flat cores N= 50					
Levallois for blades	14	34	-	-	48
Atypical Levallois preferentiel	-	-	-	1	1
Discoidal		-	-	1	1
Volumetric cores N= 58					
	1 platform	2 platforms	3 platforms	> 3 platforms	Total
Prismatic (parallel)	28	17	1	-	46
Narrow lateral face cores	9	3	-	-	12
Total N=108 (flat 46.3%; volumetric 53.7%)					
	1 platform	2 platforms	3 platforms	> 3 platforms	Total
	47.3 %	50.0 %	0.9 %	1.8 %	100 %

TABLE 2. Kulychivka, layer III. The types of initial raw materials used for knapping (pcs)

Type of raw material	Flat cores	Prismatic cores	Narrow lateral face cores
nodule	33	29	-
Nodule fragment	4	4	6
Flake	5	5	11

TABLE 3. Kulychivka, layer III. Certain data on dorsal pattern of flake products appeared on Ist and IId stages of utilization of cores

	Flakes of stage I (decortication)	Flakes of stage II (blanks)	Blades of stage I (decortication)	Blades of stage II (blanks)
Index of flake products with parallel dorsal pattern	71.42	72.37	83.25	91.16
Index of flake products with parallel bi-directional dorsal pattern	7.14	16.02	30.39	35.74
Index of flake products with centripetal dorsal pattern	0	0.55	0.44	0
Index of flake products with perpendicular dorsal pattern	17.53	18.78	10.57	6.82
The quota of bi-directional parallel flake products among total number of products with parallel dorsal pattern	10.0	22.13	36.5	39.5

TABLE 4. Kulychivka, layer III. Certain data on preparation of butts of flake products appeared on Ist and IId stages of utilization of cores

	Flakes of stage I (decortication)	Flakes of stage II (blanks)	Blades of stage I (decortication)	Blades of stage II (blanks)
IF	16.44	16.56	31.94	36.32
Ifs	1.32	5.91	19.9	27.76
Itr	26.32	33.13	15.28	16.74
ITr for plain butts	41.89	40.86	25.58	27.16
Index of plain butts	28.29	32.54	29.62	24.08
Index of cortex butts	5.42	0	2.31	0.4

TABLE 5. Kulychivka, layer III. Variants of preparation of striking platforms of cores

Preparation of platform	Flat cores	Prismatic (parallel) cores	Narrow lateral face cores
only F, Fs	16	5	3
only Tr	8	11	5
combined F, Fs, Tr	26	12	3
other	0	18	1
Total	50	46	12

TABLE 6. Kulychivka, layer III. The order of detachment of flakes in dependence of type of cores

Order of detachments	Flat cores	Volumetric cores
Turning order	4	2
Successive regular order	24	9

pieces, 53 core-like fragments, 15 pre-cores, 108 cores (graph. 1). In expositions of the Ternopil Museum of Local Studies, a rather large series of flint artifacts is exhibited. These are - in general - retouched pieces. In total, the number of tools (counting here artifacts exposed in the Museum, and Levallois points and flakes with intentional, although light, retouch) reaches 245 objects.

Among these 245 objects, considered to be tools, there are 15 Levallois points, 20 burins, 68 endscrapers, seven points, 43 knives, 10 truncated pieces, 22 encoches, 10 notched tools, seven so-called cutters, one *pièce esquillée*, two denticulates, eight combined tools, 14 blades and 26 flakes with retouch (graph. 2; fig. 15). As can be seen, the Middle Palaeolithic component in the typology of tools is reduced only to the presence of the series of typical Levallois points, being a regular co-product of knapping of flat bidirectional cores.

- The characteristic of raw materials

Kinds of raw materials

High quality fine-grained, with few or no inclusions, Cretaceous flints of Turonian deposits served as raw materials. Coloring ranges from dark grey to black (predominant), light grey and grey bandy-zonal (widespread) and brown-chocolate (rare). The main type of initial raw material is nodular or concretion with smooth surfaces. Accordingly to V.P. Savych, occasional tabular raw material pieces are also known; however, in materials stored in Ternopil, these are absent. As was found out by the characteristics of the surface of large worked items (cores, core-like fragments, fragments of flint), undamaged nodules - or big fragments - were used as initial pieces of raw materials. Then small-sized fragments and flakes (either natural or artificial) followed, which were used considerably less frequently (graph 3).

The physical state of flint artifacts is rather good. There are practically no traces of lustrage, erosion etc. Light or even heavy patina covers sometimes lithics; as a rule, the latter is associated with either the dorsal or ventral surface of artifact.

Sources of raw materials

Flints are abundant in non-redeposited outcrops, as well as in redeposited spots in immediate proximity to the site.

Variants of the raw materials acquisition strategy

To judge by abundance and variability of knapped flints, the toolmakers of Kulychivka had no problems with qualitative and quantitative deficit of initial raw materials. Thus, their raw strategy was in many ways highly expensive. Kulychivka 1979 layer III assemblage shows no examples of reutilization of flakey tools, as well as no unquestionable specimens of transformed (reutilized) cores. Therefore, the raw strategy was rather simple and lineal: each need in new lithic products was realized through new search for a suitable raw material block, its following knapping and, then, selection of desirable products.

Two definitive features of the site of Kulychivka are important in this respect, namely: a) its open-air vast

area character (and - very likely - repeated character of habitation), and b) abundance of immediate by the site placed outcrops of high quality flints. Once again it must be stressed that Kulychivka raw materials acquisition strategy has a transparent simple scheme, not complicated by any sophisticated chains, so characteristic of cave sites with their practice of heavy utilization and reutilization of lithic products.

- Morphology of knapped products

Pieces of raw materials

The fragments of raw materials without signs of processing are absent in the assemblage under discussion.

Precores

The assemblage includes 15 pieces representing nodules with several (up to five) detachments of testing. These items are not precores *sensu stricto,* but - rather - pieces of tested raw materials.

Cores

The assemblage under description includes 50 flat and 58 volumetric cores (table 1). As raw materials for knapping , the nodules and concretions of local high-quality Turonian flints were used. Initial type of raw material blanks might - more or less reliably - be recognized in a number of cases (table 2). As can be seen, there are no crucial differences in selection of raw materials for flat or volumetric prismatic (parallel) cores; on the contrary, the difference is obvious in the case of narrow lateral face cores.

The overwhelming majority (48) of nuclei of the first group are represented by specific Levallois cores with one or two platforms (the latter are predominant) and one working surface (fig. 6; 7; 8). The detachment was conducted from platforms, prepared by facetting and retouching. The prevailing scheme of knapping is bi-directional longitudinal; in the case of single platform cores - parallel. Only one nucleus, and with certain reservations, can be referred to the Levallois preferentiel type. One more artifact is defined as discoid centripetal core. Judging by the negatives of flakes on available cores (graph. 4), among the products of knapping were represented Levallois points, as well as flakes and bladey flakes (ratio of the latter is as 1 : 2).

Among volumetric cores there are 46 prismatic one (fig. 9; 10) and 12 narrow lateral face (fig. 11) with one/ two platforms. In comparison with non-volumetric knapping, the appearance of final detached products is appreciably different. Thus, according to data of the analysis of negatives on available cores of the assemblage, the ratio of flakes and blades for prismatic cores is looking as 1: 9, while the same ratio for narrow lateral face cores constitutes 0: 12. It is important to stress the fact of absence of true prismatic cores for bladelettes.

Post-cores

Exhausted cores, i.e. those, whose metric parameters or the peculiarities of working surfaces do not allow production of qualitative blanks, are practically absent in the assemblage under consideration.

Debitage

The total number of flakes of the considered assemblage enumerates 4185 pieces (fig. 12-17), where a third of the flakes might be referred to as blades. Formally the industry might be characterized as blade-oriented, with average level of facetting (cf.: I lam 31.66 average IF 25.07 IFs 13.72 (table 4)). Worthy of note is the absence of true bladelets; instead the studied series of lithics provides rather exceptional and quite atypical specimens of occasional randomly appearing "bladelets". Flakes produced during the early stage of processing of raw materials represent up to 39 % of the total number of these pro-ducts. At the same time, the flake-blanks constitute more than 54 %, flakes of preparation of cores - 5.8 %, wastes of retouching and resharpening of tools - about 1 %. Standard waste-flakes of retouching practically are absent, that can partially be explained in terms of preservation of the layer. Waste-flakes of manufacturing of tools are represented exclusively by burin spalls. It cannot be excluded that this latter group of artifacts also includes so-called edge crested flakes.

Graph 5 gives the notion about the ratio of blades and flakes resulting during the different stages of core utilization. Flakes with oblong proportions are most frequent at phase II, that is, utilization of core for manufacture of flake-blanks.

Table 3 demonstrates the main regularities in dorsal pattern of flake-products of utilization of core at the stage of initial preparation of a working surface and working platform (phase I) and utilization of the prepared working surface and platform(s) (phase II). As can be seen, flakes with parallel dorsal pattern are crucially predominant. An increase of parallel bidirectional products at the stage of phase II naturally reflects utilization of cores with two platforms and one flaking surface. Index of flakes with perpendicular removals on the dorsal surface is rather high among the products referred to phase II of core utilization (manufacture of flake-blanks). This fact can apparently be explained in terms of the existence of a special method of raising of working surface by a series of flakes removed by the lateral edges of the core. Worthy of note is the minimal number of débordant flakes, typical for Middle Palaeolithic assemblages. At the same time there are various true crested products, and a series of typical tablets.

Table 4 provides the data on preparation of butts of flakes resulted during the phases I and IIof core utilization. The statistics of flakes with facetted butts is very indicative. Two tendencies might be traced here. First, the number of such flakes increases among the products of Phase II of utilization by approximately 1.5 times. Second, their quotas are sharply disagreeing among the series of flakes and blades (on average six times more frequent among the latter). The first tendency can be explained as evidence of more careful control of quality of flake-blanks and, accordingly, more thorough monitoring of conditions of platforms of cores at this operational stage. As to the second tendency, it, in our view, clearly illustrates the principal orientation of Kulychivka III layer toolmakers on production of blades. The degree of care-

fulness of preparation of butts (and, correspondingly, core platforms) sharply increases during the manufacture of blades practically without dependence on the extent the used working surface is free from cortex. The more than twofold disproportion in the number of finely prepared flake products from phase II of core reduction specifies, in fact, that the significant part of these artifacts constitutes not true blanks, but technological wastes of rejuvenation of working surfaces of core.

No less clear is the dynamic of flakes with reduced butts. Index of trimming (reduction) [ITr] is 1.5 to 2 times higher among the flakes (contra blades) and, in general, shows approximately the same rates for the products of phases I and II of core utilization. How to evaluate this evidence? In our view, it can be considered as one more example of a Middle Palaeolithic way of solution of technological problems.

The data on methods of preparation of working platforms of various types of cores is illustrative in this context (cf. table 5): retouching of platforms is widely applied for prismatic (parallel) and narrow lateral face cores, as well.

Not high indices of cortical platforms, most probably, testify to the fact of knapping already at the stage of pre-core, conducted from the prepared platforms. This evidence, apparently, might be regarded as an indication that the testing and initial processing of raw materials pieces was conducted outside the area of the layer uncovered during 1979 excavations.

The series of flakes of considered assemblage demonstrates organic mixture of Middle and Upper Palaeolithic technical features. Orientation to manufacture of large blades is expressed clearly. Technological orientation of Kulychivka layer III industry to large and wide blade is complemented with further fragmentation of bladey blanks.

There is significant difference between the average length of blanks and negatives on cores. Therefore, optimal blanks were detached during stades of core reduction normally not presented in the assemblage. Available cores of assemblage represent exhausted forms, keeping in mind the standard of the given industry. At the same time, cores were reduced only up to 25-50 %.

- The technique of knapping

Modes of curation of working surface of cores

The profile of working surfaces of flat cores was curated by: a) usually elongated removals with cortical backs which were oriented alongside the edge of core (fig. 12, 4; 9, 6; 14, 4; 17, 1); b) comparatively short flakes, removed from the edge of core toward its center. Working surfaces of volumetric cores were maintained automatically through regular detachment of blanks. In certain cases working surfaces were rejuvenated - as evidenced by available specific crested products - by the means of creating a crest, either uni-faced or dihedral.

Modes of curation of striking platforms

Different modes of curation of striking platforms of cores as evidenced by the series of flake products were already briefly described and discussed. Corresponding statistics are represented in table 4. Cores themselves, indeed, also provide needed information, accumulated in graph. 6 and table 5.

The working zone of platforms of flat cores was prepared by facetting, retouching (more than 50 % of platforms) and reduction (Nekhoroshev 1993; Girya & Nekhoroshev 1993; Girya 1997) (graph. 6). Similar modes were applied for preparation of volumetric cores, however finely retouched platforms are rare (only about 6 %), whilst the index of platforms prepared exclusively by reducing (trimming), that is not combining reduced and facetted areas will increase from 23 up to 63 %.

As might be learned from these sources, there are two main modes in preparation of striking platforms of cores. The first mode constitutes facetting or/and retouching of striking zone in completely Middle Palaeolithic way. The second mode is concentrated on preparation of trimmed or reduced zone through the fringe area between working surface and striking platform.

If the first mode is associated - in general - with flat cores, the second one is far more typical for volumetric cores. It must be especially stressed that standard products of the second mode, i.e. flake/ blade with plain reduced (trimmed) butts are regularly associates with abrasion, sometimes very intensive.

- Supporting tools and the most reliable mode of knapping

Hard versus soft hammerstone technique

Data provided by flat cores and corresponding products of reduction (including artifacts with facetted or retouched butts) allows recognition of the application of hard hammer technique. This assumption is based on the presence of characteristic traces of cones of blows on the surfaces of flake butts, as well as on data on proportions and morphology of bulbs. Conical fracture initiations (Giria 1997) are crucially dominant among flake series of the Kulychivka flat cores.

On the contrary, products basically associated with volumetric cores (flake and blades with reduced and abraded butts) regularly show non-conical initiations, frequent lips, traces of reduction (trimming) of fringe area and sometimes signs of isolation, releasing, and abrasion of fracture zones (fig. 13, 1, 7; 14, 6; 15, 1; 17, 2, 3). This evidence obviously points to the fact of exploitation of soft hammer stone technique.

Therefore, Kulychivka layer III assemblage comprises artifacts indicating application of both hard and soft hammerstone techniques.

Retouching implements

The assemblage under consideration includes several hammerstones on flint nodules, as well as others made of fine-grained sandstone pebbles. There also is a typical specimen of a bi-sided retoucher on a flat fine-grained sandstone pebble. This piece has typical hammerstone damage, as well. To the number of so-called anvils might

probably be referred the piece of sandstone with numerous hollows concentrated in the central part of one of the flat surfaces.

Mode of knapping

For both the flat and volumetric cores, the most reliable the mode of free knapping in hands using direct percussion can be suggested.

- Parameters of the "ideal" blank

Judging by the parameters of blanks selected for further retouching and utilization, the industry was oriented on a large and wide blade (very probably, with its consequent fragmentation).

Accordingly to available statistical data, illustrating the tendencies in selection of blanks, the most frequently used (as if to say, "ideal") blank of the industry of the III-d layer of Kulychivka can be described as a large blade, with parallel dorsal pattern, without cortex, with finely prepared butt.

It is important to stress, that the considered industry in equal extant was based on flat (Levallois-like cores with one, or, frequently, two platforms) and on volumetric knapping (predominant prismatic (parallel), and well expressed narrow lateral face cores).

Kulychivka toolmakers were oriented exclusively to obtainment of blanks by means of core reduction. There are no doubtless data witnessed for familiarizing of Kulychivka inhabitants with the technique of bifacially prepared blanks.

Industry: Typological aspect

General notes on typology and manufacture of tools

- Typology and manufacture of flake tools: general notes

Typologically, all available tools are referred to the Upper Palaeolithic, though many of them were manufactured on Levallois blanks. It is worthy to note the complete absence of typologically expressive Middle Palaeolithic points and sidescrapers. Endscrapers followed by knives (retouched and *couteau à dos*), retouched blades and flakes, notched tools, burins, Levallois points with retouch of utilization, truncated pieces, combined tools, points, cutters, denticulates and single types are represented in typological structure (graph. 2). Endscrapers, alongside with ordinary types on blades and flakes, include core-like tools (carinated,nosed, *rabot)*.

Tools of Kulychivka only in exceptional cases exhibit heavily retouched, seriously modified initial blank. As it seems, it is quite normal for the site located near outcrops of abundant, high quality lithic raw materials. Neither tools nor wastes show signs of intentional intensive resharpening and reshaping of instruments. The series of Kulychivka tools, instead, provides a good sample of Palaeolithic morphology not affected by scarcity of raw materials, intensity of occupation, and other related terms.

One quite peculiar feature of Kulychivka technology must be stressed. This is the trend of intentional fragmentation of big blade/ bladey flake blanks. Complete blades are rather rare in assemblage, while the fragments prevailed. Surfaces of breakage sometimes show characteristic traces of that kind which might be interpreted as witnesses of intentionality of fragmentation (Matyukhin 1994). Attention should be drawn to the series of broken blades with remains of retouched notch by the zone of breakage. It cannot be excluded that these notches might be prepared just for maintenance of successful fragmentation.

The group of Levallois points needs some additional notes. These products are quite typical, normally proportioned, triangular in shape; the dorsal pattern, as a rule, is bi-directional. Elongated triangular "pointed" flake pieces with facetted butts were not regarded as Levallois points in the case of Kulychivka. The above given index of Levallois points must be regarded as a minimal one among other possibilities (keeping in mind high subjectivity of the definition of the border between elongated Levallois point and pointed Levallois blade).

Highly variable blanks were used for manufacture of tools. Herewith, a clear trend of utilization of large blades is statistically confirmed. Secondary working was executed by retouch, burin spalls and far less frequent thinning.

- Manufacture of bifacial tools: general notes

Traces of bifacial technology are not at all known in assemblage of the III layer of Kulychivka. In this respect it is important to stress that the bifacial foliate tool, reported by V.P. Savych as associated with Upper Palaeolithic occupation in fact is intrusive from the uppermost cultural layers, as argued by available field documentation.

- Typology

The structure of Kulychivka layer III assemblage from the 1979 field season (graph. 2) is confirmed by the preliminary data obtained through the analysis of materials of the same layer reported for other years of investigation of the site (Savych 1979; 1983; 1988). Endscrapers, retouched blades, burins and Levallois points represent morphologically clearly definable forms. The overwhelming majority of tools (ca. 60 percent) are prepared on bladey blanks, resulting from exploitation of either flat (Levallois) or volumetric (prismatic) reductions.

Endscrapers of the assemblage are subdivided into four main typological groups, namely: endscrapers on blades and flakes, core-like tools, (semi-) circular, and double forms (graph. 7; fig. 2; 3; 4). Endscrapers on blades and flakes are represented by almost equal portions. There are flat, standard and high endscrapers. The group of core-like tools includes carinated forms, nosed endscrapers, and *rabots*. Fan-like artifacts are not represented in the 1979 series, but nevertheless are known in the context of the industry (Savych 1979; 1983; 1988). Worthy of note is the prevalence of lamellar retouch associated with core-like endscrapers. At the same time lamellar or/and high retouch is represented among endscrapers of other groups, too. Circular and semi-circular tools are not numerous; there is a single double-edged tool. The

permanent presence of Aurignacian endscrapers (up to 5-6 % of all endscrapers) in different series of the Kulychivka layer III assemblage allows us to regard this feature as an integral typological component of the industry under discussion.

Burins are rather frequent among tools (graph. 7; fig. 4; 5). Angle burins are prevalent (40%) among this category of tools. Transversal multi-facetted (25%) and dihedral (25%) burins are frequent. Burins on retouched truncations are also well represented (10%). Carinated forms are represented by a single example. Examination of unpublished V.P. Savych field reports leads to the conclusion that the content burin series of 1979 might be evaluated as typical for the third layer of Kulychivka in general. The sporadic character of Aurignacian types (carinated and Baradoss ones) of burins in studied industry must be stressed .

The Middle Palaeolithic component is limited to the presence of Levallois points (6.1%), both unretouched and retouched. As already argued, it is the much diminutive index among other possible ones. There are no true Mousterian points, although we admit the possibility of a different classification look on at least some of pointed artifacts available in assemblage. There are no true sidescrapers. There are no signs of bifacial technology, as well as no specimens of bifacial retouch and regular thinnings.

A notable group is formed by tools provisionally defined as knives (consisted mainly of blades) and large retouched flakes (including blades and bladey flake products) and their fragments (17.8 and 16.3% respectively). These are large artifacts, frequently intentionally fragmented, with one to three edges. The main portion of these artifacts is represented by pieces with continuous lateral, and sometimes invasive retouch, either dorsal or ventral. From the typological viewpoint, these artifacts are rather responding to the notion of Aurignacian blade.

The group of truncated artifacts illustrate the application of truncation technique to all products of knapping, such as blades, flakes, Levallois points.

There is a rather typical *pièce esquillée* on a fragmented blade or flake, which bulb was modified by scaling retouch.

The series of combined tools, among which there are knives-cutters, knives-notched tools, and endscrapers-cutters, must also be mentioned.

Several pieces have a blunted back, but typologically these are not associated with Gravettian points or with blunted bladelets.

In general, the industry includes 3.8% of tools. Tools on blades prevail (62%), there are artifacts made on flakes (18%), bladey flakes, fragment of cores (2%), Levallois blanks. The total index of tools on Levallois blanks constitutes 18%. Average dimensions of tool constitute L 8-14 cm, W 3-4 cm, T 1.1-1.5 cm. There are no retouched bladelets and micro-bladelets. The typological structure is simple and includes prevalent endscrapers, retouched blades, burins, Levallois points, and varia. Bifacial technology is not known. The very low index of re-shaped forms must be noted. The reasons of the latter fact lie probably not only in easy accessibility of raw materials, but also in the cultural-technological specificity of given assemblage. Levallois-Mousterian industries to which latest manifestations Kulychivka industry might be referred were never oriented - as is reported by Middle Palaeolithic assemblages - to intensive re-shaping and re-sharpening of tools. On the contrary, it was rather common in the context of MP traditions oriented to bifacially worked blanks. In fact, Levallois blank technologies show a shift to intensive fragmentation, while Micoquian technologies exhibit orientation to intensive reduction of tools.

Thus, in respect of typology the Kulychivka layer III assemblage provides a good example of Upper Palaeolithic industry with a clearly expressed Aurignacian component.

Industry : Technological aspect

Reduction sequence, originality of technology

- Restoration and description of flint knapping reduction sequence

Stage of initialization of core

Initial pieces of raw materials constitute the nodules of local Cretaceous flint, their fragments, and massive primary - natural or artificial - flakes. The most preferable shape of raw materials by Kulychivka flintknappers is ovoid flat-surface pebble-like nodule. Protuberances were removed beforehand and this action produced primary flakes in its turn constituting pieces for further knapping (fig. 18, A, B).

Thus, there are two principal types of core blanks, i.e. nodule, either slightly modified or not, and primary flake, either artificial or natural. Hard hammer technique is crucially dominant.

Stage of preparation of core

Further processing of the nodule, completely covered by cortex, was different in the case of flat and volumetric knapping.

Flat cores and products of their utilization mirror several slightly different modes of decorticage. In fact, the main difference between the latter consists in certain variability of applying schemes of removing of primary - i.e. covered by cortex - flakes. Available cores and flake products allow recognition of longitudinal uni- (and/ or bi-) polar mode, transversal uni- (and/ or bi-) polar mode, and centripetal mode of decorticage (fig. 12, 3, 5; 14, 2; 16, 3; 17, 1; 18, C). If the first mode was obviously predominant, the latter is rather rare. Striking platform(s) was prepared by a series of blows (or, less frequently, by single blow) during the process of decorticage. In principle, just these platforms, more or less modified, were exploited throughout the further stages of utilization of raw material piece.

Volumetric cores and correspondent products show rather usual ways of treatment of the natural piece of raw material. The aim to remove cortex from the piece sometimes was realized - completely or partially - prior to regular knapping, and sometimes - as might be supposed - during this latter. In the first case, after removing of protuberances, the conical extremity of nodule was also

removed. The resulting plain striking platform(s) allow ed both further decorticage and manufacture of flake-blanks (fig. 19, B-a). Alongside with decorticage actions, and, probably, without removing of conical extremity, Kulychivka toolmakers could create a long crest on a processed piece of flint (fig. 19, B-b). With the appearance of the latter, the stage of preparation of pre-core was accomplished; removing of crest signalizes the beginning of regular knapping oriented on blank production. Crested blades with cortex areas are rather frequent in discussed assemblage. This evidence allows to suggest the preparation of crest on pieces still covered by cortex, and to suppose for such nuclei the simultaneity of decorticage and manufacture of flake blanks.

Indeed, Kulychivka toolmakers reacted adequately, having a deal with fragments of nodules or natural/ artificial flakes. Ways of preparation of pre-cores on such pieces differ sometimes significantly from ways of treatment of untouched nodules. It is quite natural, as soon as the decorticage of area designed for further production of flake-blanks was not necessary, and preparation of working surface and striking platform(s) was restricted to very limited extents.

Stages of utilization and re-preparation of a core

Flat mode of utilization of raw materials is well represented in the assemblage under discussion. There are numerous cores and products of their utilization. The working surface, as it consequently follows from different modes of decorticage, at the very beginning of exploitation of core might have either parallel or centripetal pattern. Platforms usually are prepared by facetting and retouching, rather often associated with reducing (trimming); plain platforms are rare. Initialization of blank manufacture was started either with detachment of edge flake of debordant type (fig. 20, A-a, b, e) or with Levallois pre-ferentiel type removal (fig. 8, 3; 14, 2; 20, A-c, d). It is worthy to note that débordant flakes sometimes are hardly distinguishable among crested products (fig. 21, B). In dependence of the width of given core, the number of removed blanks can broadly vary through the one cycle of utilization of one striking platform.

The latter need a certain explanation. The term "cycle of utilization" means operations that are possible to conduct on core until exhausting of the potential of its working surface. If the core has one striking platform and the width of its working surface does not exceed three widths of desirable flakes, then, indeed, one cycle of utilization results in the production of three qualitative detachments (fig. 22, A). In the case of a core with two opposite platforms and analogous width of flaking surface, the number of qualitative detachments through one cycle of utilization reaches up to six pieces (fig. 22, B). From this point of view, two-platform cores appear to be more productive and allow more economic utilization of raw materials. Core productivity is directly connected with metric parameters of working surface cores and number of working platforms. A two-platformed uni-working surface has, as a rule, elongated rectangular shape in plan. Such a shape allows, in principle, two possible orientations of knapping, namely longitudinal and transversal. It must be stressed in this connection that longitudinal disposition of platforms predominates among the studied cores (cf.: fig. 7, 1, and 2). It must be also stressed the fact that two-platform core with single working surface is oriented - as if to say "on definition" - to the manufacture of pointed bladey products. The idea of bi-directional exploitation of the same flaking surface was widely applied during Stone Age just among blade-oriented industries. Thus, the well-known Swiderian Late Upper Palaeolithic flintknapping technique aimed to manufacture of pointed blade products exploits principally the same technological idea.

In the case of flat core after removing of all detachments possible in given cycle of utilization, the convexity of flaking surface needs in rejuvination. Removing of lateral longitudinal or transversal debordant flakes solved this task.

Correspondent cores and flake products document frequent application of this method. The raising of convexity of working surface was followed by re-preparation of striking platforms. After removal of a débordant flake, the contour of platform in plan often obtains original ugly shape. Retouching of platform in marginal areas was conducted in different directions (fig. 21, A), as is mirrored by available flakes of assemblage (fig. 11, 7; 15, 4). As already noted, preparation of platforms was conducted by other methods, as well. After renewing of working surface and platforms, a new cycle of knapping took place, upon completion of which a new re-preparation of core was conducted.

It seems doubtless, that the majority of available flat cores pass through not a single cycle of knapping/ preparation. According to very preliminary estimations, Kulychivka flat cores might pass through three to six such cycles. At the same time there are cores, in particular made on flakes, which full reduction results only in few flakes (fig. 8, 2). Utilization of multi-platformed cores allows varying the order of use of working surfaces, as well as the sequence of detachments from one platform within single cycle of knapping (fig. 20, A, B).

A significant difference is traced in the dynamic of platform angle of flat and volumetric cores. As illustrated by graph. 8, sharp angles (35°-60°) associate mostly with flat cores, while volumetric cores provide the peak around 80°-95°. This difference is obviously connected with different modes of exploitation of raw materials in flat and volumetric modes.

Volumetric way of knapping is also represented by the series of cores and correspondent flakes. The process of knapping was usually begun by the removal of either a bifacial or unifacial crest (fig. 14, 5). The available series of artifacts provides specific products, that is to say, secondary crested flakes and blades. Some of these illustrate two-platformed mode of reduction of volumetric cores from the very beginning of their exploitation. In the course of reduction of a volumetric core, the front of the working surface increased gradually and, therefore, the nucleus obtains a potentially fruitful trend of conversion in cylindrical type. Working platforms of volumetric or

semi-volumetric cores were rejuvenated by flaking, and rare retouching. Single blow technique of preparation of striking platform was also used and sometimes resulted in appearance of rejuvenation core tablets.

Practically all large blades in the assemblage were obtained during the first stages of reduction of large volumetric cores. Peculiarities of these flakes allow reco-gnition of soft hammerstone technology and such advanced technical modes as "isolation", "releasing", and "abrasion" of fracture zones (fig. 13, 1, 7; 14, 6). Crested blades might also appear during the process of flaking. Preparation of a new bifacial rib might become technologically obligatory when further exploitation of core met difficulties. This assumption is confirmed, however, only by the presence of crested blades of small sizes, that is not sufficient for positive conclusion. Certain flakey products (fig. 13, 7) illustrate possible knapping of cores that commenced from the very beginning without creation of crested ribs.

Stage of abandonment of exhausted core

Many of the available cores of the assemblage constitute non-exhausted artifacts, for which further exploitation could successfully have been continued. Several cores, nevertheless, show clear signs of technical mistakes and difficulties for further knapping and were abandoned without special improving. Practically all such cores were discarded for their impossibility of further utilization, though - in fact - these are not true exhausted cores *sensu stricto*. To the number of such artifacts might be referred, probably, several cores on flakes, reserve of raw materials volume of which was practically exhaustedly used.

- Original features of applied technologies

The crucially dominant scheme of knapping of both flat and volumetric cores is parallel in its unipolar and bipolar variations. Two-platformed flat cores regularly and two-platformed volumetric cores less frequently were oriented to exploitation of single flaking surface. Data on order of removals on two-platformed cores is of certain interest (table 6). Two variations might be distinguished, namely turning order of removals, and successive regular order of removals. Turning way of splintering foresees that each next removal was detached from opposite platform. Successive regular order requires knapping of series of flakes from one of platforms and then similar utilization of other platform. Both methods might be applied through the reduction of the same core; independent applying of one of methods during the all stages of exploitation of single core is disputable. Successive knapping is close to the idea of one-platformed parallel technique. Hereunder, the assemblage of the third layer of Kulychivka exhibits certain, that is to say, genetic liaisons of Levallois and volumetric parallel knapping. The prevalence of successive regular order of knapping through the utilization of two-platformed Levallois cores and evident shift toward one-platformed knapping through utilization of volumetric cores does not seem to be random in this connection (table 1; 6).

Refitting evidence coming from technologically similar assemblage of the Moravian site Stranska Skala IIIa reveals that a block of raw material in the process of knapping could first pass the stage of volumetric reduction initialized by crested removal, followed by non-volumetric reduction, resulting in a flat discarded post-core (Svoboda & Skrdla 1995). To date, we have no direct indications of similar records in Kulychivka, save for three flat two-platformed cores demonstrating negatives of semi-volumetric one-platformed parallel bladey knapping on narrow lateral face. Other indirect signs, such as, for instance, correlation of the number of crested products and number of cores (113: 108) also add to such possibility.

The following general conclusions might be summarized. The assemblage of the IIId layer of Kulychivka from the 1979 excavations demonstrates a clear example of coexistence of "Middle Palaeolithic" Levallois flat and "Upper Palaeolithic" parallel (prismatic) and lateral volumetric knapping. Exactly the coexistence of these is clearly illustrated by certain specifically characteristic features. Thus, the flat knapping technology is associated only with hard hammerstone technique and almost exclusively with facetted fracture zones, while volumetric knapping technology portrays such advanced elements as isolation, releasing, and abrasion of fracture zones and application of soft hammerstone technique. However, there are examples of organic inter-penetration of Middle and Upper Palaeolithic traits. These are, for instance, presence of retouching platforms on prismatic (parallel) cores, and reduced fracture zones both on volumetric and flat nuclei; prevalence of successive order of knapping on Levallois two-platformed cores; examples of combination of volumetric and flat knapping on the same core. To judge by negatives of removals on available cores, endproducts of flat and volumetric reduction (except for knapping on narrow lateral face) are rather similar with respect of morphology. Nevertheless, several quite sharp differences must be stressed, e.g. far higher output of pointed bladey products in the case of Levallois knapping; less frequent flakey products in the case of volumetric exploitation of raw materials. Additionally, as evidenced by the available blades, volumetric reduction provides a bigger quota of large blades.

The discovery of an unusual lithic artifact must be noted, demonstrating evident traces of so-called thermal treatment. The artifact represents the middle portion of a large blade. Surfaces of lateral breakage are characterized by specific brilliancy peculiar to flints, to which thermal treatment was applied. To date, this fragment is the sole one discovered in the materials of Kulychivka. Therefore, it would be somewhat invalid to assume that site inhabitants were familiar with this refined technology of flint processing.

DISCUSSION

Cultural definition, analogies, regional MP forerunners, Aurignacian impacts, summa summarum

- Cultural definition

V.P. Savych referred the industry of the III-d layer to the early stage of Upper Palaeolithic and defined its analogies in materials of early Gravettian of the Middle Dniester area (Babin I, Molodova V, Korman ' IV etc). There is a notion about accessory of the industry to the first stage of the initial period of the Upper Palaeolithic and to Upper Palaeolithic bi-directional (pointed) blade Levallois (Demidenko and Usik 1993). M.V. Anikovich regards Kulychivka as belonging to the Aurignacoid way of development of the Upper Palaeolithic (Anikovich 1994). Rather common is the notion about affinities of Kulychivka and the Moravian Bohunician (Svoboda & Skrdla 1995; Stepanchuk 1996; Kozlowski 1996). O.S. Sytnyk refers the Kulychivka industry to the so-called post-Levallois of the early stage of Late Palaeolithic (Sytnyk 1996).

The combination of Middle Palaeolithic and Upper Palaeolithic features in Kulychivka assemblage is organic and allows to refer this inventory to the number of so-called "transitional industries". Originality of Kulychivka materials among other transitional industries is strengthened by the unusual appearance of Middle Palaeolithic components. For the number of known East European EUP assemblages, the Middle Palaeolithic elements in technology and typology demonstrate connections with the so-called Micoquian technocomplex strictly associated with technology of bifacially worked blanks. Being the exception from this rule, the Kulychivka points to certain liaisons with Levallois-oriented Typical Mousterian. Assemblages similar to Kulychivka are not yet known in Eastern Europe. The clear originality of Kulychivka industry in comparison with *sensu lato* synchronous sites of the Ukraine, in particular, and of Eastern Europe in general, provides all grounds to recognize locally original phenomenon, that is "Kremenician tradition (industry)" (="Kremenician").

- Analogies

Close analogies of the industry of the III-d layer of Kulychivka might regularly be seen in materials of transitional assemblages of the Central Europe, Balkans and Near East, exhibited combination of Levallois and Upper Palaeolithic traits in technology and typology. These are the sites of Moravian Bohunician, assemblage of the VI-th layer of sector TD-II of Temnata cave in Northern Bulgaria, and Emiran assemblages of the Near East. These analogies are discussed more detail elsewhere (Cohen & Stepanchuk 1999; Cohen & Stepanchuk 2000; Stepanchuk & Cohen in press).

Initially, V.P. Savych referred the industry of lower layer of Kulychivka to the early stage of Late Palaeolithic (Savych 1975; 1975a). Such notion was also shared by other scholars (Chernysh 1985). Later definition becomes less categorical. As was emphasized, the basic parameters of the flint industry are inherent with Late Palaeolithic sites of transitive, initial and early phases (Savych 1987). Savych proposed rather wide analogies of assemblage of lower layer of Kulychivka, namely: Babin I: 1, Molodova V: 9 and 10, Radomyshl, Predmosti, Szeleta, Korman' IV: 8-7, Willendorf, Vogelherd etc (Savych 1975a: 26; 1987: 51). As soon as there are assemblages of Early Upper Palaeolithic (Aurignacian and Early Gravettian) and transitional industries (Szeleta cave), it seems that the taxonomical evaluation of V.P. Savych was not based on a cultural-stratigraphical approach. Similarity between Kulychivka and the mentioned sites rather formal, as all industries are based on large blades.

Chronostratigraphical position of the IIId layer of Kulychivka allows to consider this industry to be existing somewhere between early and middle chronological groups of sites of the Kostienki-Borshevo region in the River Don basin and preceding the beginning of Gravettian sequence of the Dniester area sites (Babin I, Molodova V). Therefore, this industry is conditionally synchronous to the Early Aurignacian of Krems-Dufour tradition and to the Streletskaya culture of the Early Upper Palaeolithic of Eastern Europe. Probably, it also is simultaneous to assemblages of the end of an early phase of transitional industries of the epi-Micoquian technocomplex and directly precedes the appearance of industries of the technocomplex of Early Gravettian in Central and Eastern Europe. It is obvious that for such estimation of age, there are no sufficient bases.

Some technological aspects of the industry of Kulychivka became a subject of consideration in a publication by Yu. Demidenko and V. Usik (1993: 239-242). The authors ascertained the presence of a Levallois component in the industry and have offered its technological substantiation. Kulychivka materials were mentioned in the same technological context as assemblages of the Moravian Bohunician. At the same time, Kulychivka genesis was considered in connection with the Levallois-Mousterian of Molodova I and V in the Dniester area. Conclusions of this research are close to earlier K. Valoch's interpretation of Middle Palaeolithic predecessors of the Bohunician in Central and Eastern Europe. K. Valoch for the first time noted typological and technological similarity between the Bohunician and the site of Boker-Tachtit in the Near East (Valoch 1990). Analogies of the Bohunician industry are often seen in the Emiran of the Near East (Valoch 1990; 2000; Marks 1993; Svoboda 1993; Svoboda *et al* 1996; Kuhn & Stiner 1999 etc). K. Valoch stresses the identity of these industries, and A. Marks defines similarity between them as striking. The Emiran exists between 47-34 Kyr BP.

In general, Valoch's notion about probable genetic liaisons between Moravian MP to UP transitional and Dniester MP industries is reasonable. On the other hand, arguments stated to the benefit of Bohunician roots in transitional Balkanian industry of Temnata TD II: VI also seem to be rather convincing (Ginter *et al.* 1996; Kozlowski 1996; 1998). According to Demidenko and Usik, the Levallois technique of Bohunician and

Kulychivka represents a qualitatively new stage in development of Upper Palaeolithic technology, which can be characterized as Levallois bipolar, pointed, bladey (Demidenko & Usik 1993: 241). In our opinion, Kulychivka technology integrally combines both flat bipolar Levallois and volumetric prismatic reductions and just this integrity constitutes the most characteristic feature of this industry. Similar integrity is reported for Bohunician assemblages (Svoboda & Skrdla 1995). The organic combination of flat Levallois and volumetric prismatic knapping is also characteristic of the Levantine Mousterian of Tabun D tradition, including the transitional industry of Boker-Tachtit: 1-3 or the Emiran (Marks, Monigal 1985, Meignen 1998).

The notion about direct analogies of the Kremenician (Kulychivka) industry with the Bohunician might be regarded as commonly adopted (Demidenko & Usik 1993; Kozlowski 1996; Stepanchuk 1996; Svoboda *et al.* 1996; Cohen & Stepanchuk 1999; Geneste *et al.* 1999, etc). However, the range of similarities and distinctions between the two is not elucidated in detail. Data on technology (Svoboda & Skrdla 1995) and typology (Svoboda *et al.* 1996) of the Bohunician can be involved in comparison on the level of macro-parameters. Kremenician and Bohunician technologies are identical, and exhibit organic mixture of flat Levallois and volumetric prismatic knapping. The index of flat cores is apparently higher in the Bohunician. Bohunician assemblages - alongside with typical bipolar nuclei - include more frequent centripetal flat cores, while the Kremenician flat core portion is almost exclusively based on bipolar reduction. The Kremenician includes more frequent volumetric cores. Indices of blades are about identical, but probably higher in the context of West Ukrainian industry. The Bohunician industry is somewhat more heterogeneous than the Kremenician and includes Aurignacian and Szeletian components. The latter is decisively explained in terms of interrelations of Szeletian and Bohunician (Valoch 2000). The Kremenician has no bifacial components. Both industries show an identical range of Aurignacian endscrapers. Burins and points are more numerous in the Kremenician. The index of Levallois points seems to be somewhat higher in the Kremenician. The Bohunician includes essential portion of sidescrapers, whilst Kremenician has practically no tools of Middle Palaeolithic appearance.

A brief comparative analysis shows a rather high level of similarity between industries of Bohunician and Kremenician both in technological and typological aspects. Distinctions between industries might be evaluated as due to their existence under terms of different natural and cultural environment, as well as different chronological position.

Bohunician sites of Central Europe are dated to between 43-36 Kyr BP. Thus, the latest of them are separated from Kulychivka by 5-6000 radiocarbon years. The recently discovered site of Nizny Hrabovec in Eastern Slovakia is regarded as evidence of connection between Moravian-Silesian and West Volhynian centers (Kaminska *et al.* 2000).. It might be assumed that the Kremenician industry results from a Bohunician population invasion toward the east. Unique characteristics of the Kremenician might be regarded as the result of adaptation to local environmental conditions and as further development of the initial industry.

The assemblage of Kulychivka, layer III represents valuable evidence on the process of Middle to Upper Palaeolithic transition in Eastern Europe. The specific character of the discussed Kremenician industry allows definition of clear analogies with Moravian Bohunician, North Bulgarian industry of Temnata cave type, and Near Eastern Emiran. The Kremenician combines both Middle and Upper Palaeolithic features in technology and typology. Middle Palaeolithic components in technology are clearly recognized in widely applied regularly bi-directional knapping of flat one-/two-platformed cores with one flaking surface. These cores, as well as typical products of their reduction might undoubtedly be regarded as Levallois. Alongside Levallois technology, Kulychivka toolmakers used rather developed Upper Palaeolithic technology involving such features as utilization of volume, parallel (prismatic) knapping, initialization of core with crested removal, and application of such advanced techniques of curation of fracture zone as isolation, releasing, and abrasion. As to typology, Upper Palaeolithic features are far forceful than Middle Palaeolithic, the presence of which is reduced to Levallois points and, probably, a few rather atypical flake tools. Upper Palaeolithic types are characteristic and include perceptibly essential Aurignacian components.

- Probable regional Middle Palaeolithic forerunners

In searching for Levallois Middle Palaeolithic forerunners of the Moravian Bohunician in European context, colleagues from Czech are referred to Dniester Molodova sites (K. Valoch, J. Svoboda). The same Middle Palaeolithic base is supposed for the Kulychivka industry (V.P. Savych, Yu. Demidenko, V. Usik). Proposed links can not be rejected at least due to the almost complete absence of other well-documented Levallois sites in the area. On the other hand, this explanation is disputable, as the chronological gap between the early Bohunician and the latest well definable Molodova materials (Brorupian Molodova I: IV and Molodova V: 11) is too deep and constitutes ca. 20 Kyr. No less important is the techno-typological difference between these assemblages. Molodova technology is oriented on Levallois flake knapping of mainly recurrent centripetal type. Transition from this technology to uni- and bipolar blade-oriented Levallois is possible, but needs additional argumentation. Technologically more close analogy of Kremenician and Bohunician assemblages is provided by recently published materials of layer III of the site of Ezupil in Western Ukraine (Sytnyk 2000). Ezupil: III is dated geologically to Eem and exhibits uni- and bipolar blade-oriented Levallois technology and generally Middle Palaeolithic typology. But in this case the gap between a suppositional Middle Palaeolithic forerunner and Bohunician-Kremenician assemblages even more considerable. This gap, probably, might be filled by Crimean assemblages of

Kabazi II: II type including examples of flat and volumetric technologies and blade orientation (Marks & Chabai 1998).

Dniester Levallois-Mousterian sites have analogies on the territory of continental Ukraine and Crimea. There are rather poorly documented assemblages in the Middle Dnieper area (Nenasytets I and Skubova Balka; A.A. Bodyanski). More informative evidence is coming from the Donbass region (Kurdyumovka; A.V. Kolesnik) and especially from the Crimea (Shaitan-Koba I, Alyoshin Grot etc). Donbass evidence is dated to ante-Brorup and, according to A.V. Kolesnik, has similarity with Crimean Kabazi II: II assemblages.

For the sites of Shaitan-Koba I type, the evolution into assemblages of Kabazi II: II is proposed by V. Chabai. Absolute date of the latter by means of different dating methods is defined in frames of 50 to 30 Kyr BP (Chabai *et al.* 1998). Along with the recent age of latest manifestations of Kabazi II: II, it is true that the general appearance of this industry remains still Middle Palaeolithic, though published materials includes morphologically UP pieces, defined as MP ones (cf.: Marks & Chabai: fig. 13-7: 3). In the regional East European context, the Kabazi II: II industry shows certain signs which might be regarded as shifts toward the Kremenician. Nevertheless Ezupil: III assemblage - despite its more ancient age - exhibits more essential signs of similarity with the Kremenician.

Thus, there are no undoubted and clearly recognizable Middle Palaeolithic base of Kremenician and Bohunician industries in the frames of currently known Central and East European records. More close resemblance is traced in the Near East. The similarity between the discussed industry and Near Eastern records is of great importance and will be discussed with respect to its probable liaisons elsewhere (Cohen & Stepanchuk in press).

- Aurignacian impacts

In the opinion of a number of authors (Kozlowski 1996; 1998; Ginter *et al.* 1996), the Bohunician industry represents a final stage of development of Levallois technology, where there is a gradual replacement of Levallois knapping by Upper Palaeolithic. As stressed, Kulychivka and Bohunician exhibit no signs of shift toward typical Upper Palaeolithic of Aurignacian or Gravettian traditions. A basically different understanding of Kulychivka industry is proposed by M. Anikovich (1994; 1999). Coming from the presence of blade technique, oriented to obtainment of large massive blanks, and availability of intensively retouched pieces in toolkit, he considers the given industry within the structure of the Aurignacoid technocomplex (Anikovich 1994: 150-151). According to another point of view, the lower layer of Kulychivka represents a non-Aurignacian Middle to Upper Palaeolithic transitional industry (Cohen & Stepanchuk 1999: 311; Geneste *et al.* 1999: 154).

The question about Aurignacian nuance in the Kremenician industry deserves special attention, as it is directly related to interpretation of the given complex and assumes some conceptual disagreements in understanding of processes of Upper Palaeolithic formation. For the first time the presence of high scrapers - an important component of Aurignacian industries - in Kulychivka was noted by V.P. Savych (1975). However, this observation was not reflected in his interpretation of the site. Other researchers writing about Kulychivka pay no attention to the presence of the Aurignacian component in this complex (Demidenko & Usik 1993; Kozlowski 1996). Aurignacian typological elements were described later (Cohen & Stepanchuk 2000; Stepanchuk & Cohen in press). As it was appeared, Aurignacian endscrapers of Kulychivka are typologically various and comprise nosed, fan-like, rabot and carene forms. They were made frequently on core-like blanks and were modified through lamellar retouch. Besides there are high forms of common endscrapers. Kulychivka burins include few typical carinated tools; there also are several rather typical waisted blades.

The Aurignacian technocomplex shows a wide spectrum of taxonomical, cultural and area variability. There are assemblages based on blades; flakes and blades; bladelets. Sometimes the index of core-like endscrapers is very high, sometimes insufficient. Dufour bladelets might be represented or not, etc. (Cohen & Stepanchuk 1999). Additionally, Aurignacian typological elements are also known in industries of other technocomplexes, such as Gravettian or epi-Micoquian. At the same time, and it must be specially stressed, known Aurignacian industries have no signs of Levallois technology. In our view, the given argument might be decisive in discussion. We do not see sufficient bases for consideration of the Kremenician industry within the structure of the Aurignacian technocomplex.

Different variants of explanation of the Aurignacian component in the context of Kremenician are possible. The most probable one is provided by the concept of acculturation, supposed cultural interactions of Aurignacian and non-Aurignacian populations. Illustrative in this respect are the facts that the Bohunician industry also contains an Aurignacian typological component, while assemblages of Amiran and Temnata TD: VI have no such elements as actual Aurignacian population arises on the territory of their distribution perceptibly later.

- Summa summarum

The proposed paper deals with typological and technological aspects of the Kremenician industry.

The assemblage of Kulychivka layer III is characterized by the co-presence of two, at first view, hardly associated technologies, namely Upper Palaeolithic and Levallois. It is a really strange picture, provoking inconsistent interpretations. Nevertheless, there are certain indications that allow preferring the hypothesis of simultaneity of both technologies in the context of Kulychivka. First, it is the existence of comparable and sometimes closely comparable (Bohunician) assemblages that also combined Levallois and true Upper Palaeolithic technologies. Second, it is evidence of the combination of both technologies on the same cores reported both in Kulychivka and closely related Bohunician records.

The obvious orientation of Kulychivka technolo-

gy toward obtainment of blades and bladey flakes must be stressed; herewith the given technological aim was achieved through different ways. The industry is characterized by certain specific features, which might be regarded as stylistic. To their number, for instance, the original modes of preparation of flaking surfaces on raw material pieces destined for knapping as flat cores might be referred. Kulychivka flat two-platformed bi-directional knapping exhibits all characteristic features of Levallois technology, namely thorough attention and specific modes of preparation and maintenance of properties of working surface and striking platforms. At the same time, Kulychivka volumetric cores and related flake products demonstrate a very advanced appearance and elaborated techniques. There are examples of combination of two technologies. All these makes Kulychivka layer III technology highly valuable for further comprehension of processes of the Middle to Upper Palaeolithic transition as it took place in Eastern Europe.

A quite Upper Palaeolithic typology (endscraper, burins, retouched blades etc) is complemented by Middle Palaeolithic component (Levallois points). There is a perceptible Aurignacian component, especially clearly recognized in the series of endscrapers.

Technological analysis of Kulychivka layer III assemblage allows to recognize a rather uncommon picture of co-existence of Middle and advanced Upper Palaeolithic features in the framework of a single industry. Though rare, such examples are nevertheless known in world Palaeolithic and mirror one of specific ways of modification of culture at a crucial moment of transition. Techno-typologically, the closest similarity of the above discussed industry might be seen in the Central European Bohunician. Typological structure of Kremenician allows to suppose Aurignacian impacts on population, which much probable liaisons with the Middle Palaeolithic might currently be searching for in the Near East record.

Acknowledgments

The technological study represented in this paper was prepared in the frame of project INTAS-96-0079. The typological study was funded by the L.S.B. Leakey 2000 grant "Middle to Upper Palaeolithic transition in the South of East European Plain". We are grateful to T. M. Kovalchuk, Ternopil Museum of Local Studies, for kind promotion in treatment of materials of the site of Kulychivka.

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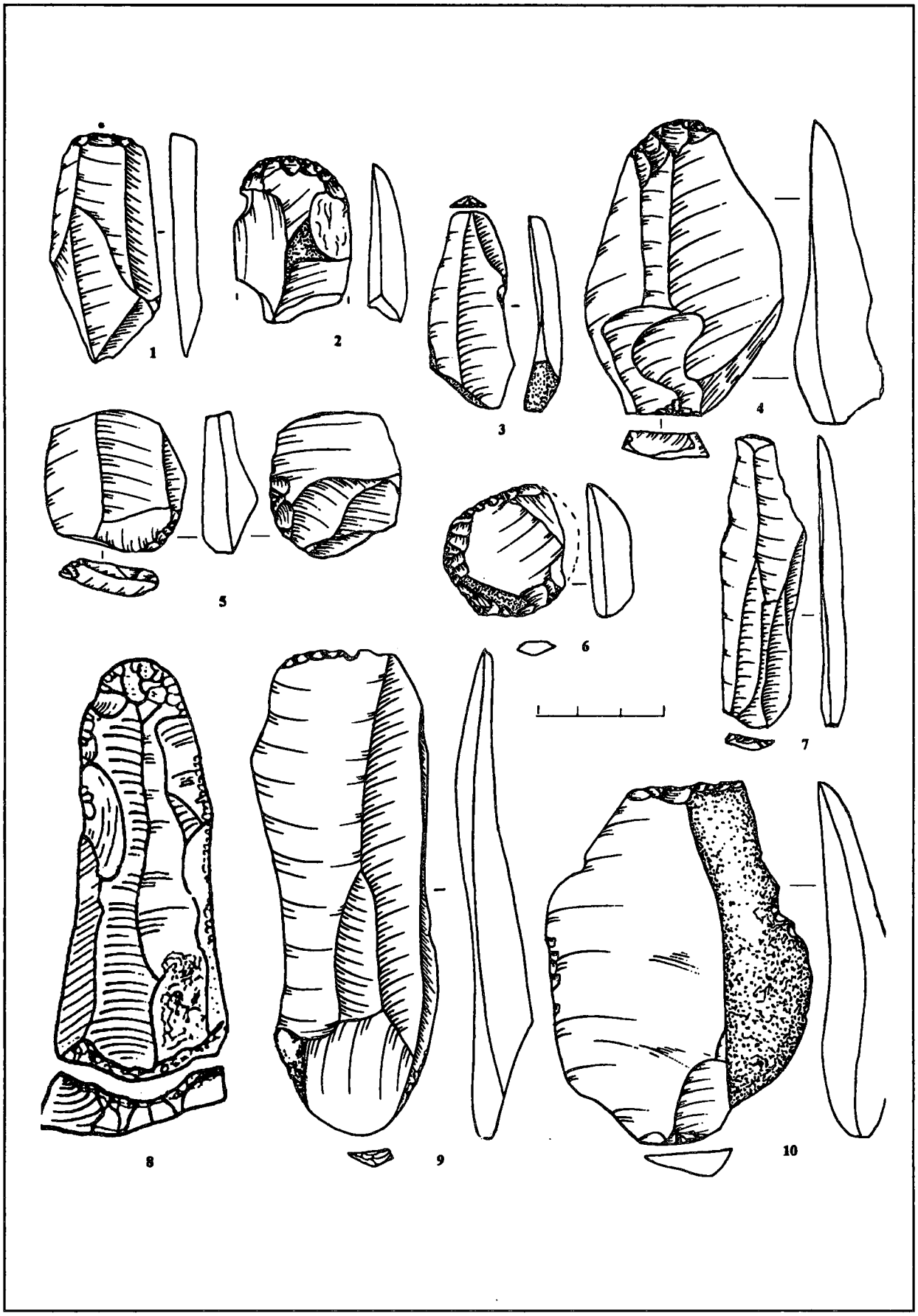

Figure 2 : Kulychivka. Tools: 1, 2, 4, 6, 8. Different types of endscrapers; 3, 7, 9, 10. Truncated pieces; 5. piece esquille.

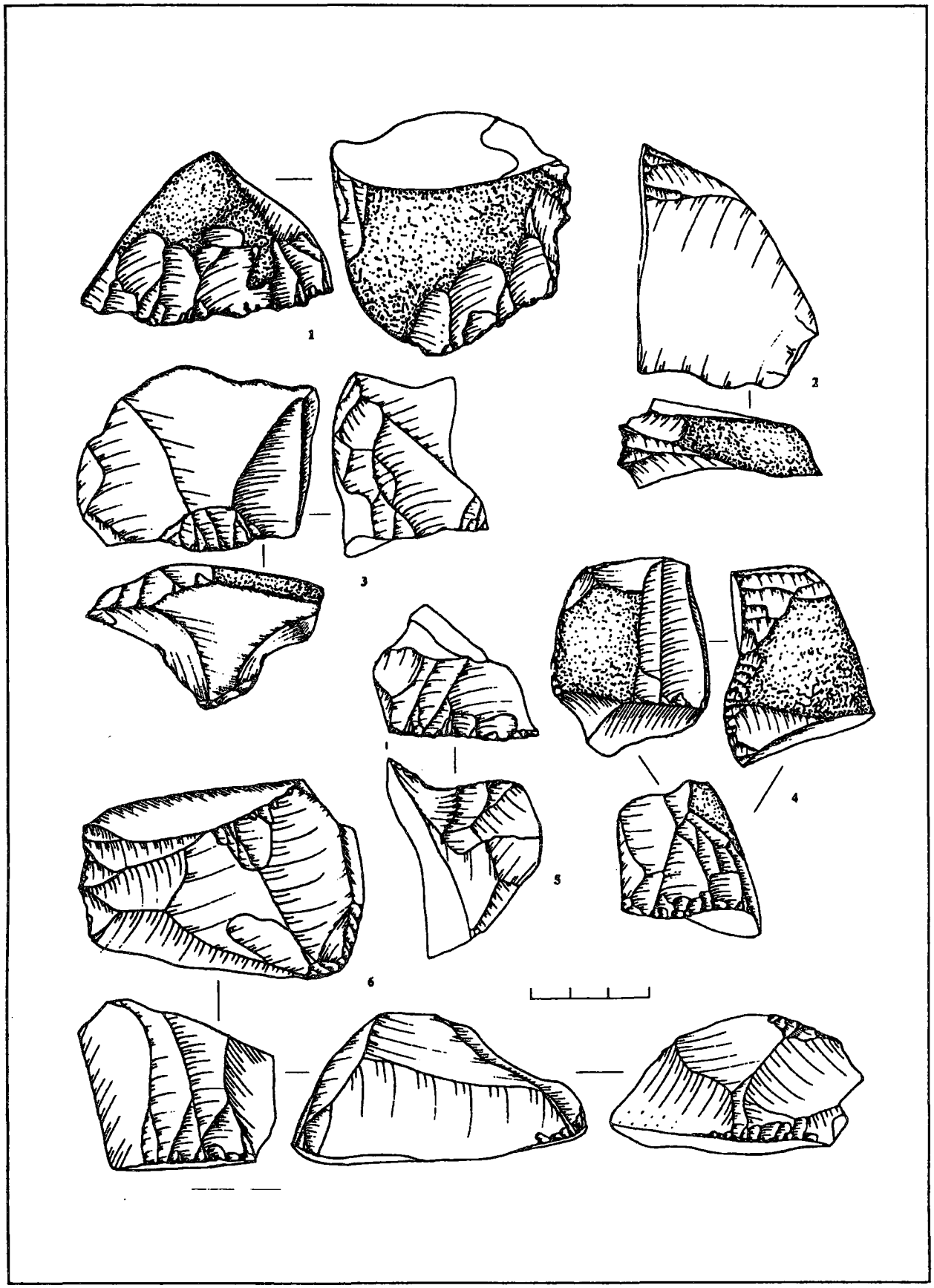

Figure 3 : Kulychivka. Tools: 1-6. Different types of core-like endscrapers.

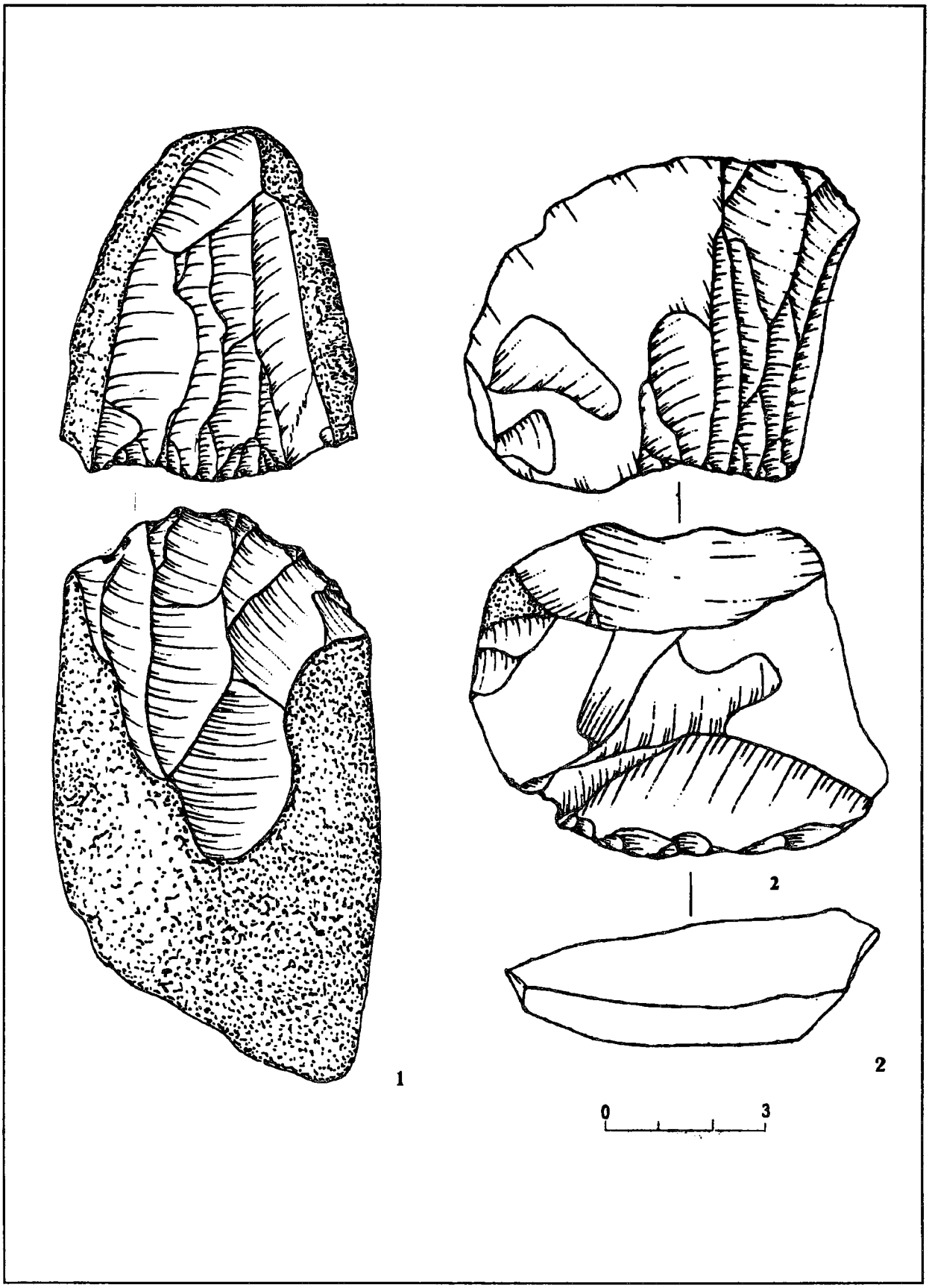

Figure 4 : Kulychivka. Tools: 1. Core-like endscraper; 2. core-like burin.

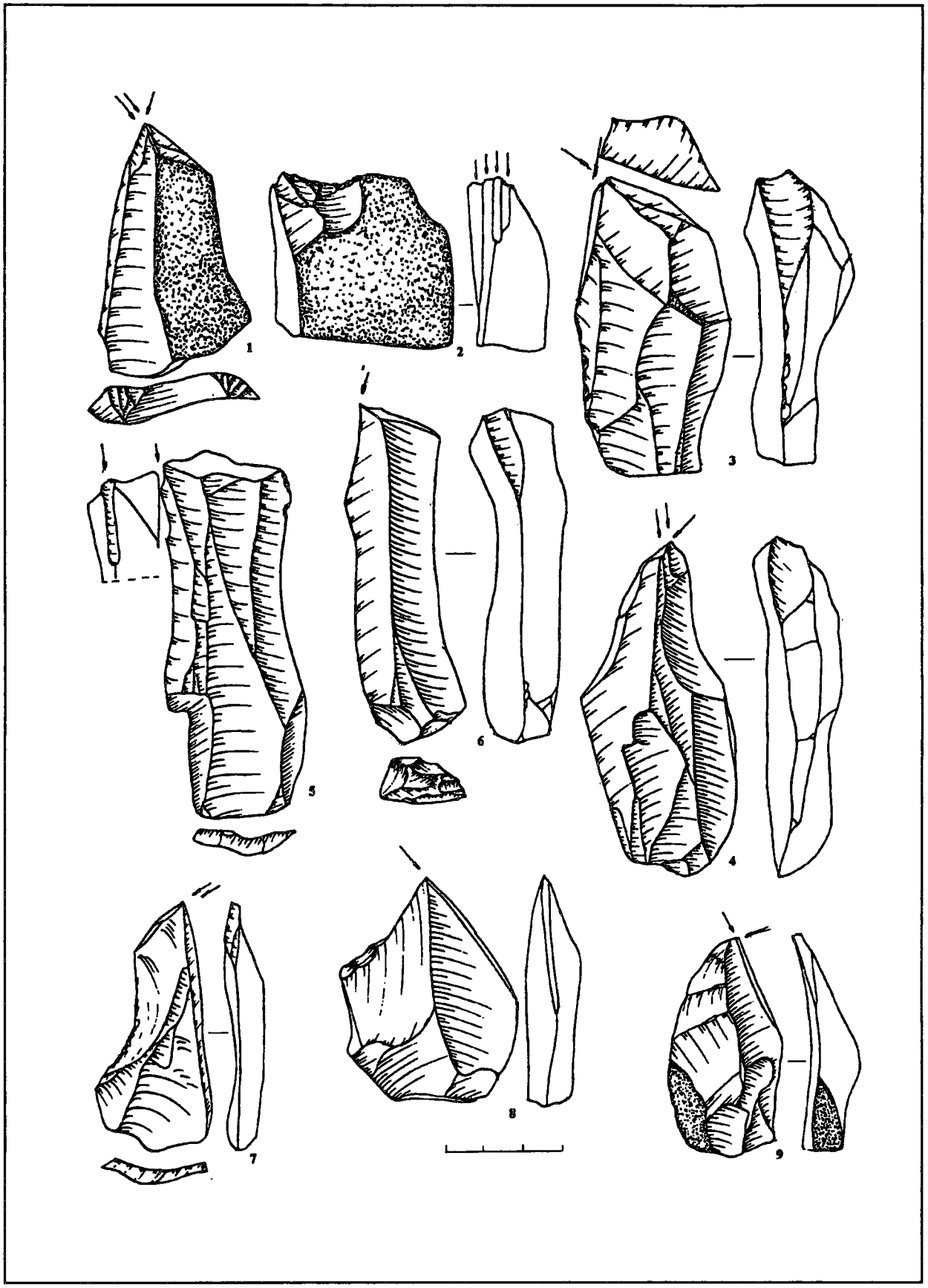

Figure 5 : Kulychivka. Tools: 1-9. Different types of burins.

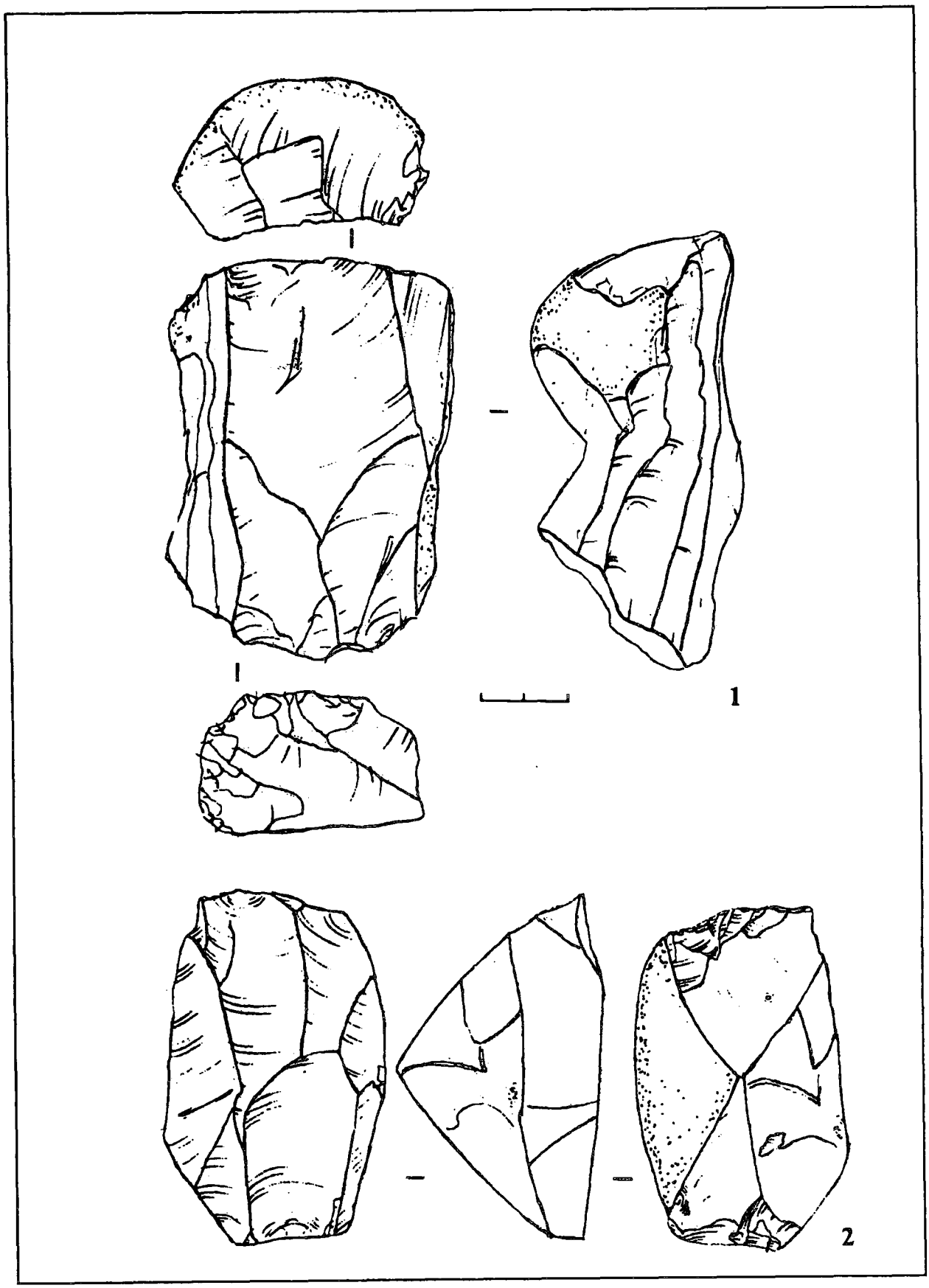

Figure 6 : Kulychivka. Flat cores: 1. Levallois recurrent flat two-platformed bi-directional core on nodule. Facetted and retouched platforms; lateral bladey debordants/ evidence of narrow lateral parallel semi-volumetric knapping. 2. Levallois recurrent flat two-platformed bi-directional core on fragment of nodule. Retouched platforms; lateral debordants.

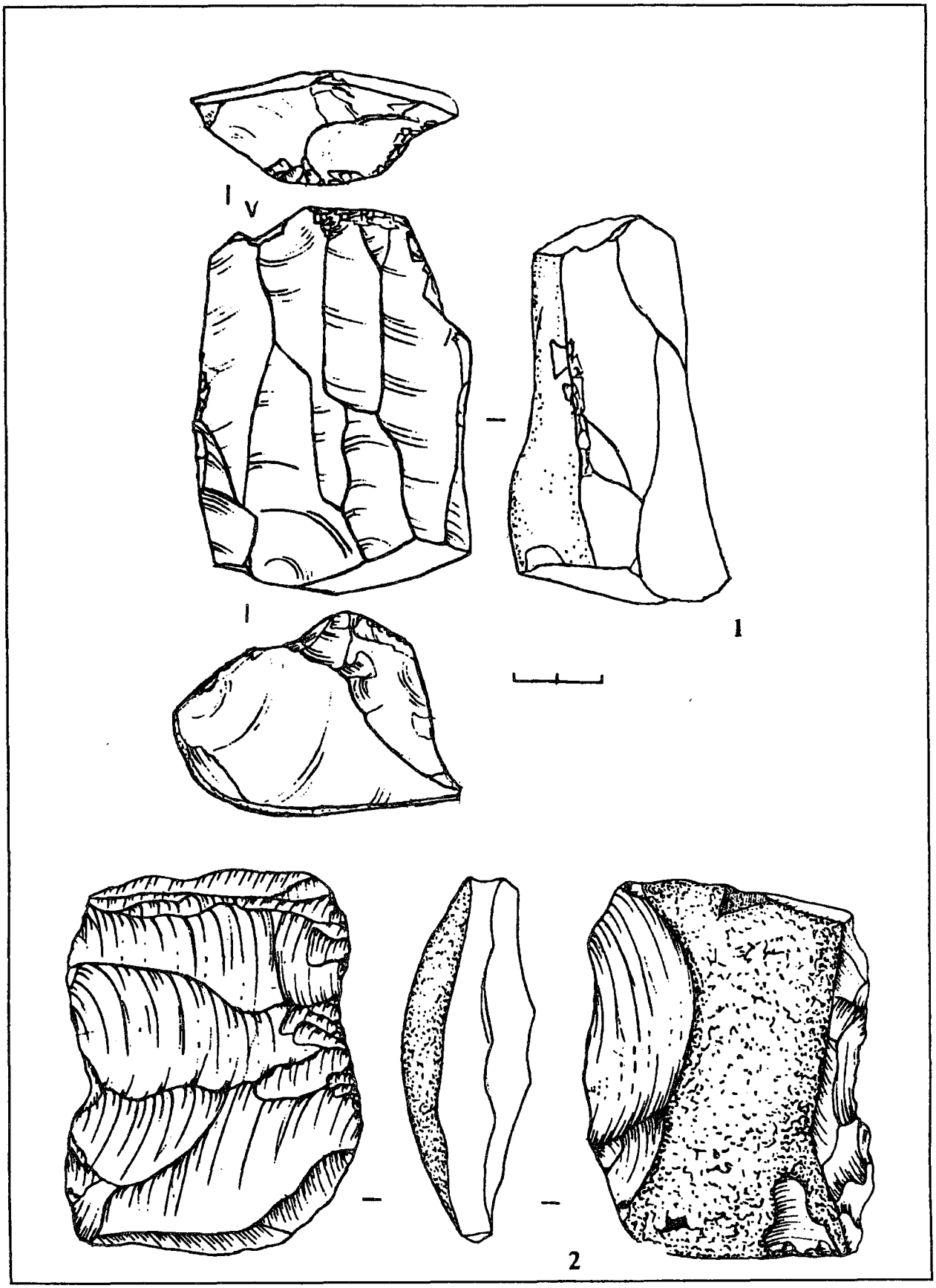

Figure 7 : Kulychivka. Flat cores: 1. Levallois recurrent flat two-platformed bi-directional core on nodule. Facetted and retouched platforms; evidence of trimming (reducing). 2. Levallois recurrent flat two-platformed bi-directional core on fragment of nodule. Facetted platforms; lateral debordants; transversal disposition of platforms.

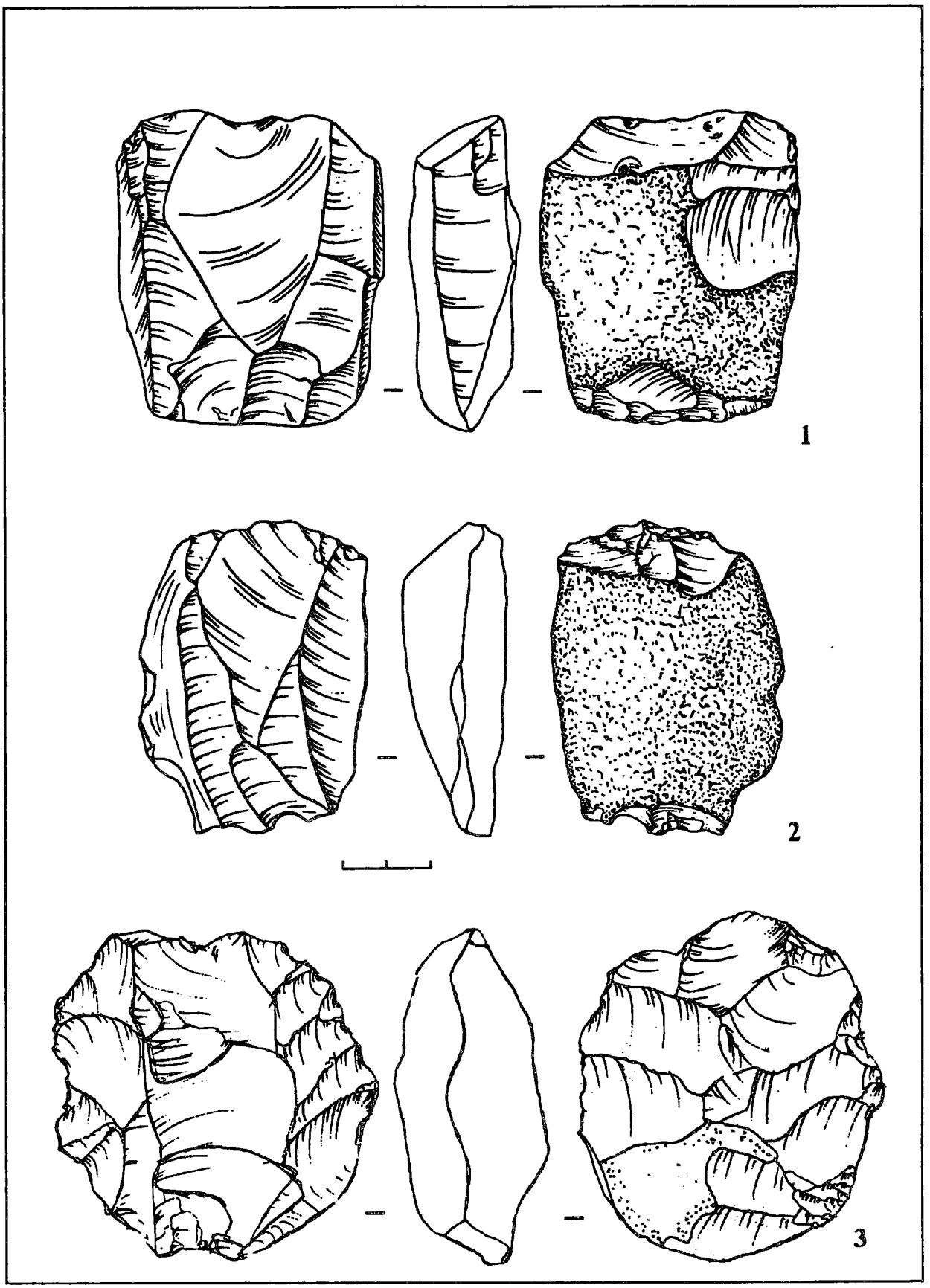

Figure 8 : Kulychivka. Flat cores: 1. Levallois recurrent flat two-platformed bi-directional core on fragment of nodule. Facetted and retouched platforms; lateral debordants. 2. Levallois recurrent flat two-platformed bi-directional core on flake. Facetted and retouched platforms; lateral debordant. 3. Levallois recurrent bi-directional core/ Bifacial disc.

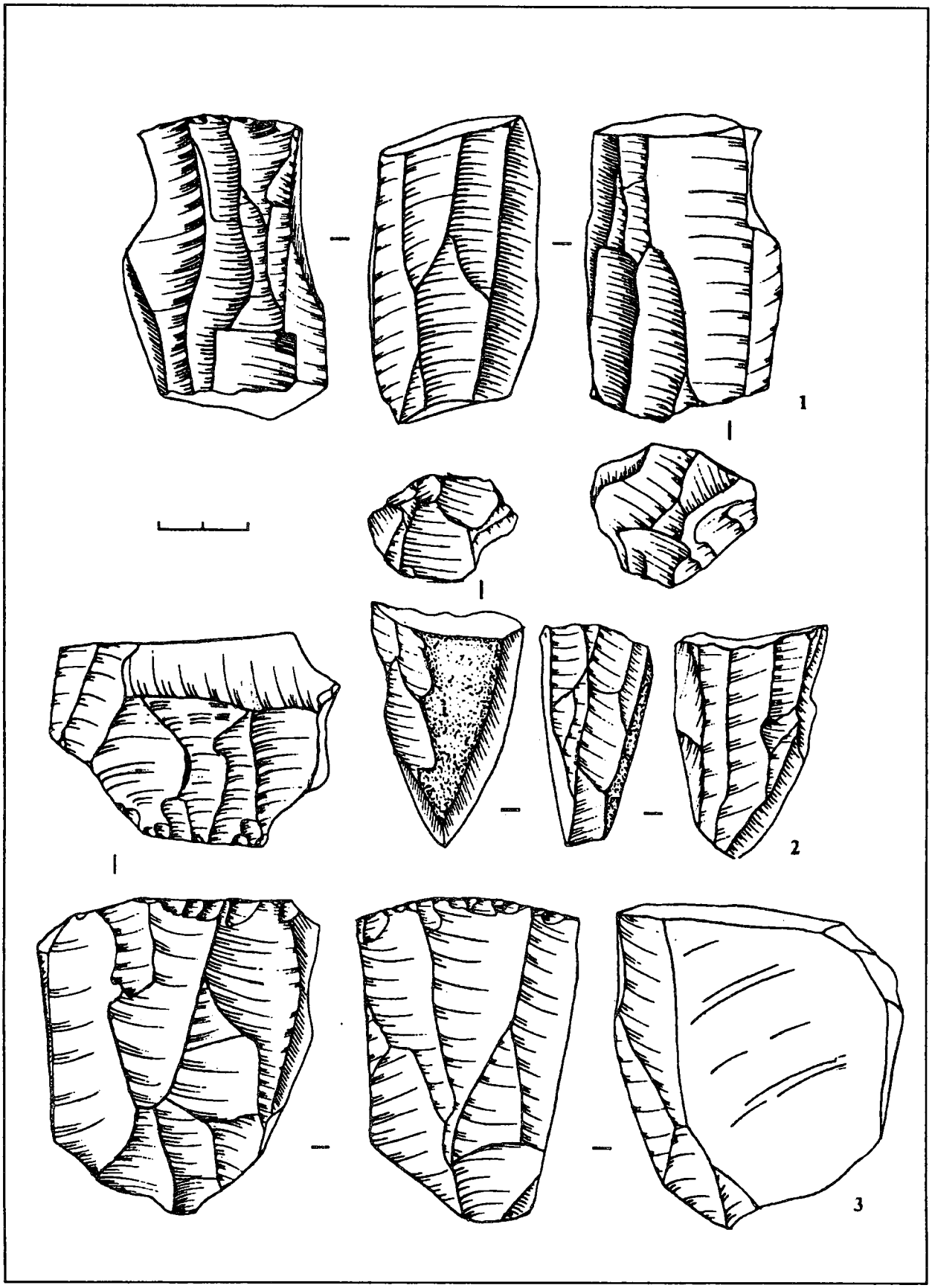

Figure 9 : Kulychivka. Volumetric cores: 1. Prismatic two-platformed bi-directional core. Facetted and plain platforms; evidence of reducing. 2. Parallel one-platformed core. Facetted platform; traces of crest. 3. Parallel one-platformed core. Facetted and retouched platform; evidence of reducing.

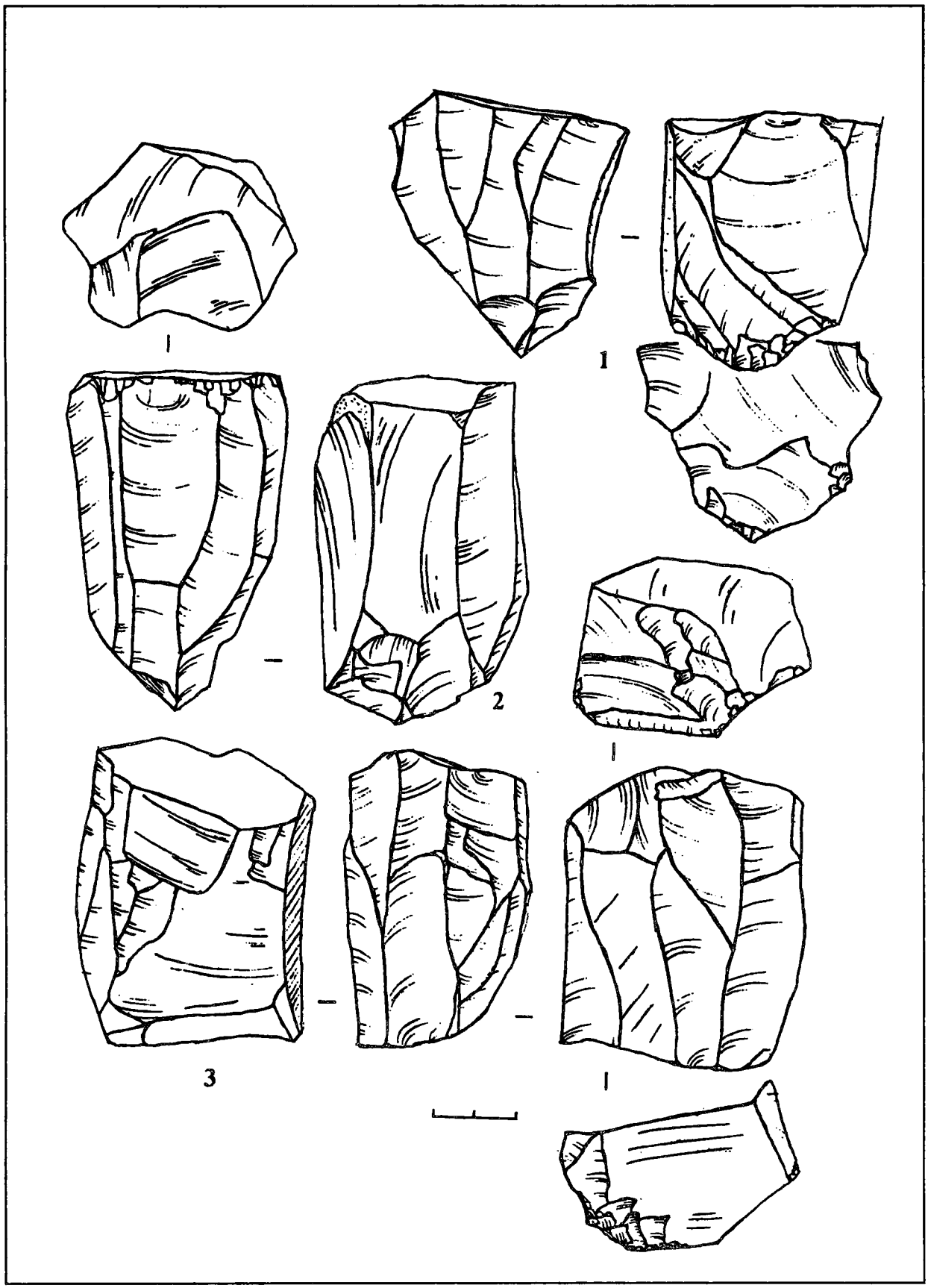

Figure 10 : Kulychivka. Volumetric cores: 1. Parallel one-platformed core. Facetted platform; traces of crest. 2. Parallel one-platformed core. Facetted platform; traces of decorticage; evidence of reducing; special preparation of zone opposed to platform. 3. Parallel two-platformed core. Facetted and retouched platforms. Probable example of combination of flat bi-directional Levallois knapping and semi-volumetric lateral flaking.

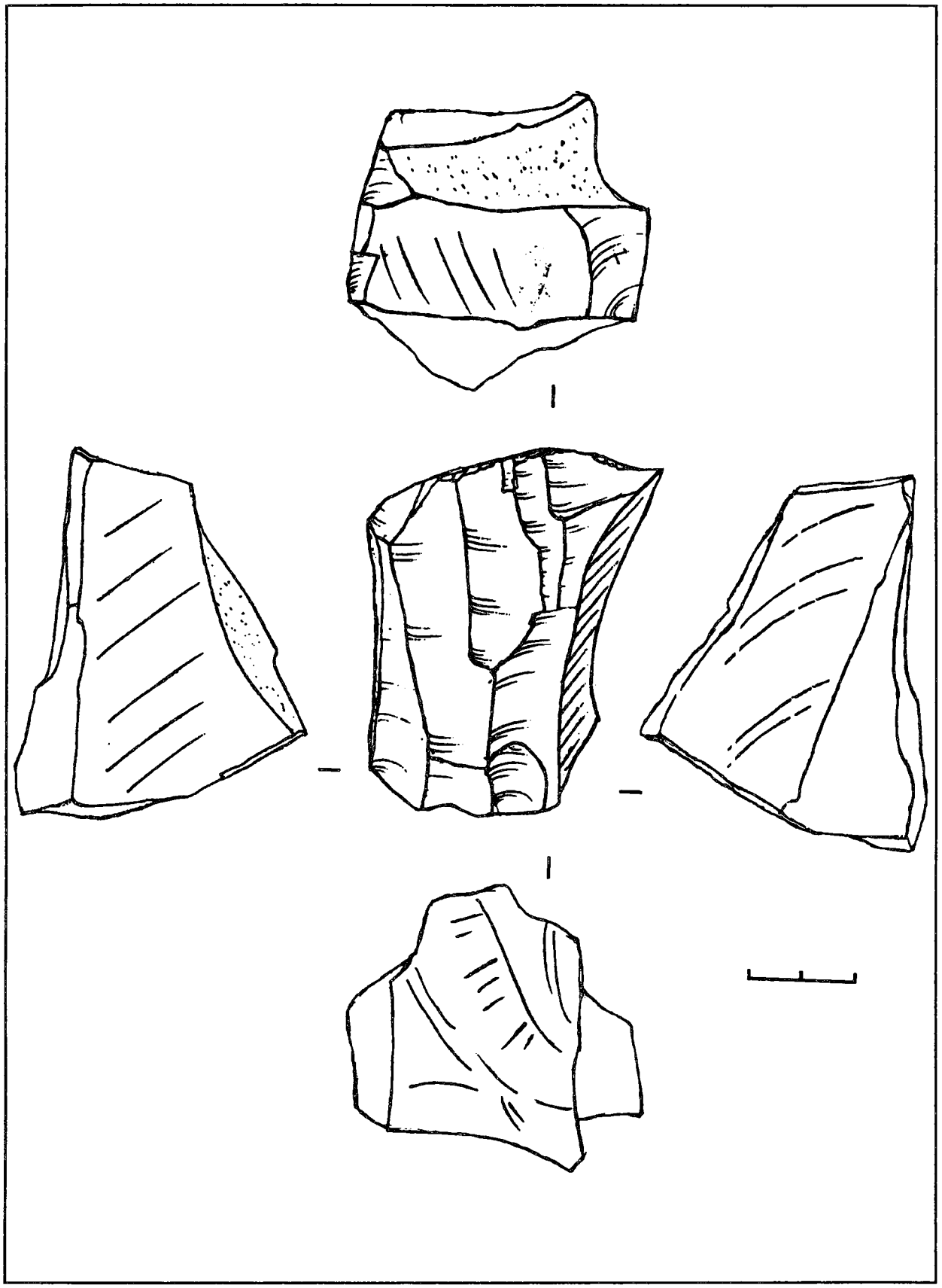

Figure 11 : Kulychivka. Volumetric cores: 1. Narrow lateral face parallel bi-directional core. Facetted and plain natural platforms. Evidence of reducing.

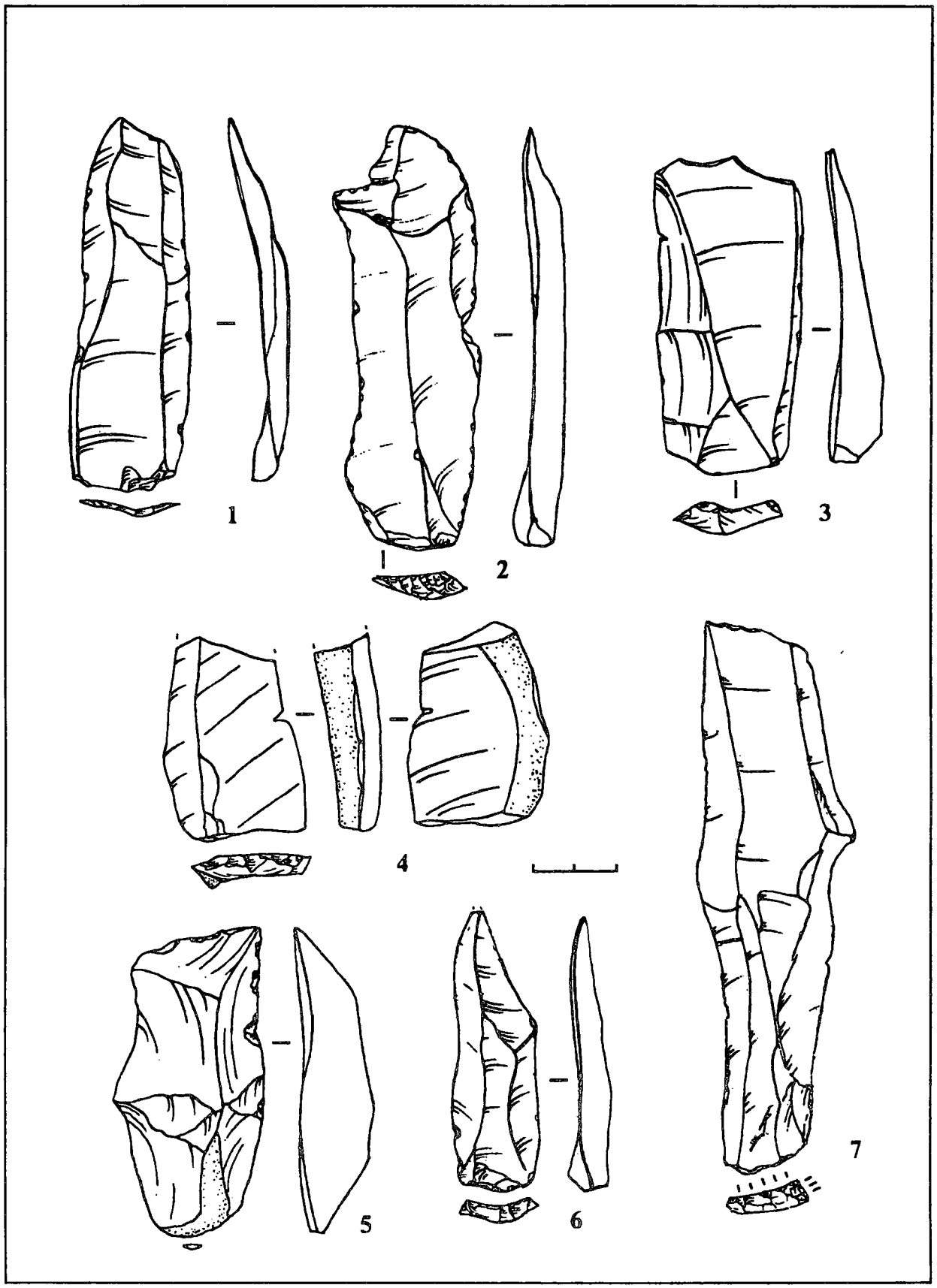

Figure 12 : Kulychivka. Different flake products: 1, 2, 6, 7. Levallois blades. Parallel bi-directional dorsal pattern, facetted butt. #7 demonstrates different orientation of retouching on butt. 3. Levallois blade. Bi-directional dorsal pattern with negatives of transversally oriented decorticage. 4. Debordant fake with cortical back, facetted butt. 5. Decorticage bladey flake resulted from disc-like pre-core.

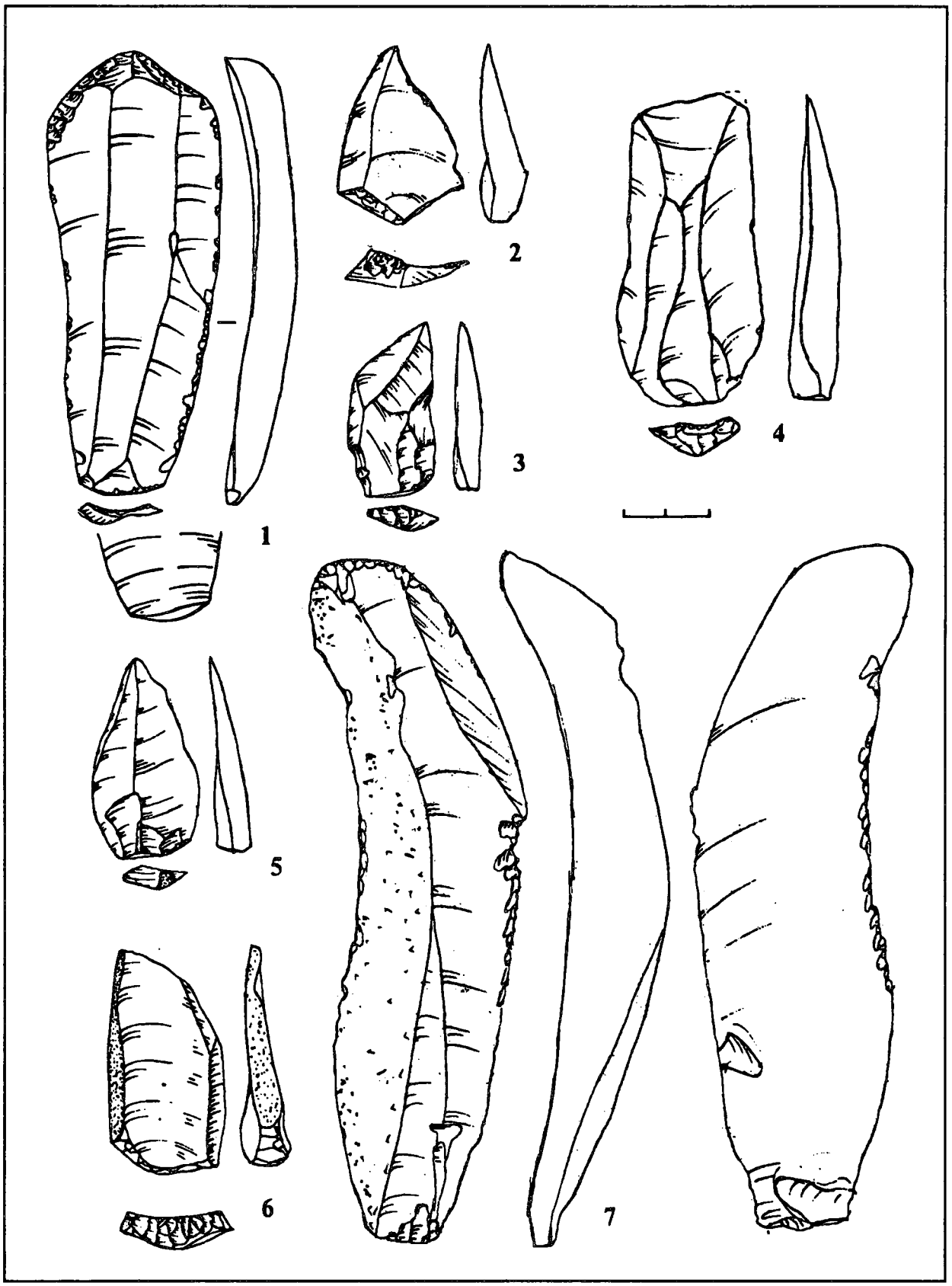

Figure 13 : Kulychivka. Different flake products: 1. End-scraper on blade resulted from parallel core. Parallel dorsal pattern; isolation, releasing, and abrasion of fracture zones. 2, 3, 5. Atypical Levallois point. Parallel bi-directional dorsal pattern, facetted and retouched butt. 4. Levallois blade. Parallel bi-directional dorsal pattern, facetted butt. 6. Debordant flake with cortical back, parallel bi-directional dorsal pattern, facetted butt. 7. End-scraper on decorticage blade resulted from parallel core. Parallel dorsal pattern, reducing of fracture zone.

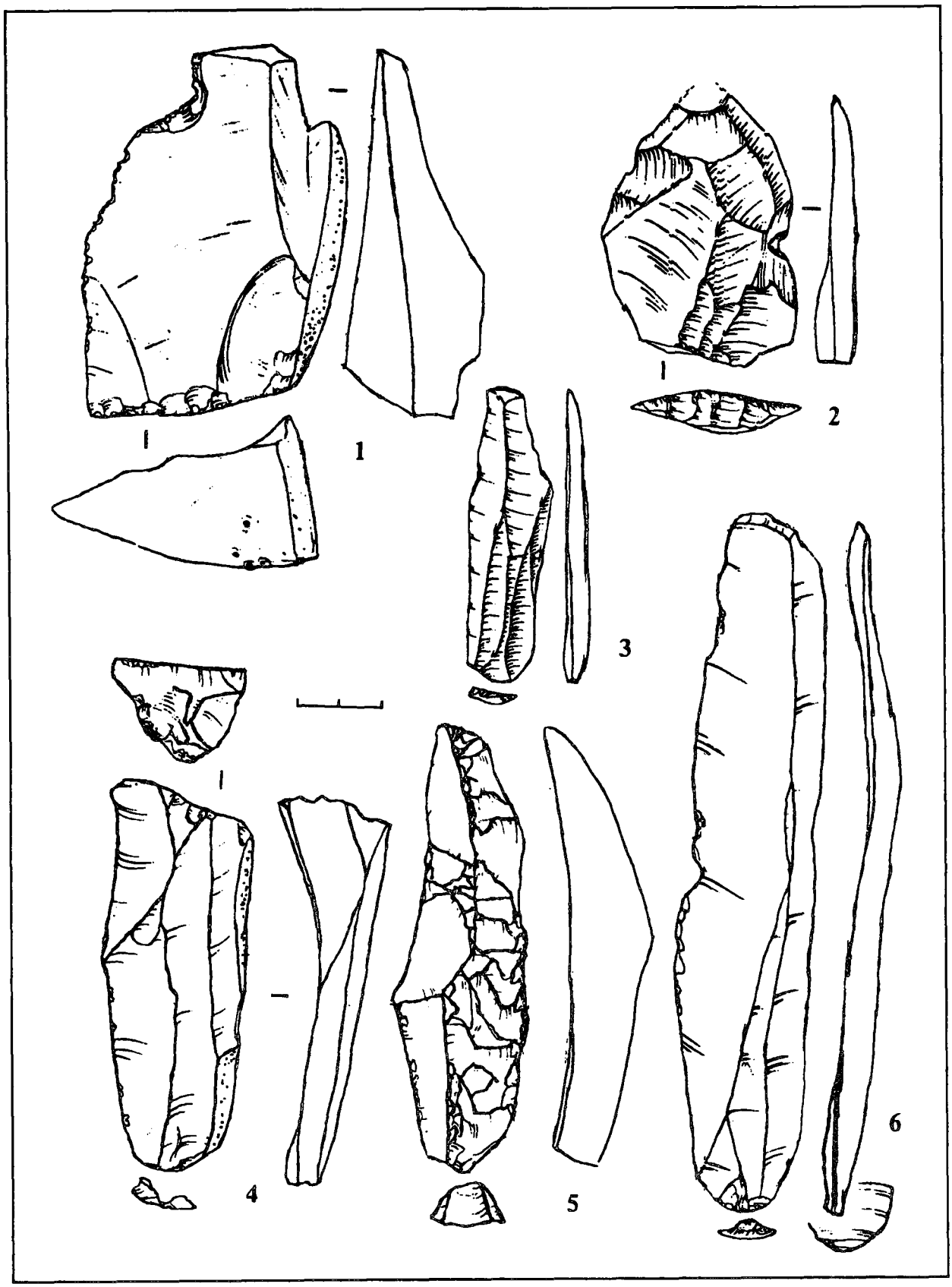

Figure 14 : Kulychivka. Different flake products: 1. Notched piece on decorticage flake. Natural dorsal pattern, plain butt with traces of hammerstone strikes, reducing of fracture zone. 2. Levallois flake. Centripetal-like dorsal patter, facetted butt. 3. Blade. Parallel bi-directional dorsal pattern, facetted butt. 4. Debordant bladey flake. Cortical back, parallel bi-directional dorsal pattern, facetted butt. 5. Crested blade with retouch. Facetted butt. 6. Blade resulted from parallel core. Parallel dorsal pattern, isolation, releasing, and abrasion of fracture zones.

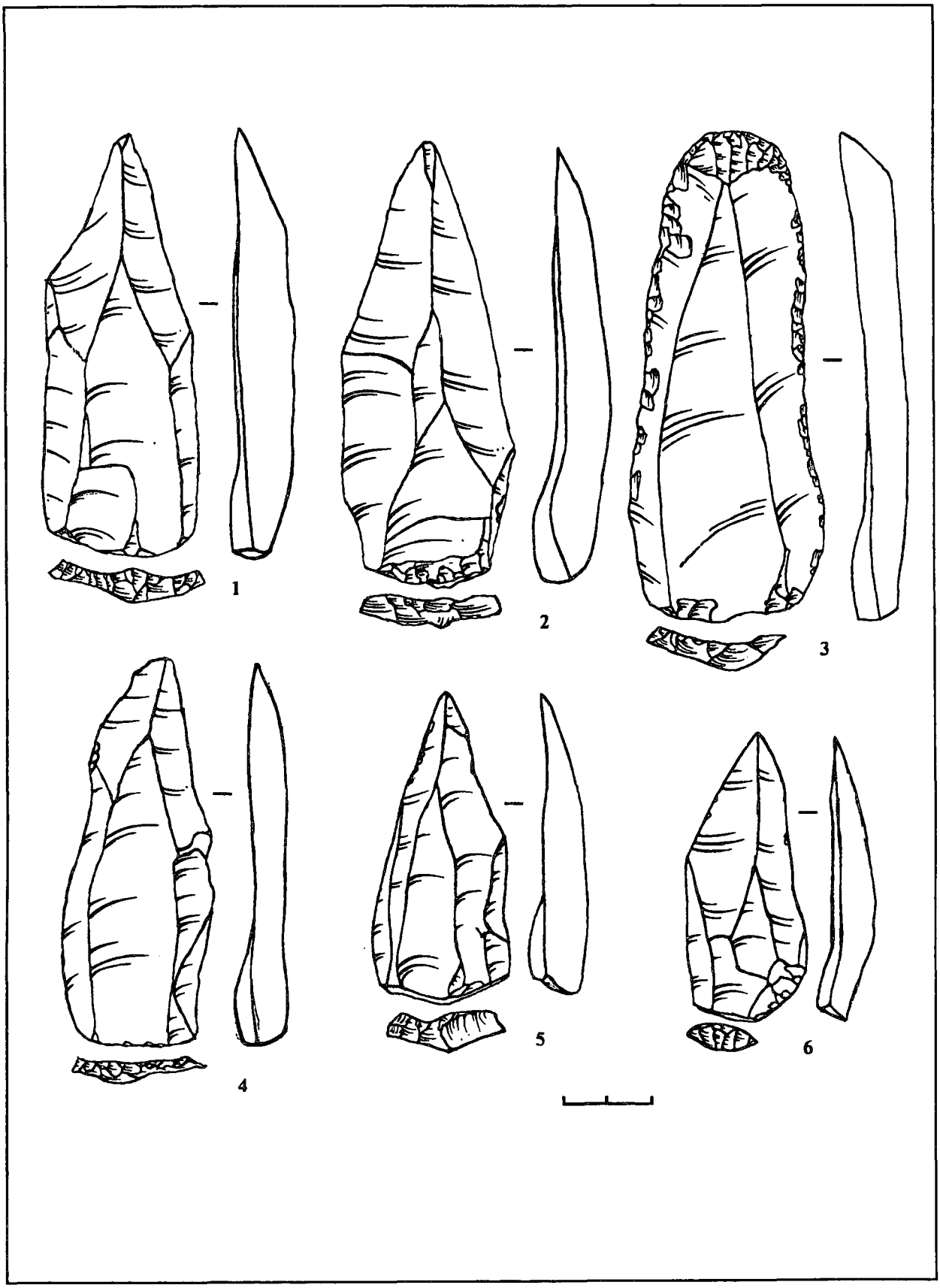

Figure 15 : Kulychivka. Different flake products: 1-6. Pointed Levallois flakey blades and Levallois points. ##1, 2, 4-6 - parallel bi-directional dorsal pattern, facetted butt. #3 - end-scraper, parallel dorsal pattern, facetted butt.

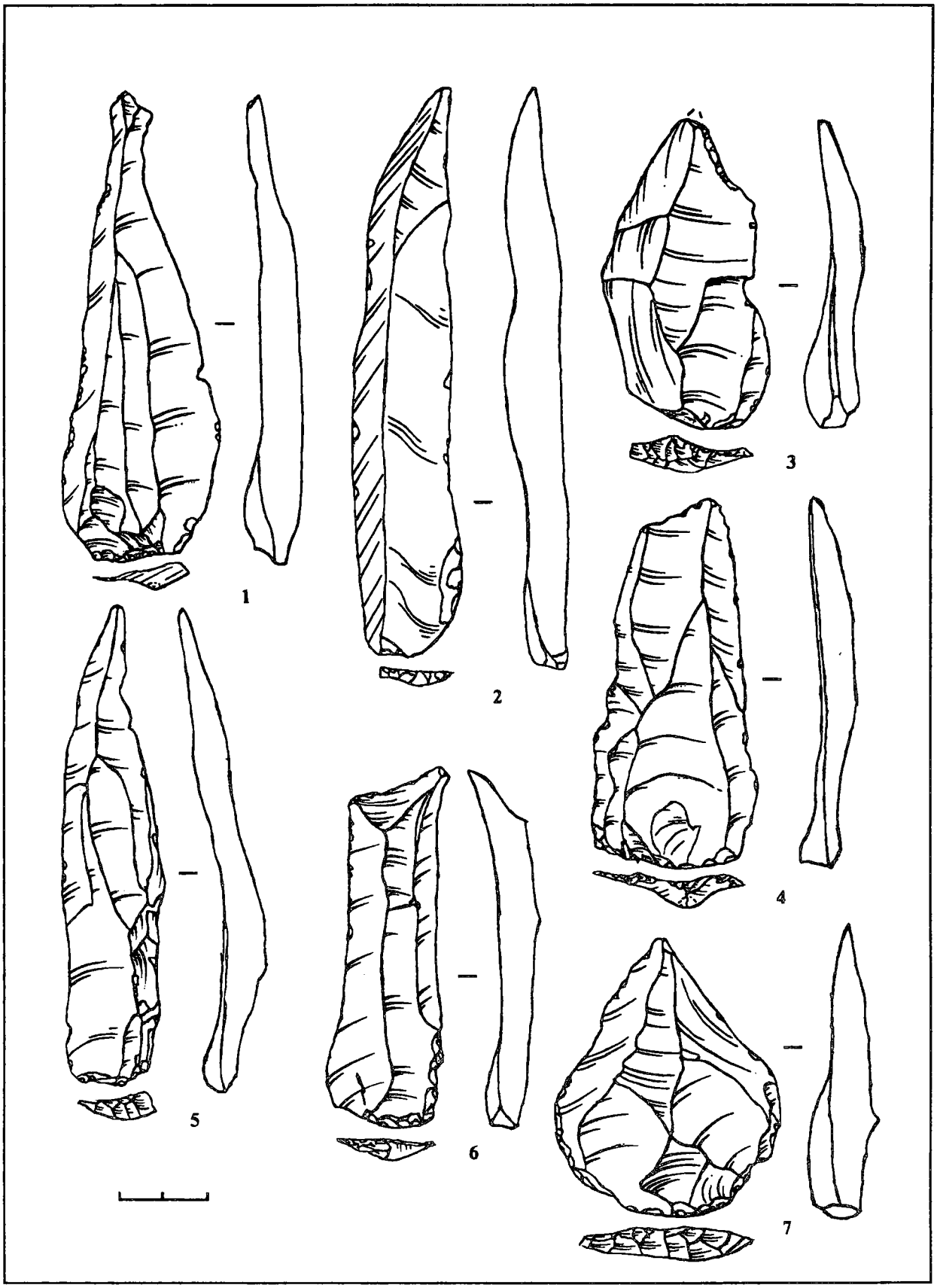

Figure 16 : Kulychivka. Different flake products: 1. Blade flake. Parallel bi-directional dorsal pattern, plain butt, evidence of trimming (reducing) of fracture zone. 2. Decorticage blade. Natural/ parallel bi-directional dorsal pattern, facetted butt. 3. Levallois bladey flake. Bi-directional dorsal pattern with negatives of transversally oriented decorticage. 4-6. Levallois blades. Parallel bi-directional dorsal pattern, facetted butts. 5. exhibits remains of crested zone. 7. Levallois point/ pointed flake. Centripetal-like dorsal pattern, facetted butt.

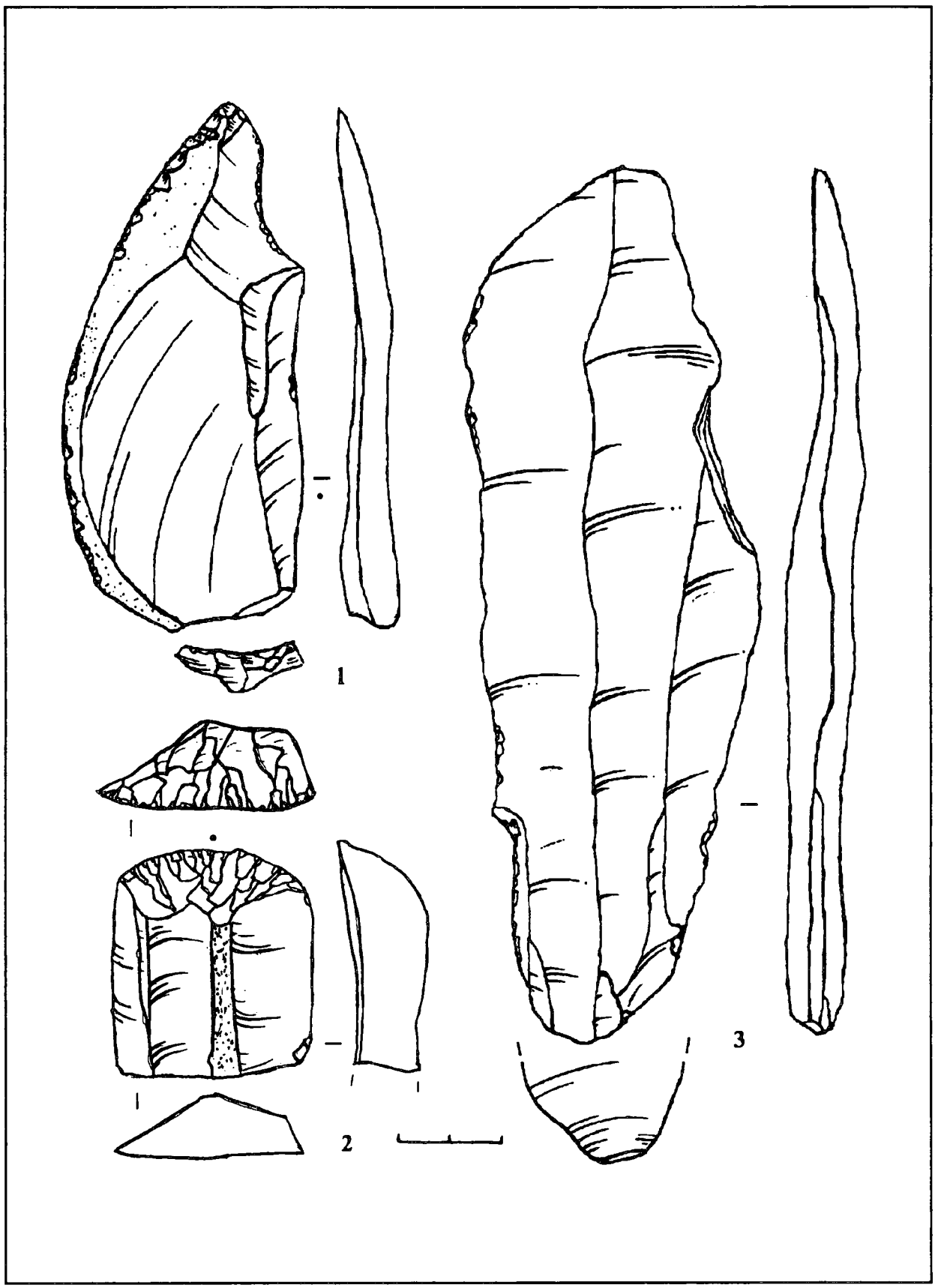

Figure 17 : Kulychivka. Different flake products: 1. Decorticage/ debordant flake. Parallel (?) dorsal pattern with negatives of transversally oriented decorticage; cortical back, facetted butt. 2. End-scraper on basal area of blade resulted from parallel core. Parallel bi-directional dorsal pattern. 3. Blade resulted from parallel core. Parallel dorsal pattern, lineal butt.

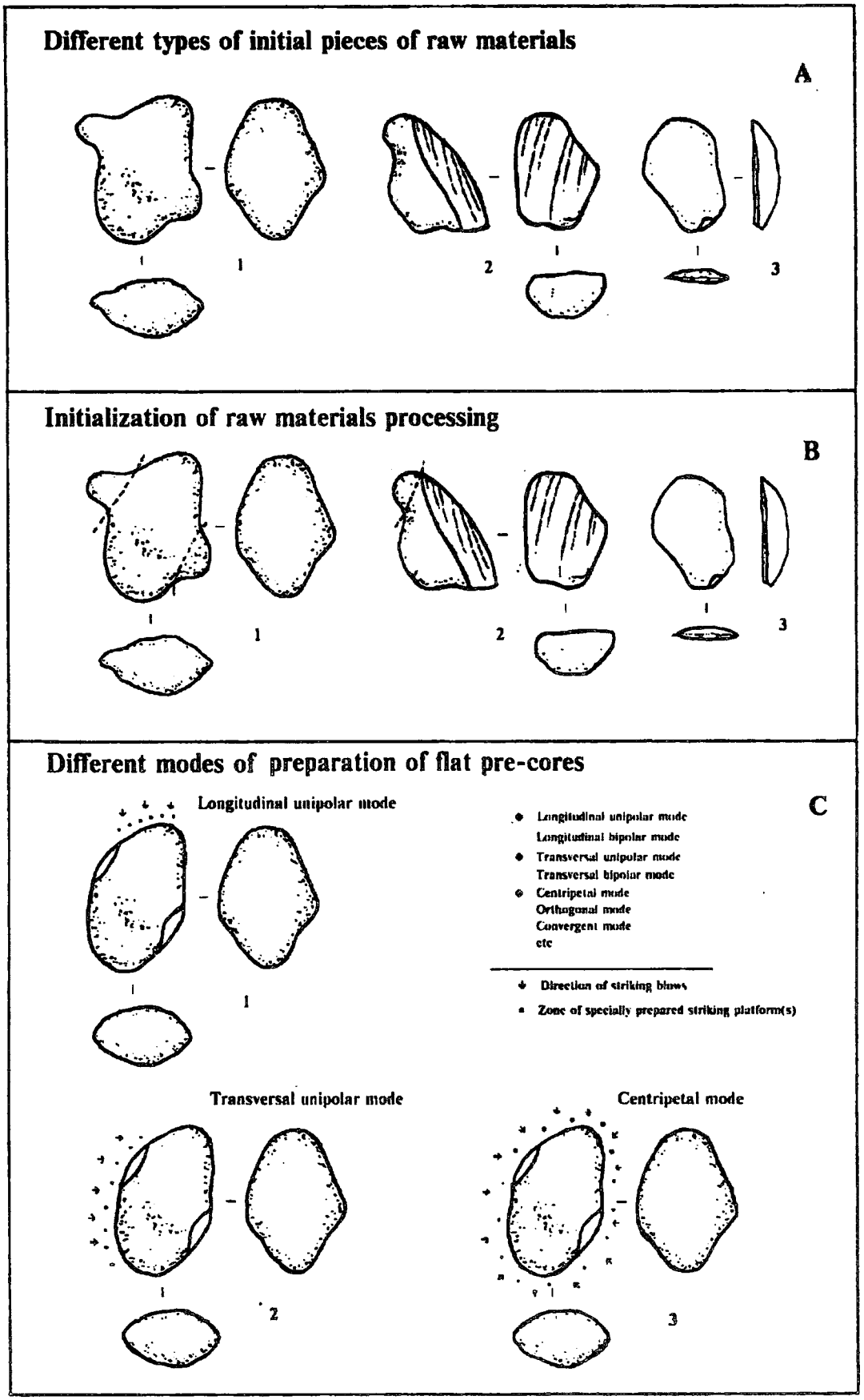

Figure 18 : Kulychivka chaine operatoire. A. Different types of initial pieces of raw materials. 1. Nodule. 2. Fragment of nodule. 3. Natural/ artificial flake. B. Initialization of raw materials processing. C. Different modes of preparation of flat pre-cores. 1. Longitudinal unipolar mode. 2. Transversal unipolar mode. 3. Centripetal mode.

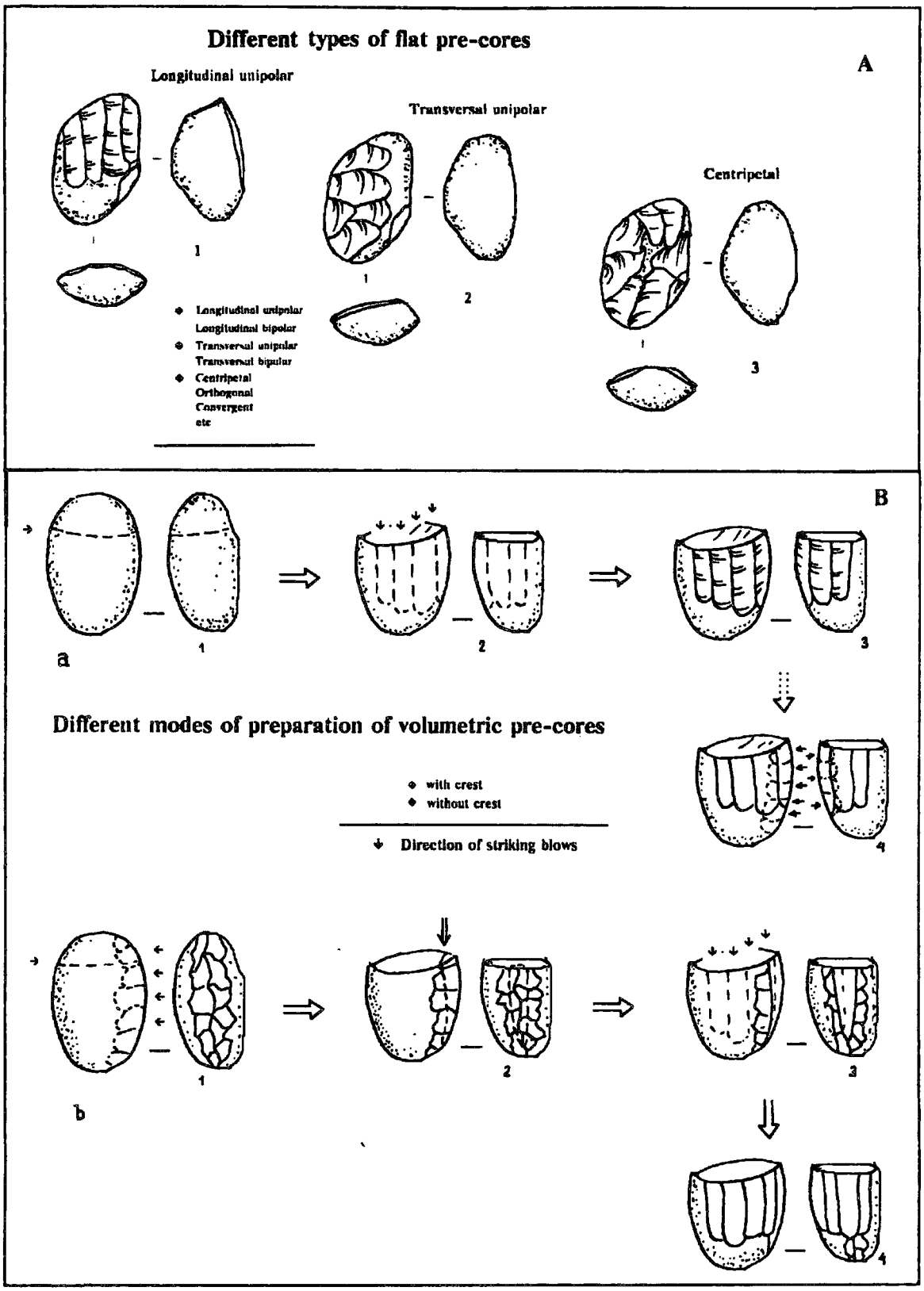

Figure 19 : Kulychivka chaine operatoire. A. Different types of flat pre-cores. B. Different modes of preparation of volumetric pre-cores. a. Decorticage without preparation of crest from the very beginning. Position 2 and 3 portray decorticage/ blank reduction. Position 4 illustrates probable shaping of crest in course of successful completion of decorticage. b. Decorticage initiated with crest. Position 4 portrays decorticage/ blank reduction.

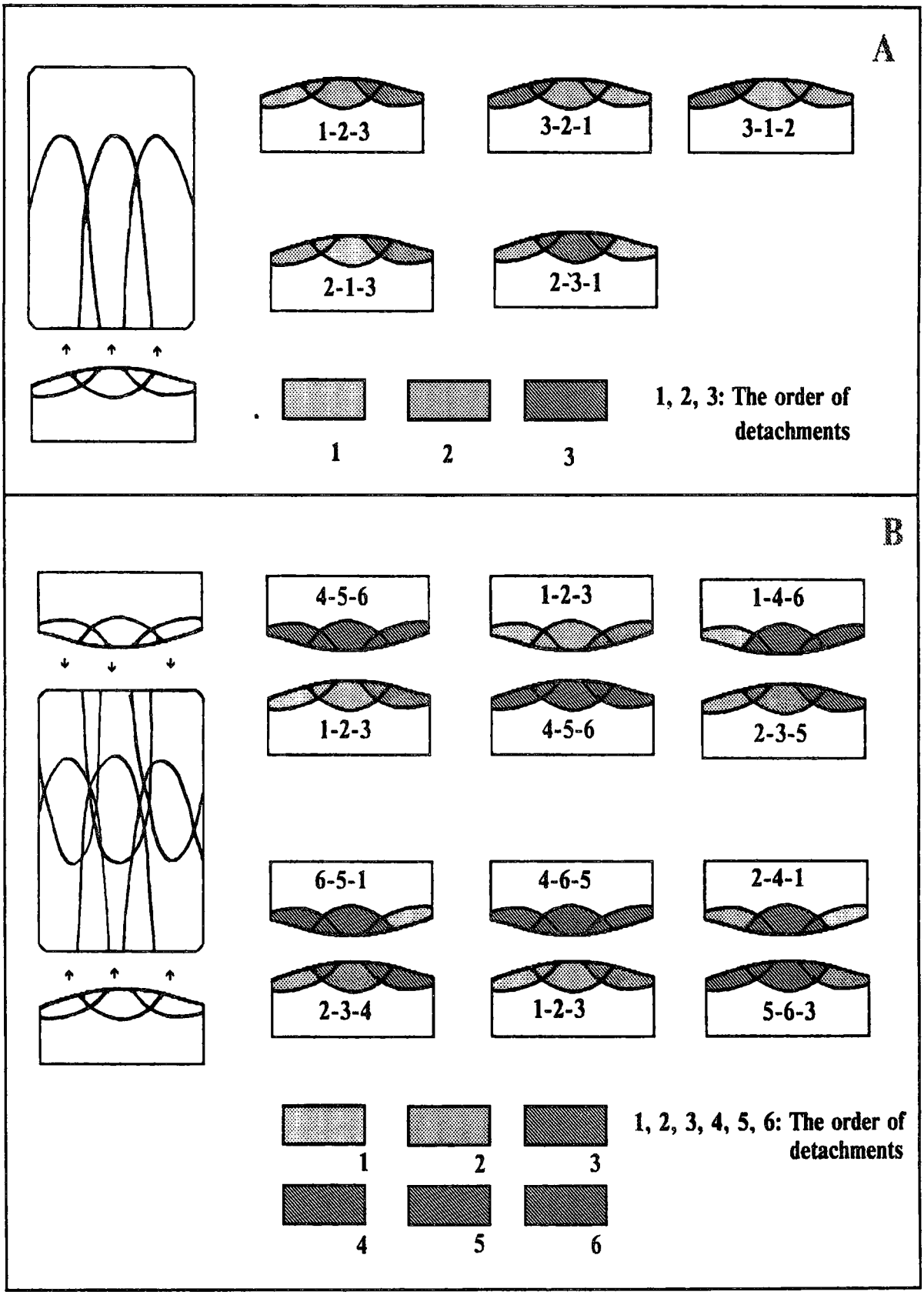

Figure 20 : Kulychivka chaine operatoire. A. Scheme of utilization of one-platformed flat core: various orders of detachments. B. Scheme of utilization of two-platformed flat core: partly presented various orders of detachments.

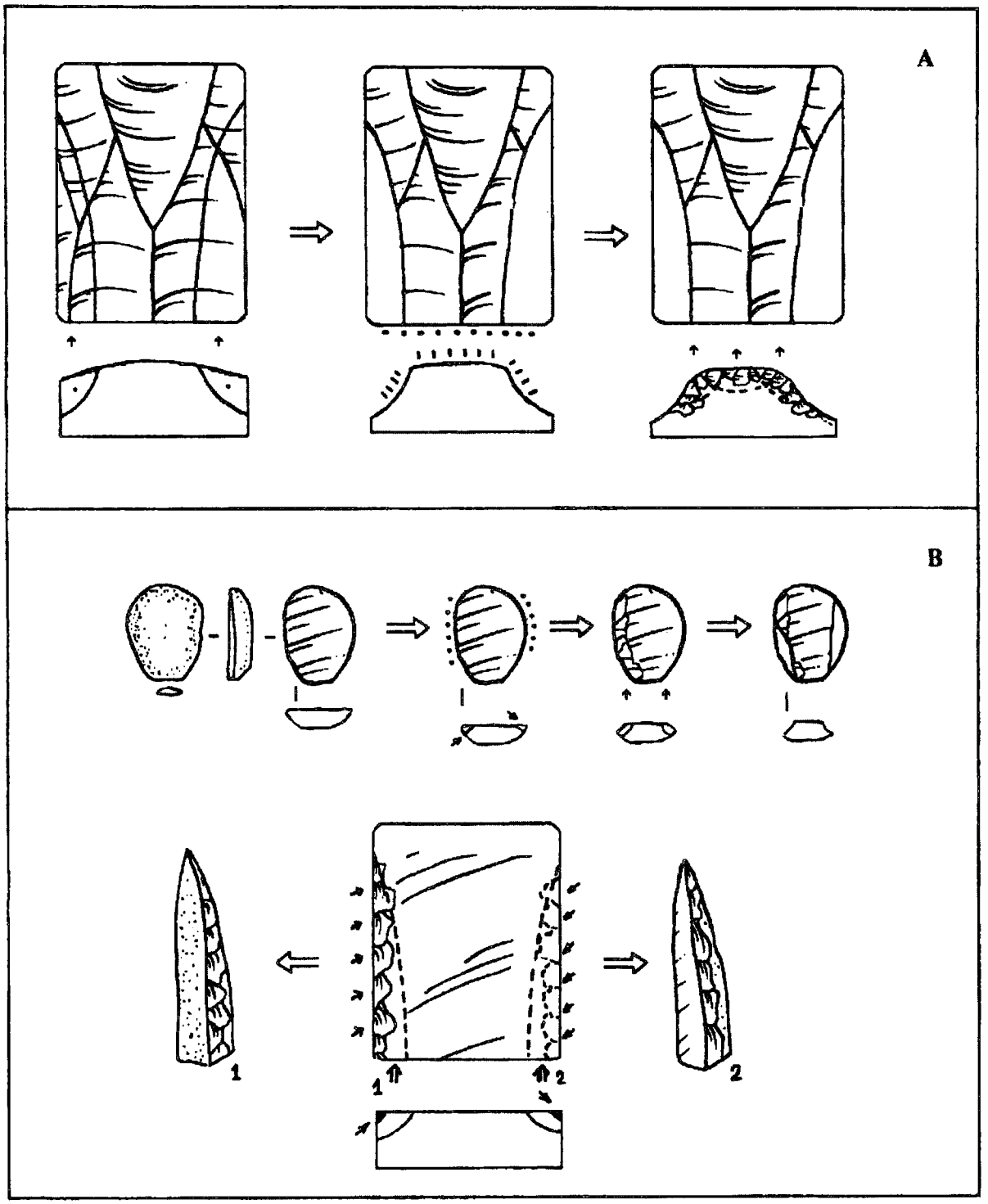

Figure 21 : Kulychivka chaine operatoire. A. Scheme showing mechanism of appearing of flakes which butts exhibit different orientation of facetting and retouching scars. B. Scheme showing the appearance of longitudinal debordant products morphologically similar to crested blades.

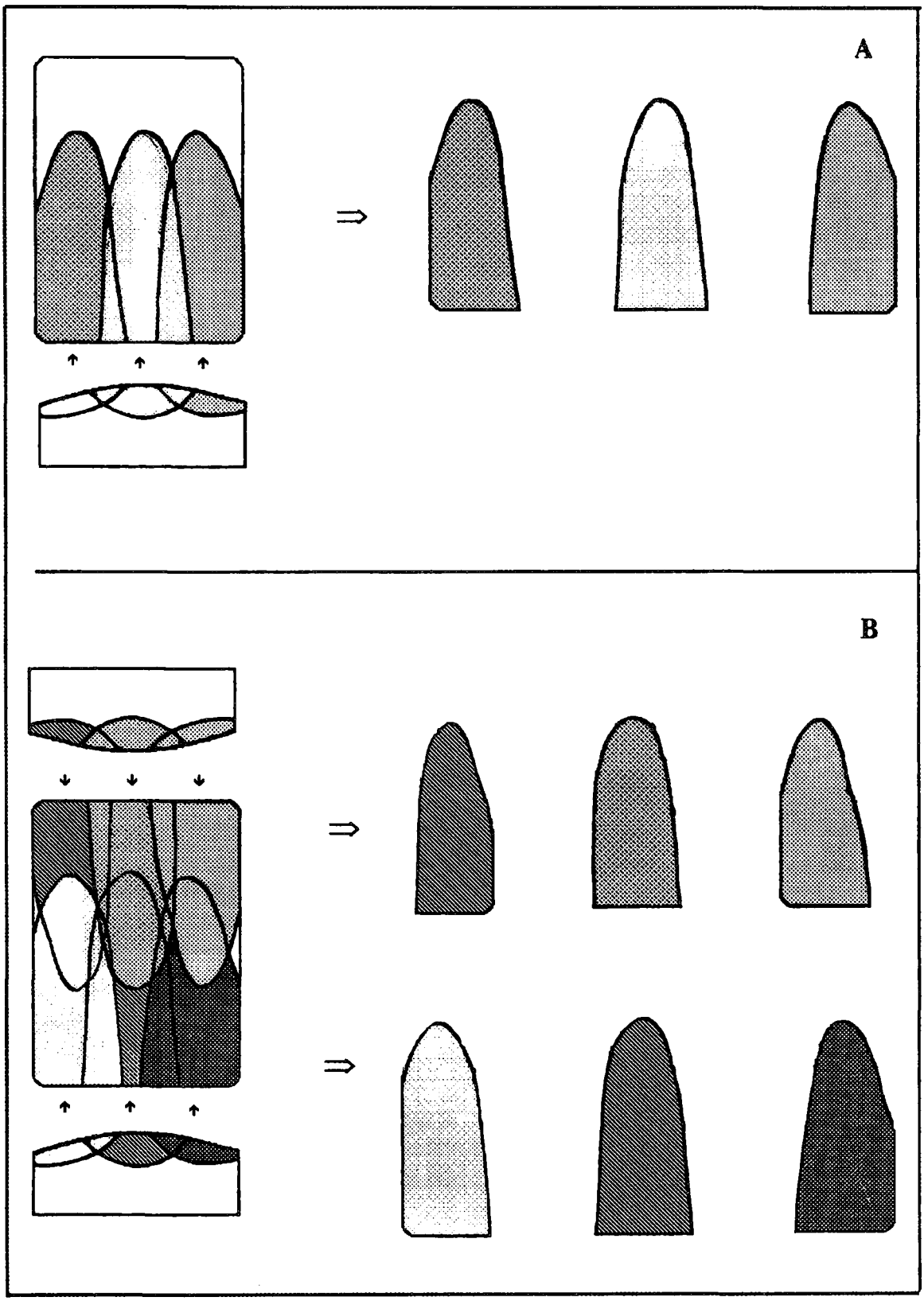

Figure 22 : Kulychivka chaine operatoire. A. Productivity of flat cores through one cycle of utilization: one-platformed core (A) and two-platformed one (B).