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PALAEOLITHIC SITES OF SURFACE OCCURRENCE IN THE ARID ZONE OF EURASIA: METHODS OF STUDYING AND POTENTIAL OF INFORMATION

ABSTRACT: The specific character of Palaeolithic sites located in the Arid zone of Eurasia and special methods of studying them are examined in the paper. Localities with surface occurrence of artifacts are compared with those occurring in the definite stratified contexts. These two data sources are complementary and thus speed up the process of spatial and temporal reconstruction.

KEY WORDS: Eurasia – Arid zone – Surface cultural horizon

Vast areas of Asia have been recently included into the scope of intensive archaeological investigations. A great bulk of new data has been obtained. In this junction, a stable tendency towards theoretical comprehension of new data and working out new methods revealing the nature of complexes under study have appeared in the Palaeolithic science.

As it is generally known, the arid zone occupies one third of the earth's surface. Many hundreds of thousands of Palaeolithic sites are situated there. In the arid zone, the denudation process dominates over the process of accumulation of loess sediments, so in majority of localities, artifacts lie on the surface. That is why a special type of Palaeolithic sites should definitely be singled out: localities with surface occurrence of artifacts.

Under the arid zone conditions, in the majority of Palaeolithic localities, culture-bearing horizons have never been covered with loess sediments. Only sporadic evidence of human activities can be recorded there: remains of hearths, dwelling structures, animal bones and artifacts. The term 'surface cultural horizon' should be applied to situations of this kind. These two terms being the basic ones distinctively separating Palaeolithic sites of the arid zone from Palaeolithic sites of all other kinds.

Buried culture-bearing layers are usually formed during a relatively short period of time, while the surface cultural horizons comprise accumulations varying in age. Distinctive features of a surface cultural horizon are as follows: 1) occurrence of cultural remains outside the loess sediments; 2) mixed character of cultural accumulations; 3) lithic artifacts constitute the main component of a surface cultural horizon, remains of hearths and stone structures are rarely encountered.

In the arid zone, Palaeolithic localities are mainly located in proximity to springs of different kinds or to the raw material sources. Due to the combination of these two factors, one and the same place was recurrently visited by ancient populations during rather long period of time. So

localities of this kind are of exceptional informative value. Concentrations of lithic artifacts occur practically *in situ* there. This is evidenced by the presence and character of debitage that allows not only to make the refitting of cores, but also to trace the sequence of secondary treatment. The Flint Valley locality situated on the piedmont plain south-east of the Arts Bogd range of the Gobi Altai (Mongolia) should be mentioned as an example (Derevianko *et al.* 1996). This locality was discovered by participants in the Joint Russian-Mongolian-American Expedition in 1996. The piedmont plain is subdivided into a number of mesa-like remnants that rise abruptly from the surrounding desert. Slopes of the remnants are densely covered by a network of ravines. The remnants are framed with deep channels of dried-up ancient watercourses – sairs. The mesas are composed of Cretaceous deposits. They are covered with dense flint horizons overlain with a thin layer of loose sediments that probably represent the erosion byproducts of Cretaceous deposits. The flint outcrops served as raw material for prehistoric inhabitants.

During the field seasons of 1996 and 1997, stationary investigations were carried out on one such mesa. The area of the mesa is of approximately six square kilometers. Up to 400 samples of primary and secondary treatment products, blanks and finished tools were recorded on each square meter of the locality under study. Hundreds of millions of artifacts of different stages of the Palaeolithic occur on the surface of the mesa. A small percentage of tools are referred to as Neolithic. The Flint Valley is among the most unique localities of surface occurrence of artifacts in the whole world. To study Flint Valley the same methods were applied that are usually utilized in excavations of stratified sites. To record precisely the position of artifacts, a 5 × 5 meter grid system consisting of 25 one-meter quadrates was established. Firstly, the whole area under study was photographed from the height of 10 meters, then each quadrate was photographed separately. Photogravimetric recording was executed by a special SWCT aerial camera "VICTOR HASSELBLAD A. B.". Then each quadrate, subdivided into 10 cm^2 sectors, was subjected to separate study including the registration of 15 attributes of artifacts (degree of abrasion, position of artifact, angle of inclination, tool type, etc.) and plotting them. Utilization of the method described allows to obtain the maximum amount of information from the Palaeolithic localities of surface occurrence of artifacts (Derevianko *et al.* 1996). Since the area on which the Palaeolithic materials are located in high concentration totals nearly 40 km^2, the investigation may be continued in Flint Valley for many years.

While studying numerous Palaeolithic complexes, an important task appears to classify sites in respect to the kinds of human activities. In the Palaeolithic of the arid zone, the most typical were workshops, temporal (seasonal) and residential sites. The mixed type of workshop/habitation sites has been also recorded. Workshop sites are characterised by: 1) large area of occurrence (of several dozen square meters); 2) high ratio of primary reduction products; 3) representative tool kit with some tools discarded due to technological defects. The features of a residential site are as follows: 1) relatively large area of occurrence; 2) lithic inventory dominated by tools and associated debitage. The typological analysis of the tool kit demonstrates that working edges are heavily worn out, trimmed or modified. Cores are not numerous. The main characteristics of a temporal site are: 1) small area of occurrence; 2) lithic artifacts are not numerous, containing a high ratio of tools, often certain groups of tools prevail over others.

Impressive localities where the lithic raw material was obtained and tested are often encountered in the arid zone. Localities at outcrops of raw material are not numerous. They are characterised by: 1) proximity to outcrops of raw material; 2) enormous amount of artifacts belonging to different epochs; 3) large number of preforms, big primary and secondary flakes; 4) absence or small percentage of tools.

Localities associated with concentrations of pebbles and isotropic rocks scattered on the surface are the most typical for the arid zone. Their main characteristics are: 1) proximity to trains of dejection of small rivers and to terrace accumulations of pebbles; 2) huge areas of occurrence, sometimes of dozens of square kilometers; 3) a very large amount of finds, often varying in age; 4) artifact collections dominated by preforms, cores, primary and secondary flakes.

Collections of lithic inventory, being a major source of information, require the use of special study methods. To separate materials of mixed complexes from a surface cultural horizon, a method of correlation of several significant attributes of artifacts has proven to be the most productive one. Firstly, it implies the classification of material by the kind of raw material. Secondly, classification of the material by the degree of surface preservation needs to be done. As it is known, the process of disintegration and destruction of rocks is of multi-factoral character. Several kinds of destructive factors can be recognised: 1) mechanical erosion – temperature fluctuations, frost action, deflation, corrosion; 2) chemical erosion – dissolution, calcification, hydroxidation, hydrotation; 3) biological erosion – action of water-plants, moss, worms, animals, etc.

Thirdly, types of cores and tools should be identified. Then cases of reworking of artifacts made in different periods of time must be registered.

Techno/typological analysis includes four stages. The first one implies the analysis of primary flaking. Several operations can be singled out. The character of the raw material selection is traced on preforms and cores. Then the whole technological sequence (from original blank to a precore) is examined. The precore is an artifact that was used for detaching regular flakes. This is especially well manifested in the Levallois tradition of primary reduction. The main link of the technological chain – the core

FIGURE 1. The arid zone of Asia. 1 – Flint Valley; 2 – Semizbugu; 3 – Kyzyltau; 4 – Tanirkazgan and Borykazgan.

exploitation – is reconstructed. In the Palaeolithic collections of the arid zone, the following systems of primary flaking have been identified: orthogonal, segment-like (slice and/or citron reduction strategy), Levallois, subparallel, parallel (including wedge-shaped and prismatic cores for microblades).

The second stage of the techno/typological analysis also implies a series of operations. It results in the elaboration of typological lists in respect to periods (Early Palaeolithic, Mousterian, Late Palaeolithic) and in establishing the typology of secondary treatment (types of retouching, trimming, dissection, hewing, burin spalls, piquetage).

At the third stage, typological characteristics of debitage by three main units of technological chain are defined: 1) primary reduction; 2) ordered flakes; 3) secondary treatment. This stage of the analysis is based on morphometric features, statistical calculations of attributes and computing of typological indices in order to create a conventional model of the lithic industry.

The above mentioned methodological directions should be followed while studying any large collection from sites with surface occurrence in the arid zone. Since the problems to be solved in the process of study are rather numerous and complicated, this paper will focus exclusively on the ways of evolution of Levallois reduction techniques (Derevianko, Petrin 1995). The earliest complexes (the heavily and moderately abraded series of lithic artifacts) will be taken as illustrations. Among the Palaeolithic sites of the arid zone, workshops are undoubtedly the most informative sites. They represent a wide chronological range and provide rich scientific material of high quality. As an example, the analysis of several complexes of this kind – Flint Valley in Mongolia and Semizbugu in Kazakhstan – is given in comparison with sites of Kyzyltau, Tanirkazgan and Borykazgan (Kazakhstan) *(Figure 1)*.

The Flint Valley locality is determined as a long-term workshop situated in proximity to outcrops of raw material (Derevianko *et al.* 1996). The collection of artifacts assembled from two loci of 37 sq. m. numbers 1,899 specimens. They may be subdivided according to four stages of relative preservation of the surface: heavily abraded, moderately abraded, lightly abraded, and unabraded series. The series of heavily abraded artifacts includes objects with dramatically smoothed edges, barely

discernible flake scars, and surfaces degraded by etched cavities. The moderately abraded series of artifacts is characterized by less smoothed edges, less pronounced cavities and clear flake removal scars. It should also be noted that at Flint Valley site, artifacts were produced on one kind of homogeneous raw material from a single geomorphological setting, and that all the artifacts were equally exposed to the impact of natural/geographical conditions. The heavily abraded complex is represented by 1,704 artifacts. The core-like specimens (6.38 % of the complex) demonstrate a tendency towards removing wide short spans of large and medium size. Orthogonal cores form a fairly high percentage (31.5 %). Cores with single platform show a tendency to transversal flaking, though distinctive flake scars are not numerous. Striking platforms produced by the removal of one or two spans are always beveled relative to the cleavage surfaces. The cleavage surfaces on the majority of cores are formed by centripetal removals. The ratio of Levallois cores in the heavily abraded series is 3.7 % *(Figure 2)*. Short spans were mainly detached from Levallois cores of different forms *(Figure 3)*. Metric parameters of the spans (1,295 specimens, 71.9 % of the whole collection) indicate the prevalence of small objects (from 1 to 3 cm), constituting 55.8 %. Quite different is the situation observed with spans that were used for tool production. This group is dominated by large (47.8 %) and medium-sized spans (40.5 %). The analysis of preserved striking platforms indicates a predominance of plain platforms (88.6 %); IF_{large} is 11.4. Faceted platforms are practically absent.

The tool kit consists of 217 specimens (12.73 %). Side-scrapers of various modifications are numerous (32.7 %). Backed pieces, notches and spur-like tools are also present (20.7 %).

The series of moderately abraded artifacts totals 1,927 specimens (10.15 %). Primary reduction is represented by orthogonal, Levallois and parallel knapping strategies. The orthogonal cores (31.39 %) are large and produced wide, large spalls. The Levallois cores (22.9 %) include those with the face prepared by centripetal flaking and with distinctly prepared striking platforms *(Figure 4)*. The most representative Levallois cores exhibit one of the lateral margins trimmed into the form of a bifacial ridge. Elongated spans were removed from them. Cores of parallel principle of knapping are of subordinate position (10.5 %).

Flakes (74.2 %) constitute the most numerous category of spalls. Many identifiable striking platforms were prepared: IL_{large} – 50.9 %, IF_{strict} – 6.7. This group of spans is dominated by small objects (47.5 %). Large (52.3 %) and medium-sized (38.4 %) blanks prevail *(Figure 5)*. The tools kit includes side-scrapers of several kinds, notches, spur-like tools and composite tools. Among the side-scrapers, single forms predominate.

Thus in the heavily and moderately abraded series of Flint Valley that may be correlated with pre-Mousterian and possibly Mousterian industries, the presence of the Levallois technical tradition is clearly traced. Its share is obviously raising from ancient (3.7 %) to more recent (22.9 %) time period.

The second site – Semizbugu (Locus 2) is located in the northern Cis-Balkhash region, in the highlands whose highest point is of 759 m of absolute height (Derevianko *et al.* 1993). The highlands were formed due to the breaking of Devonian sediments, composed of siliceous aleurolites and sandstone. Deluvial-proluvial trains of different age are situated at the foot-hills. There is much sandstone and aleurolite debris on the ancient trains. Lithic artifacts made of black siliceous aleurolite were found among them.

Locus 2 is located on the deluvial train. Its total surface is approximately 2,500 × 300 m. This site probably represents a workshop associated with concentrations of raw material scattered on the surface, i.e. a workshop of the second kind. The concentration of finds is much lower when compared with Flint Valley.

The collection from Semizbugu (Locus 2) comprises 1,611 artifacts made of aleurolite. They may be subdivided according to three stages of surface preservation: heavily abraded, moderately abraded, and lightly abraded. This subdivision is based on the same features as in the collection from Flint Valley. The first group comprises artifacts with smoothed edges and flake scar surfaces that can hardly be distinguished from cortex. Artifacts in the second group are characterised by less smoothed edges and flake scar surfaces that differ by colour from the cortex. Only heavily and moderately abraded artifacts are discussed below.

The group of heavily abraded objects characterising primary reduction strategy is represented by 96 specimens: preforms (18), cores (5), fragments (3), the rest are core rejuvenation flakes. The most impressive are Levallois cores *(Figure 6)*. Three cores are oval. Their flake faces were prepared by centripetal flaking. After that a tortoise-like flake was removed. The striking platform is small. It is bevelled relative to the flaking face at an angle of 60°–70°. One of the longitudinal edges of the cores was deliberately worked on both faces.

In general, this industry is characterized by the following indices: IL – 35.9; IF_{ty} – 18.9; Il_{am} – 20.7; IF_{st} – 42.2; IF_{large} – 50.8. Spans tend to be elongated *(Figure 7)*. The tool kit (220 specimens) is obviously dominated by notched and denticulated pieces (70.9 %). Side-scrapers of different sorts are less numerous (15.4 %). Retouched blades, flakes and knives are in minority.

The moderately abraded series, being the largest one, comprises 952 specimens, including 826 artifacts associated with primary reduction: preforms (88), cores (165); the rest are fragments, core rejuvenation flakes, cortical spalls and flakes. The group of Levallois cores comprises 78 specimens. They represent a variety of types *(Figure 8)*. The main core types are tortoise-like, single and double platform monofrontal for blades *(Figure 9)*. Technical indices of the industry of the moderately abraded series are as follows: IL – 37.5; IL_{ty} – 34.6; Il_{am} – 16.6; IF_{st} – 21.4; IF_{large} – 31.6. The tool kit (126 specimens) is

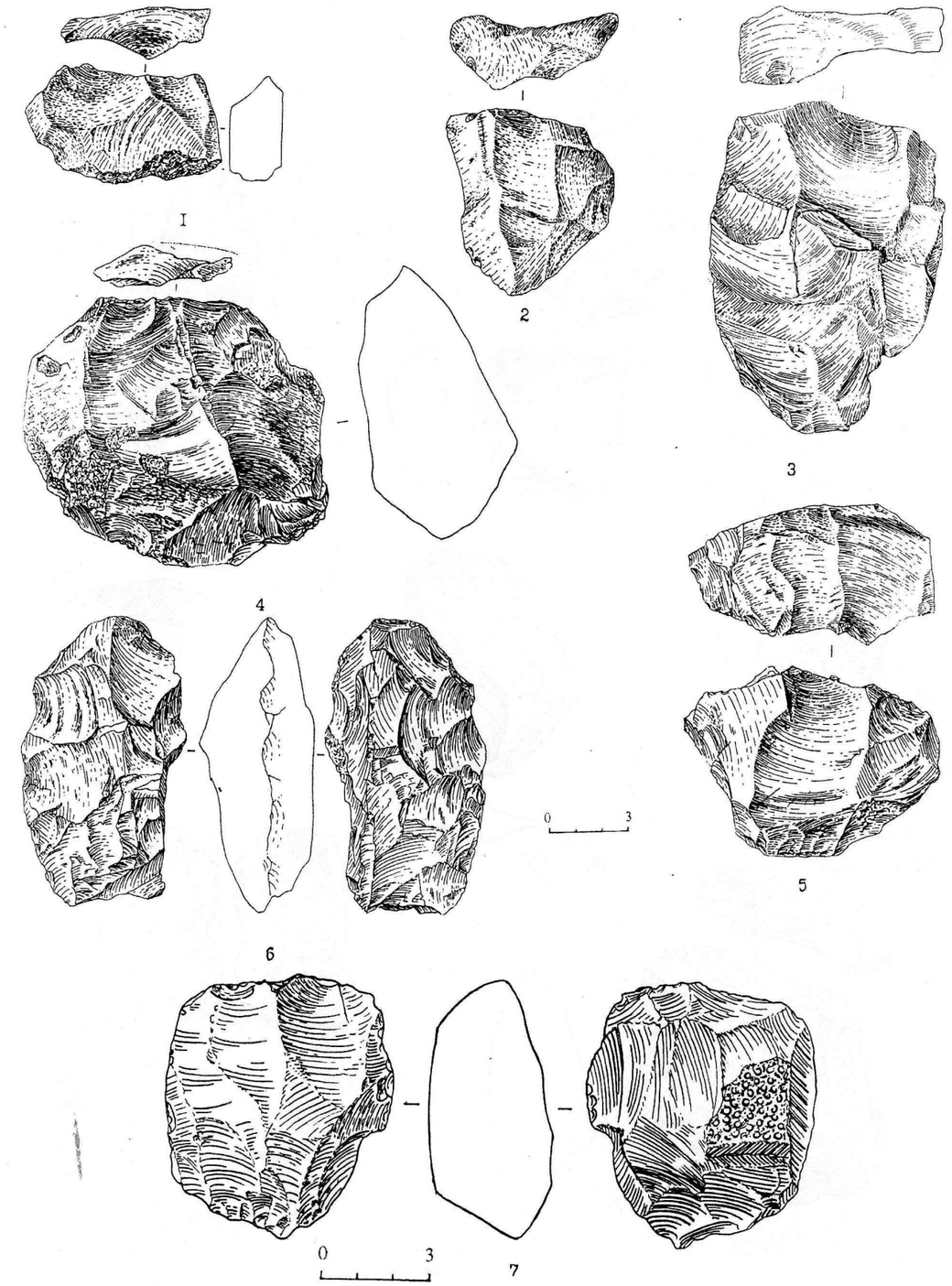

FIGURE 2. Mongolia. Flint Valley. The heavily abraded series. Levallois cores.

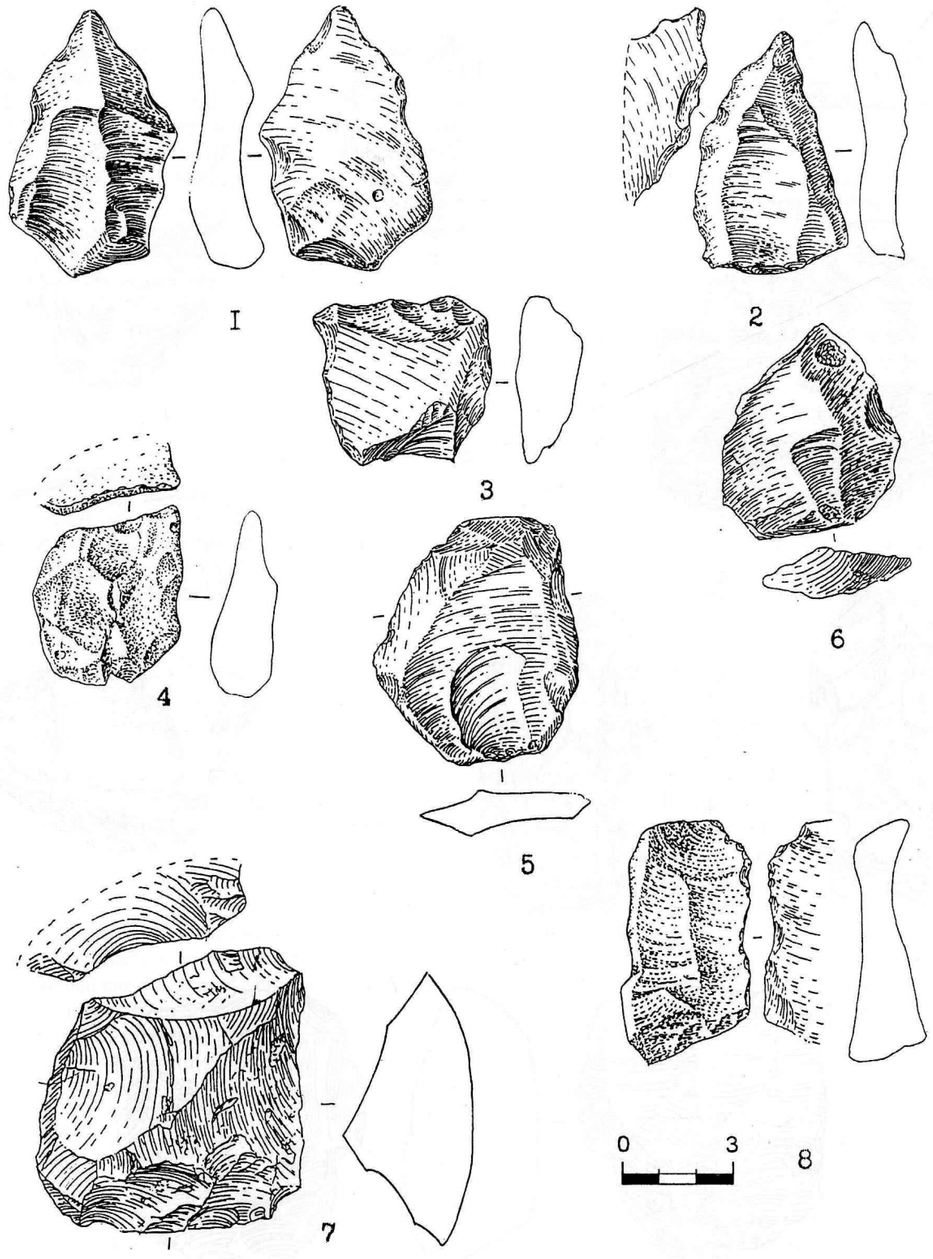

FIGURE 3. Mongolia. Flint Valley. The heavily abraded series. Spalls.

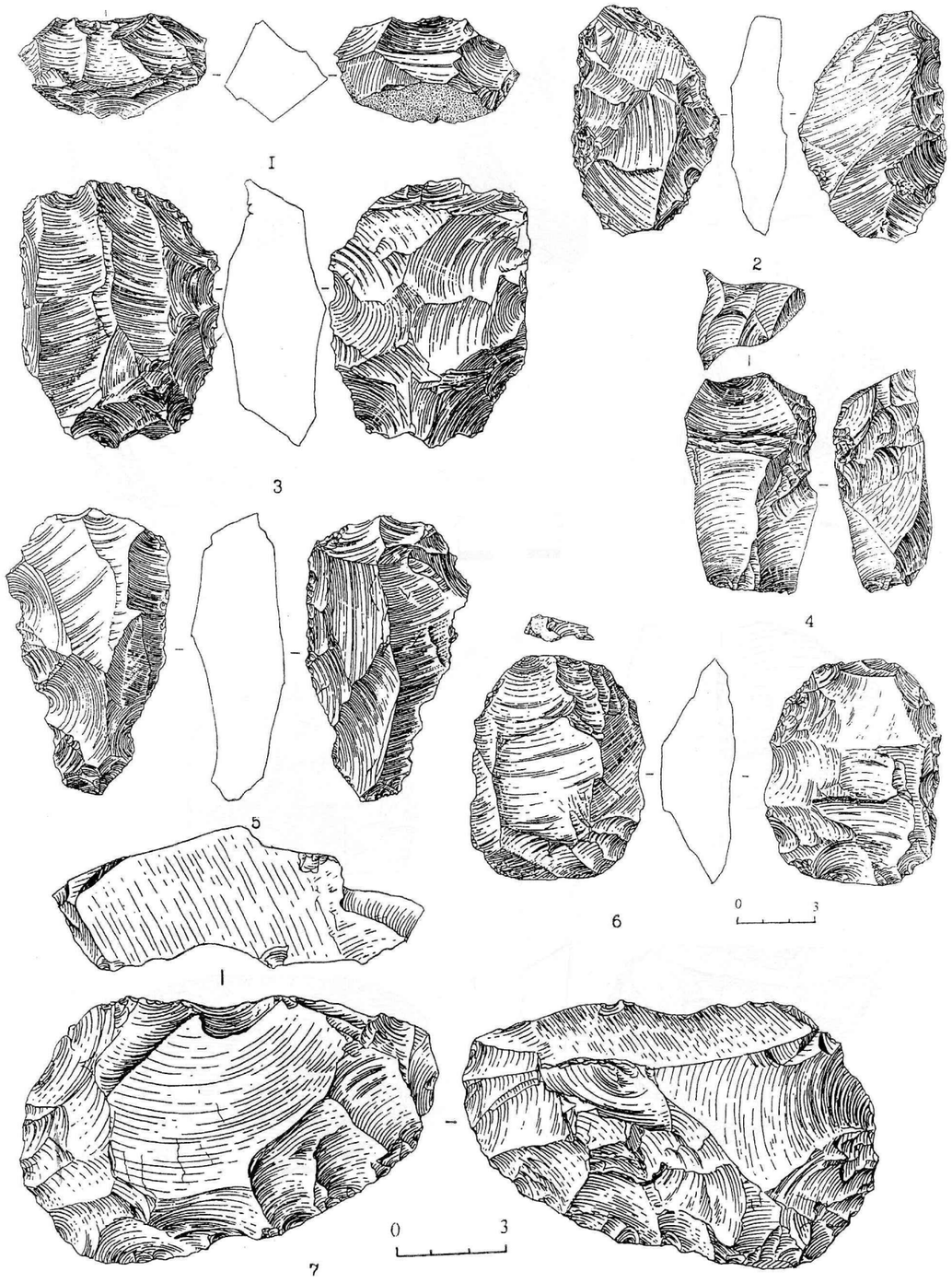

FIGURE 4. Mongolia. Flint Valley. The moderately abraded series. Levallois cores.

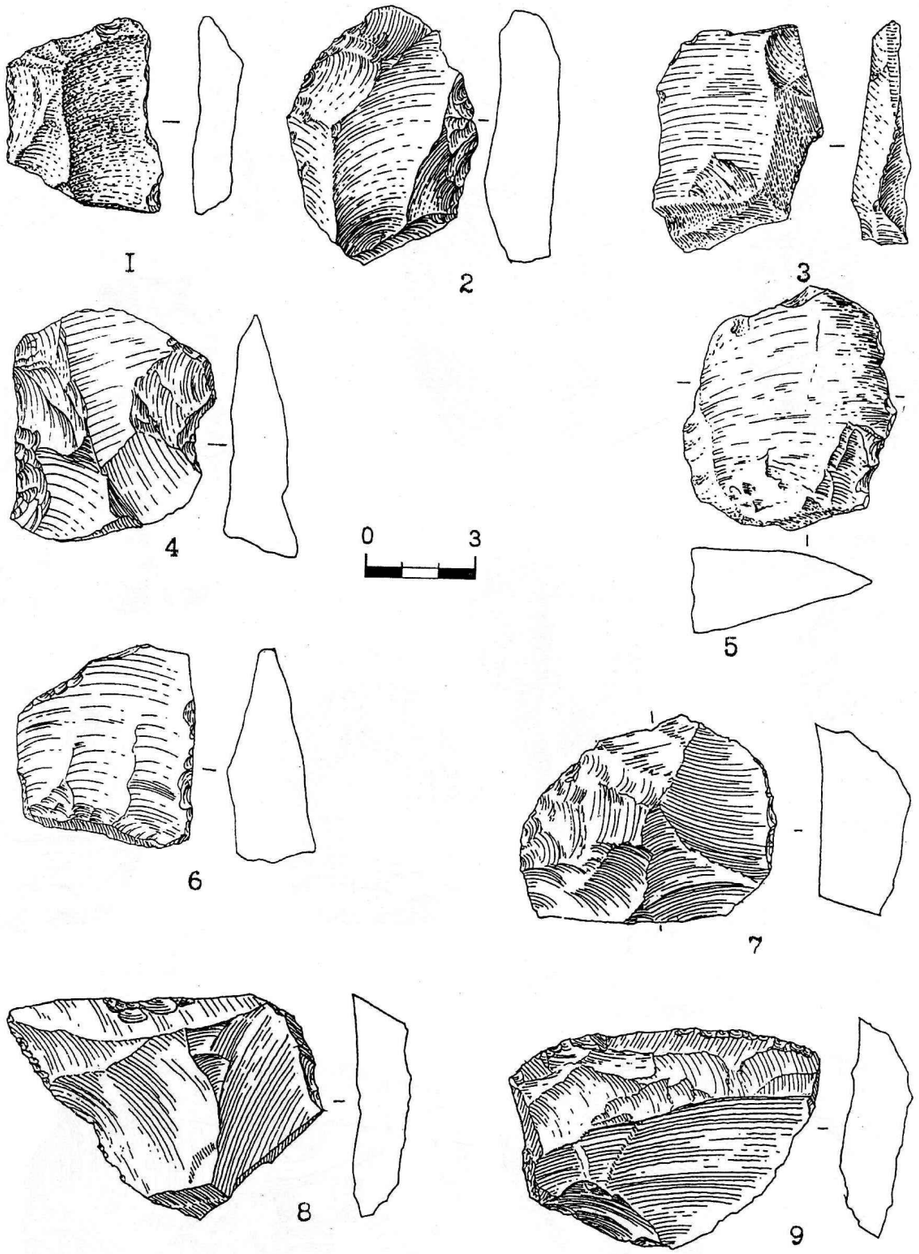

FIGURE 5. Mongolia. Flint Valley. The moderately abraded series. Spalls.

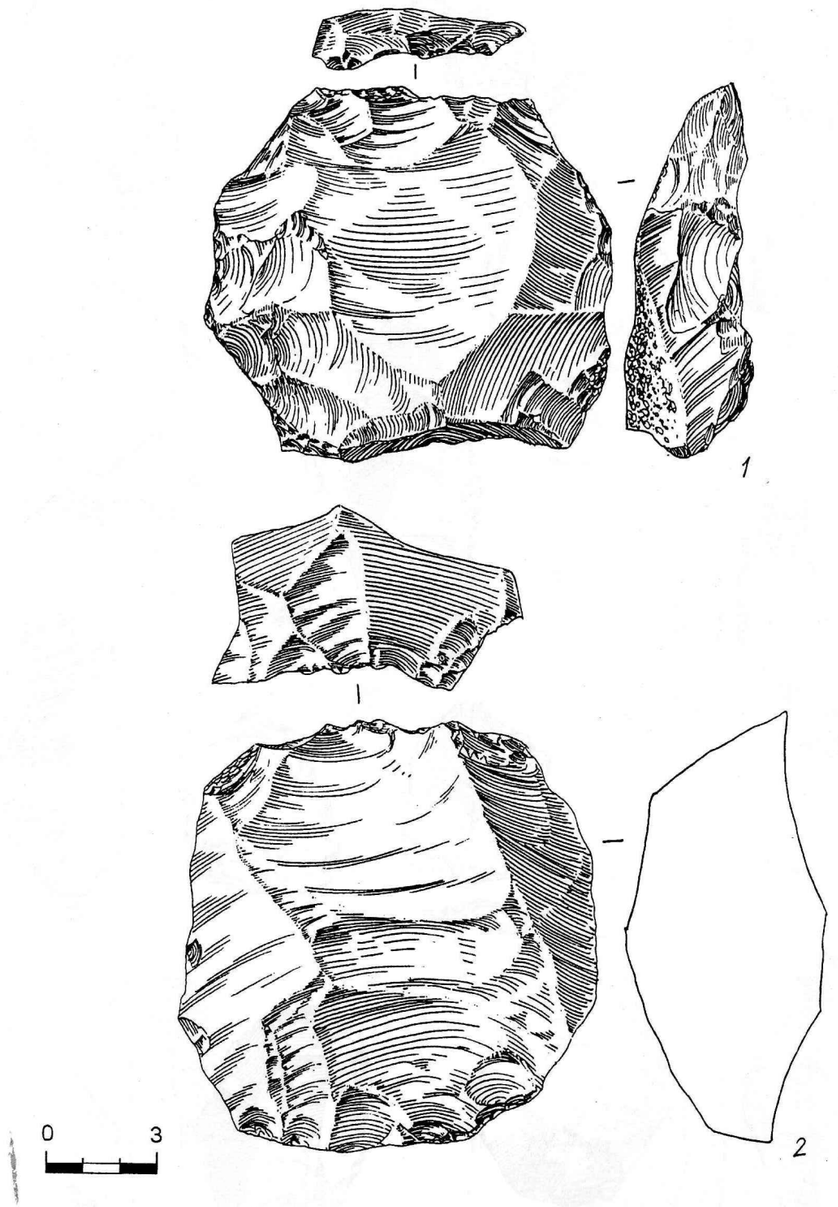

FIGURE 6. Kazakhstan. Semizbugu. The heavily abraded series. Levallois cores.

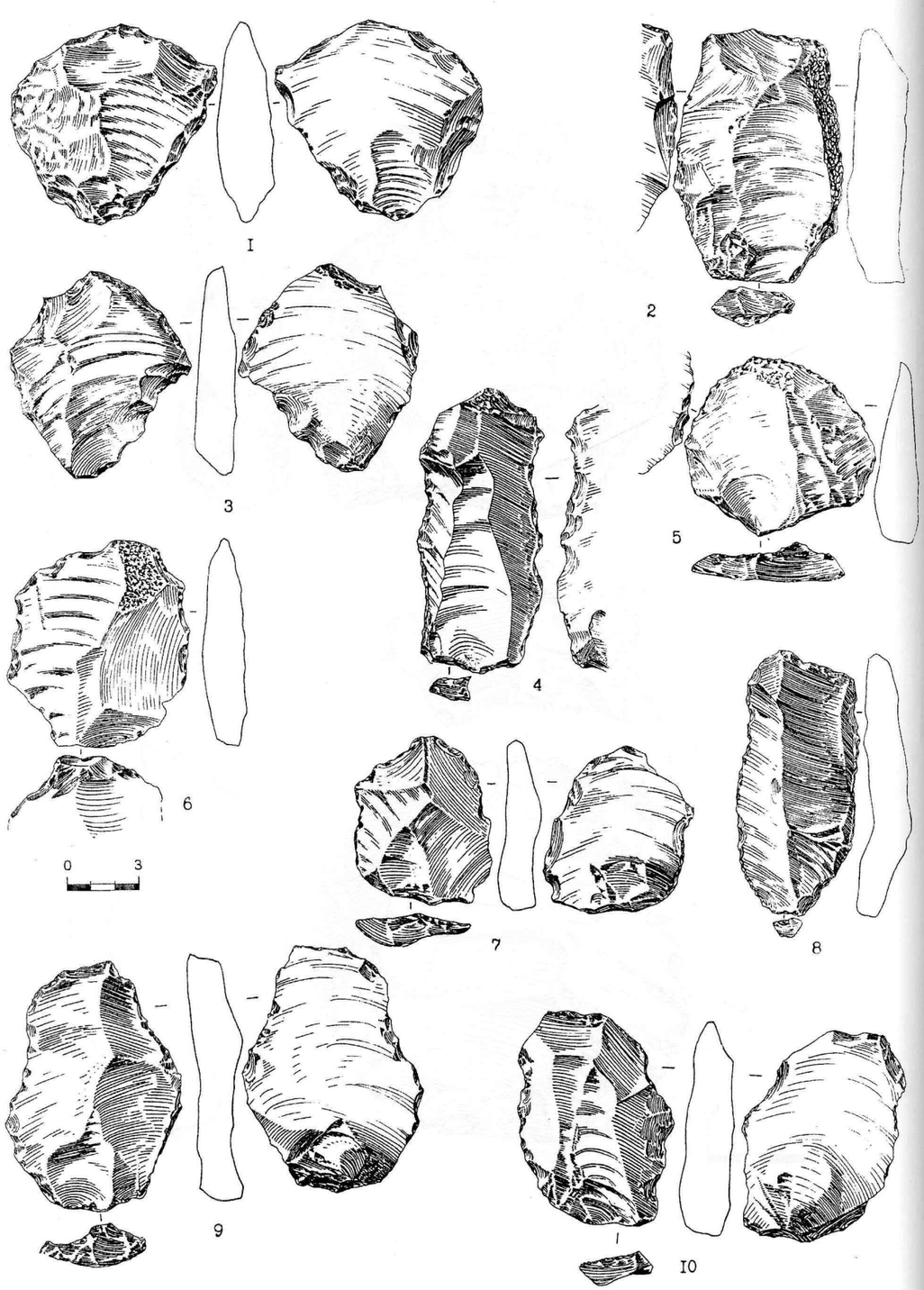

FIGURE 7. Kazakhstan. Semizbugu. The heavily abraded series. Spalls.

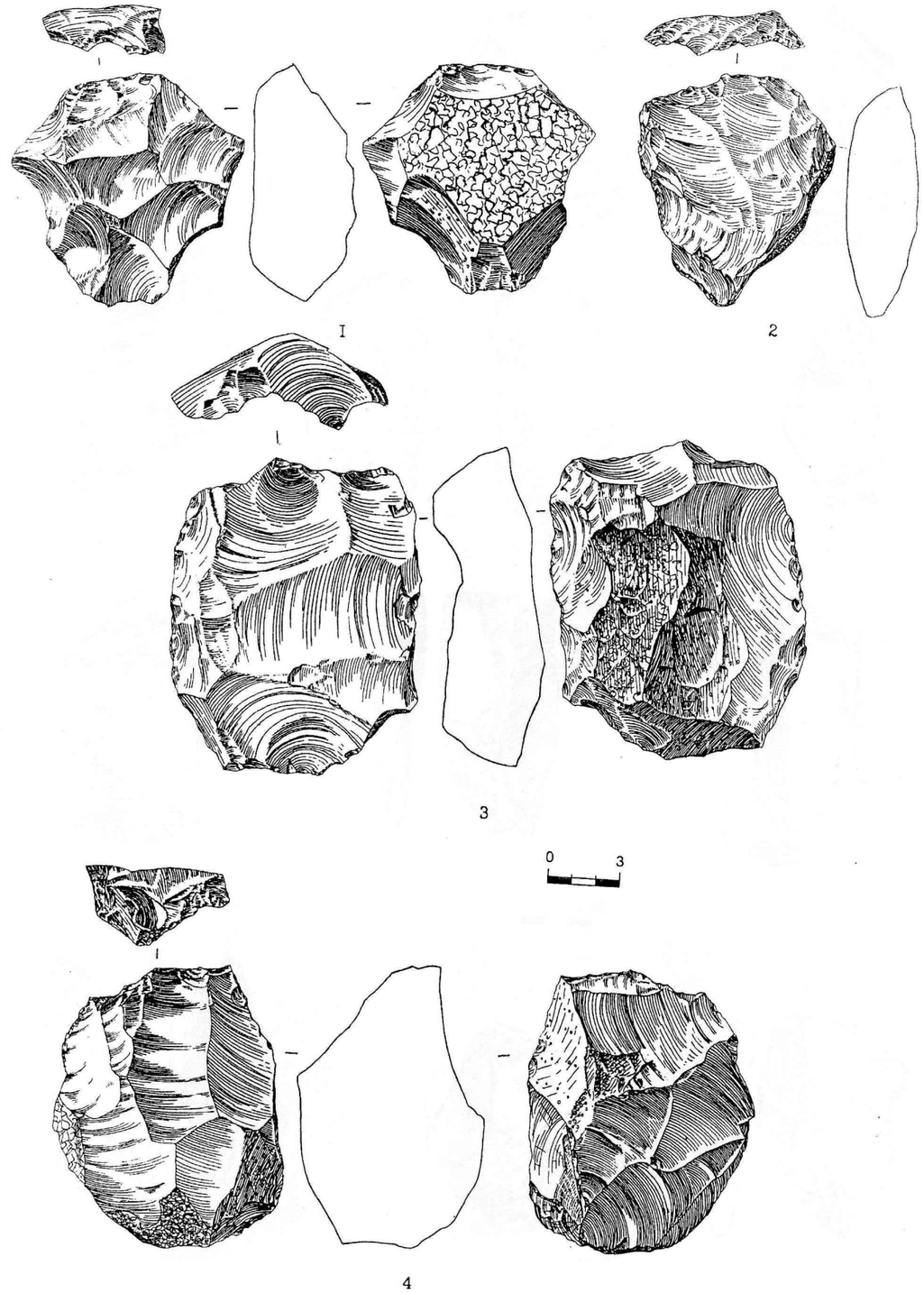

FIGURE 8. Kazakhstan. Semizbugu. The moderately abraded series. Levallois cores.

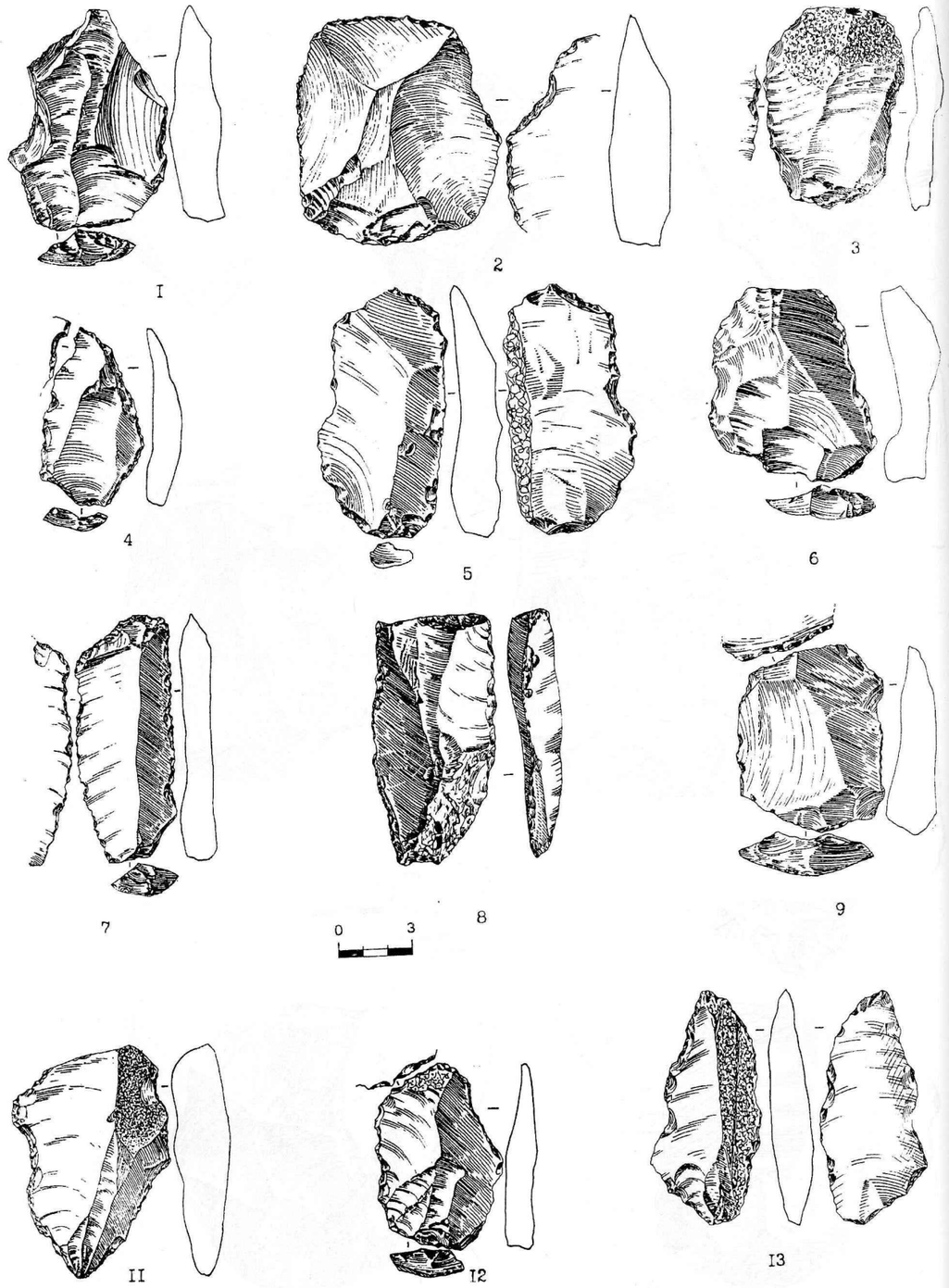

FIGURE 9. Kazakhstan. Semizbugu. The moderately abraded series. Spalls.

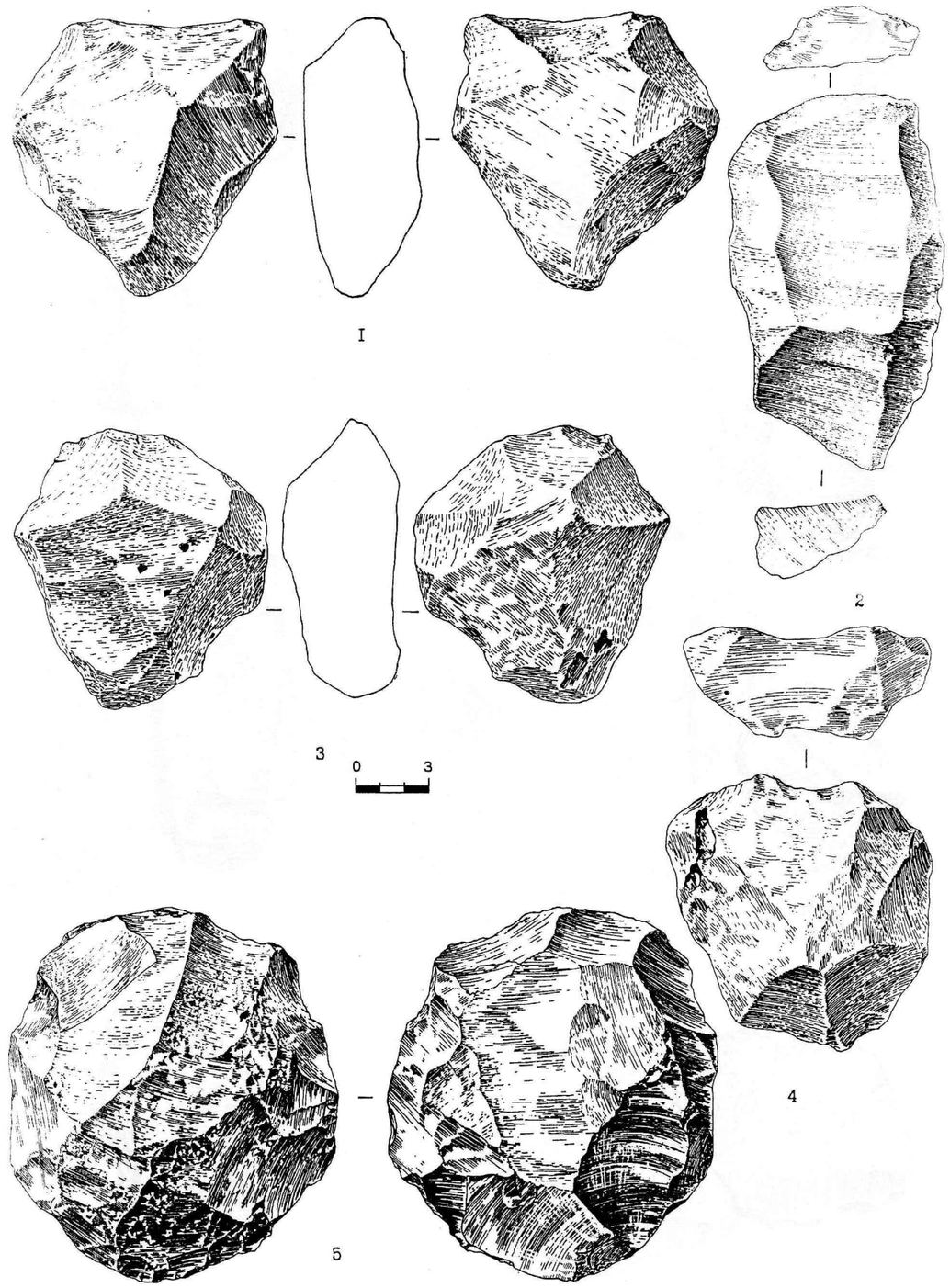

FIGURE 10. Kazakhstan. Kyzyltau. The heavily abraded series. Levallois cores.

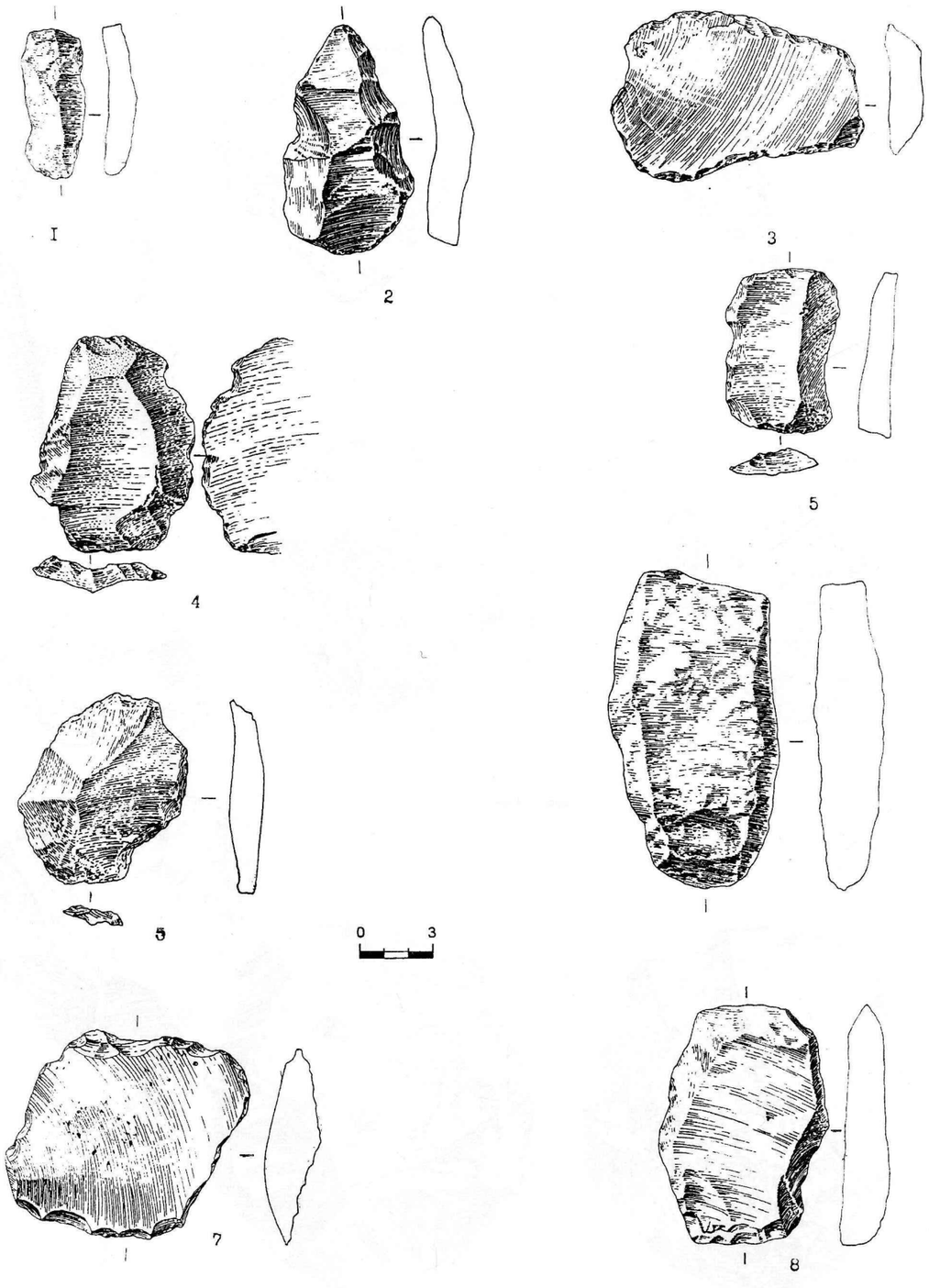

FIGURE 11. Kazakhstan. Kyzyltau. The heavily abraded series. Spalls.

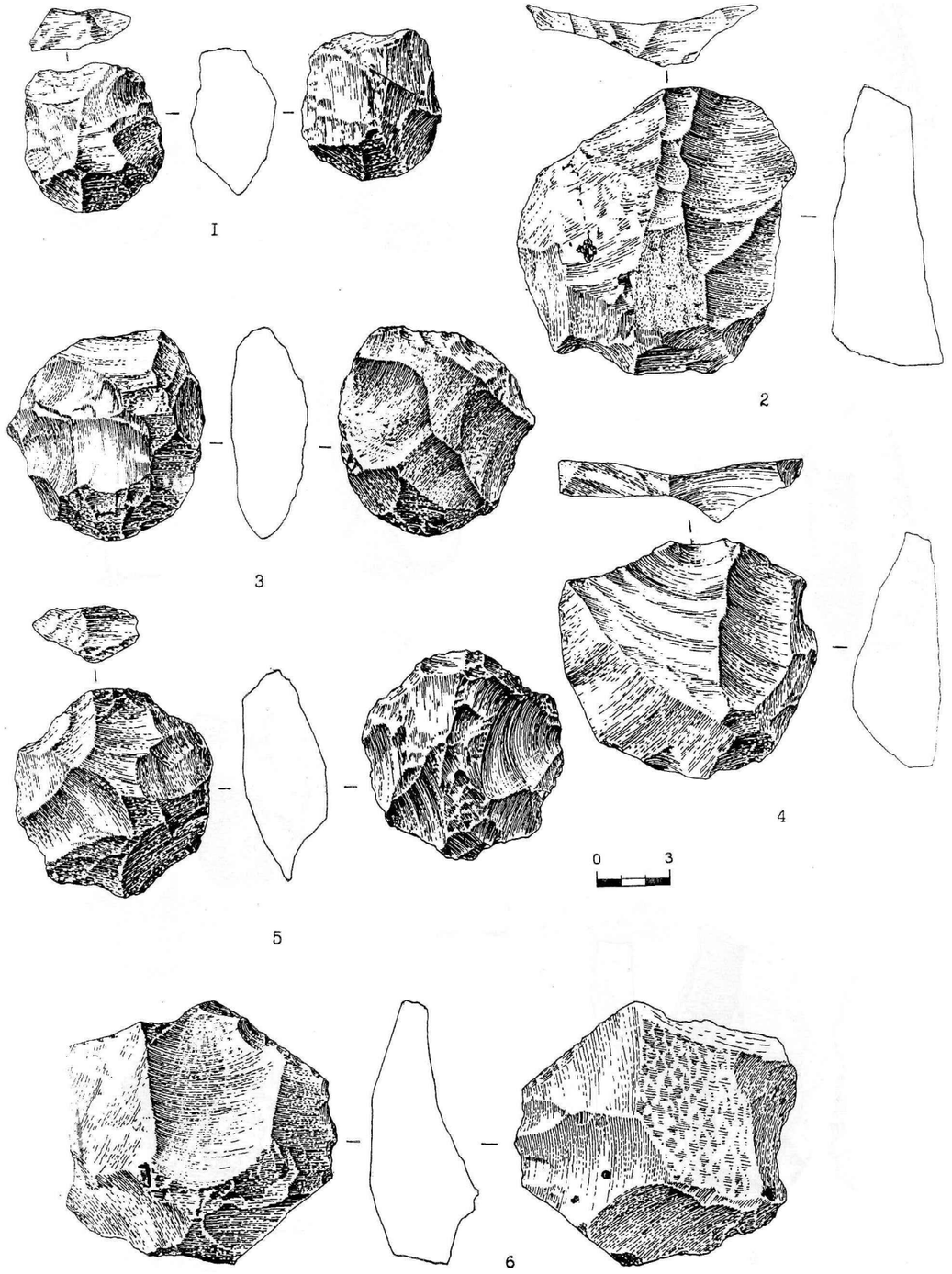

FIGURE 12. Kazakhstan. Kyzyltau. The moderately abraded series. Levallois cores.

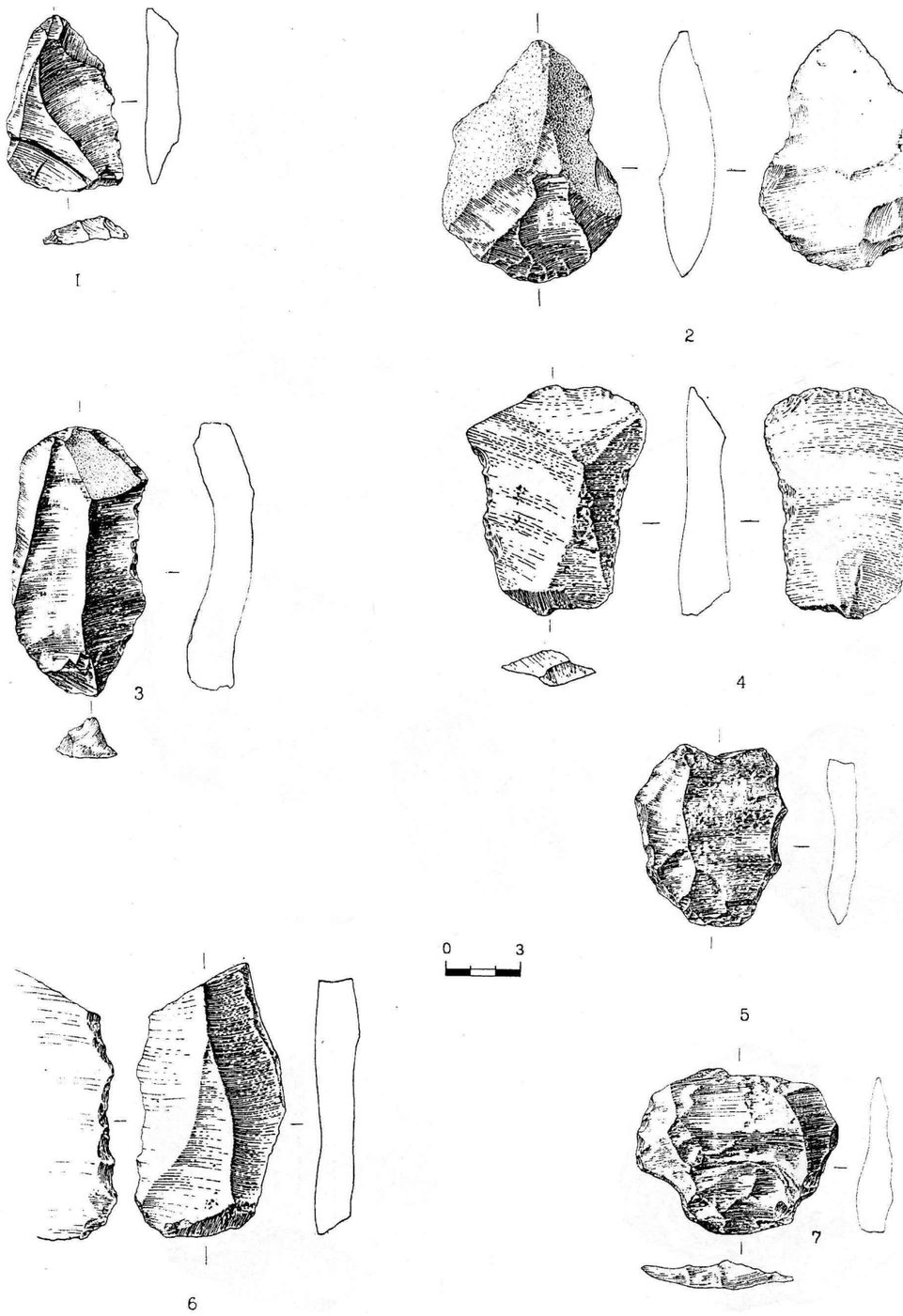

FIGURE 13. Kazakhstan. Kyzyltau. The moderately abraded series. Spalls.

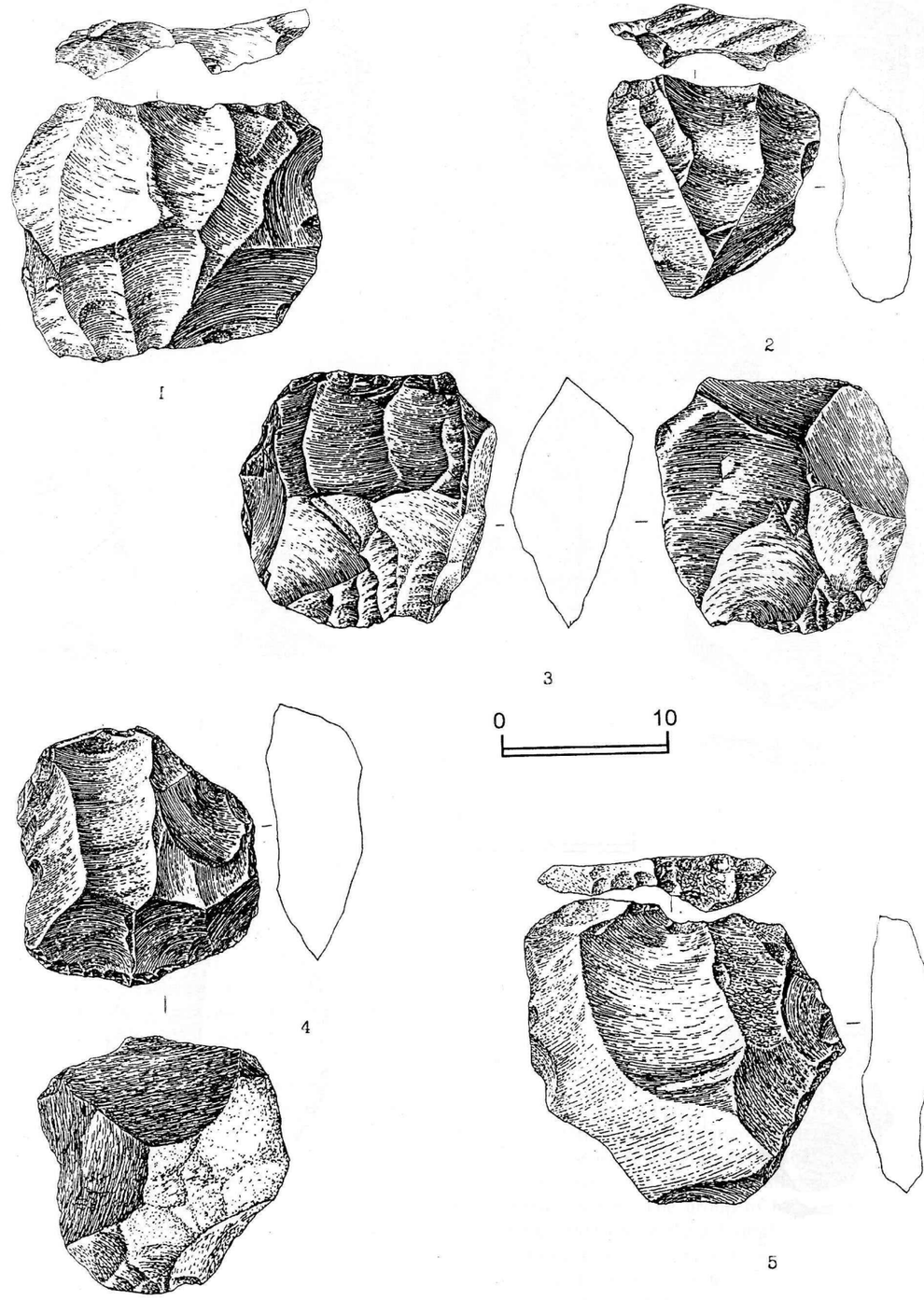

FIGURE 14. Kazakhstan. 1 – 3 – Borykazgan; 4, 5 – Tanirkazgan. The heavily abraded series. Levallois cores.

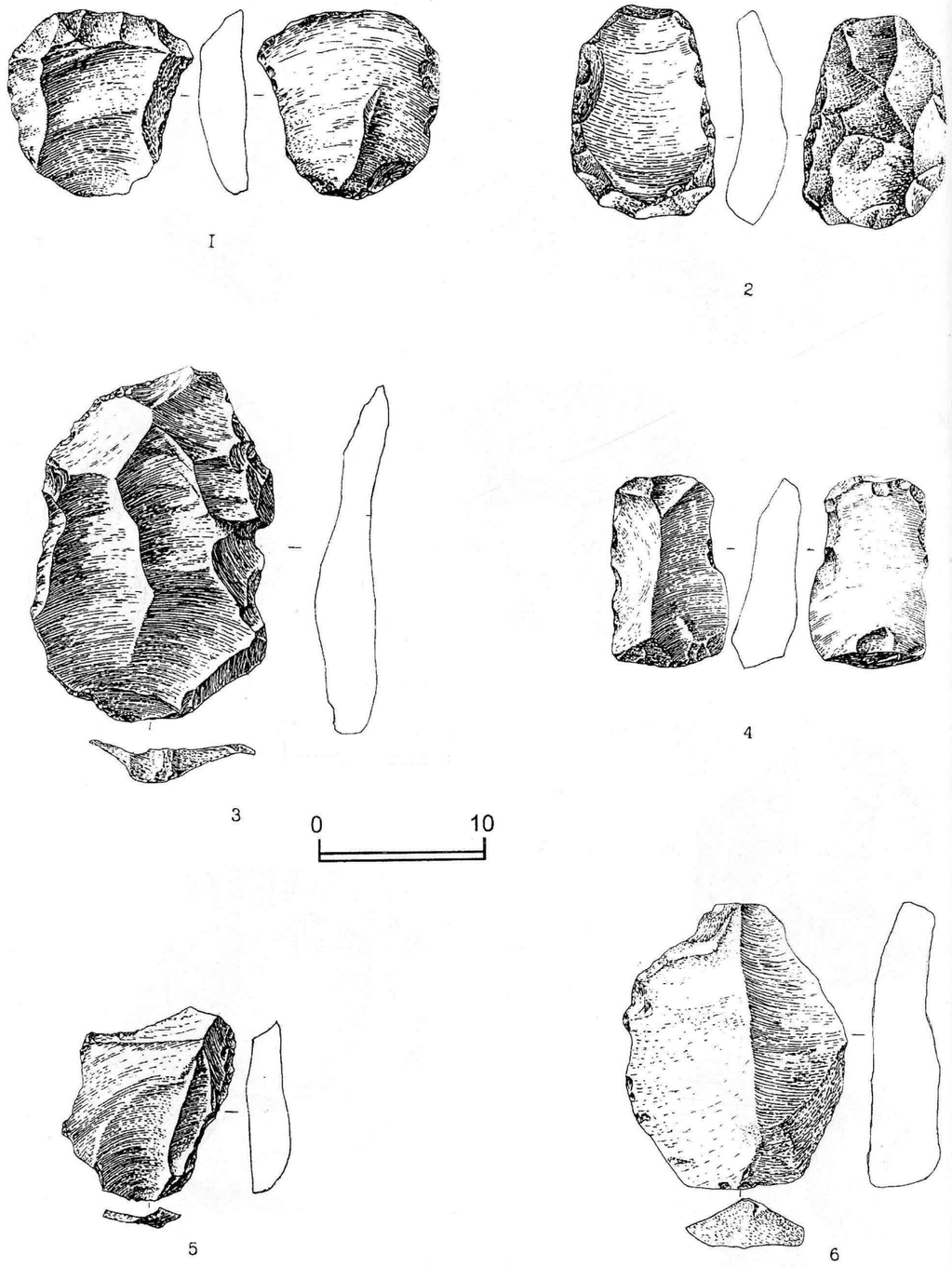

FIGURE 15. Kazakhstan. 1, 2, 4, 5 – Borykazgan; 3, 6 – Tanirkazgan. The heavily abraded series. Spalls.

FIGURE 16. Southern Kazakhstan. Plotting of archaeological materials at Kyzyltau Locus 1.

dominated by three groups of tools: notches and denticulates (28.5 %), grattoirs (25.9 %), retouched blades and flakes (34.6 %). Evident increase of the Levallois component of primary reduction is recorded.

The comparison of the archaeological remains from Flint Valley and Semizbugu (Locus 2) shows that, despite the Levallois cores variability, both sites share certain similarities. Statistically, the ratio of manifestations of the Levallois technical tradition increases at both sites. The same tendency can be traced at some other Palaeolithic workshop-sites of long duration, particularly at the workshop-sites located on the north-eastern slope of the Karatau range (the north-western margins of the Tien Shan, southern Kazakhstan) – Kyzyltau, Tanirkazgan and Borykazgan sites.

The total extension of the Karatau range is nearly 300 km. It is asymmetric in cross-section. To the north-east, a hilly-ridged (cuestas) denudation piedmont plain sides with the mountains. The cuestas were formed due to the uplift of the Karatau range which resulted in the rise of Low Carboniferous rocks. The earliest alluvial sediments in the region of the Palaeolithic workshops (of the second type) appeared in depressions between the cuestas at the time after the river had broken through the cuestas ridges. This might probably happen during the Pliocene period when the active phase of tectonic uplift of the Karatau occurred.

The palaeoclimatic situation and consequently also palaeoenvironmental conditions changed. After hot and humid climatic conditions, vertical zonation of vegetation with some elements of warm-requiring flora appeared. The climate became more arid. The cold period synchronous to Early Pleistocene (Mindel) conditioned the existence of the Koshkurgan fauna complex. A combination of hilly plains abundant in lakes and rivers of glacier origin, rich vegetation and fauna, as well as plenty of siliceous raw material created favourable conditions for human habitation in the regions adjoining the Small Karatau range from the north-east at the Pliocene/Pleistocene boundary.

The Kyzyltau site covers an area of several dozens of square kilometers. Several loci were chosen for investigation there. Material collected at Locus 1 may be given as an example *(Figures 16, 17)*. 179 flint and chalcedony artifacts of two weathering categories have been collected there. The heavily abraded series comprises 71 specimens. The rest are to be attributed to the moderately abraded series. The group of heavily abraded cores is dominated by monofrontal, single platform cores for flakes and sometimes for blades *(Figures 10, 11)*. The main ratio of cores for flakes and those for blades is retained in the moderately abraded series, though the number of cores for blades slightly increases *(Figures 12, 13)*.

FIGURE 17. Surface cultural horizon at Kyzyltau.

Tanirkazgan and Borykazgan localities are situated in the same geomorphological situation as Kyzyltau. Materials from these sites have been already published (Alpysbaev 1979). They were interpreted by the author as sites representing the pebble tradition, though the distinctive Levallois element is undoubtedly present there. This corresponds well with the situation observed in the Kyzyltau assemblage *(Figures 14, 15)*.

The example of analyses of the collections from the most representative sites of the arid zone – the workshops – considered alongside with the problem of evolution of Levallois reduction technique obviously demonstrates that the Levallois tradition was widely spread all over the vast territory of the central part of Asia. Workshops-sites of Barlagin and Mankhan in western Mongolia may be cited as examples (Derevianko *et al.* 1990).

It must be admitted that the problems of chronology are the most complicated ones at surface sites. If the heavily abraded complexes of the above described workshops-sites can supposedly be referred to the pre-Mousterian time and the moderately abraded ones – to the pre-Mousterian and partially to Mousterian period, then the definite tendency towards increase of percentage (and consequently the significance) of Levallois cores from the heavily abraded to moderately abraded series should be noted. At the same time, increase in ratio of blade removals and the appropriate cores can be observed.

In addition, proceeding from the data available and taking into account the three points of crucial importance, videlicet 1) vast territorial spreading; 2) long period of existence, especially at the early stages; 3) significant variability of core types, it may be conjectured that the Levallois technical tradition was unlikely brought from outside, it was rather of autochthonous character. This problem requires further study, though the fact that has been stated seems to be rather natural. Surface sites of the Asia arid zone do not show any detailed picture of development of Palaeolithic industries. However, they rather clearly indicate general outlines of the latter during the Palaeolithic Age.

One of the important issues of studying the Palaeolithic record of the arid zone is the comparison of inferences obtained by investigation of surface sites and those occurring in definite stratified contexts. Let us examine the informative and interpretative potentialities of both of them.

While investigating vast geographical regions, a large number of surface sites can be studied during a short period of time. Results of analytical processing of the data obtained can be used to solve a number of problems. Firstly,

to define the saturation of the area with sites belonging to different stages of the Palaeolithic. This gives an opportunity to solve palaeogeographical and palaeodemographic problems, and to approach other significant questions concerning the character and pace of peopling of the region during ancient times. Secondly, by the use of archaeological data, to define the main lines in the evolution of lithic industries, to establish the main periods in the existence of cultures, to evaluate their distribution in the region (global or local). Thirdly, on the base of statistical data, to identify the main site types in accordance with the kind of human activity. Fourthly, to create general typo-lists for different stages of the Stone Age.

Results obtained by investigation of sites with buried cultural layers allow to approach problems of another kind. Localities containing a sequence of culture-bearing horizons offer an opportunity to determine whether the process of the lithic industry's evolution was continuous or interrupted, to establish relative and, what is more important, absolute chronology by employing radiometric, palaeontological and palynological methods of dating. The distribution of complexes of lithic industries in time is a major feature for solving the problem of the lithic industry evolution. The opportunity exists to study stratified sites using methods of natural sciences (geology, palaeontology, palynology, palaeopedology and some others). Such complex investigations are conducive for creating reliable palaeogeographical reconstruction. In culture-bearing horizons of the sites covered by loess sediments, remains of dwellings, ceremonial constructions, burials, etc. are preserved. Many aspects of both economic activity and spiritual life of Palaeolithic people can be reconstructed on the basis of these data.

As obvious from the above, the heterogeneity of interpretative potential of surface sites and multilayered stratified sites provides a variety of data. Thus, the investigation of stratified sites is a rather time consuming work, and a lot of time will pass before spatial models (cultures) will have been established. But if a distinct complex of lithic inventory is available and its identity or relation to stone artifacts from certain surface sites have been established, the area of spreading of the given industry can be determined. Moreover, through establishing typologic – technological lines of development by surface finds, a certain evolution can be traced, i.e. a kind of a chain is obtained. If one link of the chain is dated due to material from the buried complexes, the whole chain can be situated in time. Since the stratified complexes provide an opportunity to date not only one, but several sites belonging to one and the same line of the evolution, the reliability of dating a certain line of the evolution (e.g. Levallois) increases.

The correlation of data obtained by complex studies is also conducive to the reconstruction of palaeogeographical conditions. If a wide spreading of similar sites belonging to a certain period of time is established, and favourable palaeogeographic conditions existing during the period of accumulation of the layer containing the industry of this kind are recorded, then the presupposition that analogous conditions existed in the whole region of distribution of the sites with similar industries would be correct.

Due to the comparison of data obtained from surface sites and stratified complexes new interpretative opportunities appear, for in the former case spatial characteristics can be obtained, and in the latter – the chronology will be defined. Thus, in a very short period of time one can start to reconstruct the spatial and temporal models.

NOTE

Russian text translated by Olga Volkova, Institute of Archaeology and Ethnography, Novosibirsk, Russia.

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