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KOSTENKI 14 (MARKINA GORA): DATA, PROBLEMS, AND PERSPECTIVES

A.A. SINITSYN*

Among the 25 sites of the Kostenki-Borshchevo region (Figure 1), Kostenki 14 (Markina Gora) is distinguished by the following features.

1. A minimum of 4 cultural layers. Only Kostenki 11 has more than this.

2. The clarity and completeness of its section. All components of the Kostenki stratigraphic column are represented, including the overlying loams, the two humic beds, and the layer of volcanic ash which separates them.

3. The archaeological material from cultural layer 2, unique in the European Upper Palaeolithic. A non-blade debitage technique, a "Mousterian" component making up almost 50% of the total, and an almost complete absence of burins, combined with a developed bone industry and complicated geometric ornamentation, make this complex special and original.

4. A uniquely well preserved human burial beneath cultural layer 3. This is particularly important because it has been claimed to be "negroid", whereas all the other human remains from Kostenki are regarded as European in type.

GEOMORPHOLOGY OF THE SITE

Kostenki 14 is on a steep promontory formed by Pokrovsky ravine and Yermishin ravine, which leads off from it to the right. The local inhabitants call the promontory Mark's Hill, which is the alternative name used for the site. 100-150 metres lower down the ravine on the neighbouring promontory is the site of Kostenki 5, and on the opposite bank of the ravine at a distance of 300 metres is the site of Kostenki 16 (Figure 1). Kostenki 14 is 1.5 kilometres from the floodplain of the Don and together with Kostenki 16 it is the furthest from the river. At present it is 15-20 metres above the floor of Pokrovsky ravine and 30-35 metres above the level of the Don in summer.

HISTORY OF INVESTIGATION

The existence of a palaeolithic cultural layer on the promontory was established by P.P. Efimenko in 1928, but his results were unpublished. In 1949 A.N. Rogachev discovered that two bone horizons were present, and in 1952 it was confirmed by boring that yellow ochre also occurred with them. In 1953 three 2x2 metre trial trenches were dug, one of them at the place where the boring had been made, and this essentially marked the discovery of the site and the beginning of its investigation. At that time it was given the number "Kostenki 14". Further work was carried out at Markina Gora in 1954, when the largest areas (5x5 and 4x10 metres) were exposed, and in 1958, 1976, 1987 and 1994, when small trial trenches were excavated (Figure 2).

Thanks to this work the existence of at least 4 cultural layers was established, which made Kostenki 14 one of the key sites in the area. It was demonstrated that it had covered a surface of about 2 hectares, and that the succession of layers within the 6 metre thickness of Quaternary deposits differed in various parts of the site. Up to now about 120 square metres of the upper cultural layer have been excavated. The corresponding figures for the second, third, and fourth cultural layers are a little more than 50, about 20, and a little more than 10 square metres respectively.

* Institute for the History of Material Culture, Dvortsovaya naberezhnaya 18, 191186 St Petersburg, Russia.

The excavated material has been published only in part (Rogachev, 1957; Rogachev and Sinitsyn, 1982) but thanks to its unusual nature it has been included in a number of general works about the European palaeolithic (Rogachev and Anikovich, 1984; Kozlowski and Kozlowski, 1975; Bordes, 1992).

THE STRATIGRAPHY OF THE QUATERNARY DEPOSITS

The promontory's stratigraphy is typical for the second terrace above the floodplain of the Don and for the large ravines in the Kostenki-Borshchevo region. Analogous conditions occur over a distance of about 5 kilometres, from Markina Gora in Pokrovsky ravine to Tel'manskaya (Kostenki 8) and Gorodtsovskaya (Kostenki 15) in Alexandrovsky ravine (Figure 1). In this whole sector the second terrace above the floodplain has the same succession of deposits: a black earth (chernozem) horizon at the top, followed by loess-like loams, and two humic beds, separated by non-humic loams with lenses or layers of volcanic ash.

M.N. Grishchenko's work in 1938 marked the beginning of the geological study of the region (Rogachev, 1961b: 398) and was a decisive moment in the criticism of the stadial scheme for the division of the Upper Palaeolithic which continued to be dominant in Russian science till the mid 1950s (Rogachev, 1961a: 43). Subsequently, almost all the leading Quaternary geologists of the USSR took part in excavations or field workshops at Kostenki, and they all contributed something to the development of our views on the palaeogeography and geology of the region. Particular mention should be made of the work of M.N. Grishchenko (1950, 1961, 1976), G.I. Lazukov (1957a and b, 1961), and A.A. Velichko (1961, 1963), thanks to whom a geological scheme was developed, according to which the sites of the region were divided at first into four and then into three chronological groups (Rogachev, 1957; Velichko and Rogachev, 1969). The first group included sites of the second terrace above the floodplain with cultural layers in the lower humic bed; the second included sites in the upper humic bed; and the third included sites in the overlying loams which constitute a colluvial deposit on the first and second terraces above the floodplain. As a whole the scheme has remained unchanged up to the present moment and has received wide recognition (Klein, 1969; Hoffecker, 1988; Bordes, 1992) as well as marking the starting point for attempts at a more detailed division of the deposits and sites of groups 2 and 3 (Anikovich, 1977, 1983, 1993).

In the completeness of its stratigraphic section Kostenki 14 is one of the most notable of the sites of the region. It contains deposits of the lower humic bed with remains of cultural layer 4, a sterile horizon of loams with lenses of volcanic ash, deposits of the upper humic bed with remains of cultural layers 2 and 3, and overlying colluvial loams with finds from the upper cultural layer. At the same time, the particular characteristics of the promontory are such as to have posed additional problems, relating in the first instance to the detailed correlation of the deposits in its various parts. To a large extent this is due to the fact that the site has been investigated mostly by trial trenches. The only long section (10 metres in extent) comes from the excavations of 1954, and unfortunately it is documented only schematically, not in detail, so it is quite complicated to try to use it to correlate the trial trench sections of the 1980s.

The specificity of the deposits on the promontory consists in the fact that on the western slope "the upper humic bed is divided by a layer of chalk pebbles into two horizons and the lower humic bed is one layer, but on the eastern slope the upper humic bed is one layer and the lower bed is divided into two by a marly loam" (Rogachev, 1957: 73). On the crest of the promontory the volcanic ash and the lower humic bed are represented only at the summit. Therefore the possibility cannot be excluded that cultural layer 4 situated in the lower humic bed beneath the volcanic ash layer on the eastern and western slopes (Figure 4, E and C) is a phenomenon distinct from the horizon with finds in colluvial loams beneath the upper humic bed in the central part of the promontory, although in both cases they have been given one designation as "layer 4" (Figure 3, B; Figure 4, D).

A marked variability in the deposits even within local bounds is characteristic of

almost all the Kostenki sites, and this is well demonstrated at Kostenki 14. Although the slope of the promontory does not coincide with the position of the sections oriented E-W and N-S, in general the A and B sections (Figure 3) can be considered longitudinal, and the C, D and E sections (Figure 4) transverse, in relation to it (Figure 2). A description is given summarily for homogeneous deposits and individually for deposits the correlation of which is open to question. Data derived from the pollen and spores analysis (Malyasova and Spiridonova, 1982; Spiridonova, 1991) are used in a supplementary fashion, since they have their own specific problems and require special examination (Figure 17).

The trial trenches and excavations produced the following succession of deposits (layers numbered from the top down).

1. Chernozem, in places more than 1 metre thick.

2. Pale yellow porous loess-like loam, with fine rare chalk fragments. In certain places underlain by a clear erosional horizon consisting of contiguous lenses of chalk rubble. Not represented on the western and eastern slopes of the promontory (Figure 4, C and E).

3. Light brown weakly humified loam, looser than the overlying and underlying horizons, with lenses of chalk rubble. In the upper part of the layer the lenses are very thin, consisting of one or two particles only, but in the lower part they are up to 7 or 8 centimetres thick and the particles are larger. Fissures filled with lighter coloured loam in places penetrate to the layer beneath. The arboreal pollen diagram is dominated by pine but also includes birch and alder. The NAP spectrum contains mostly variegated types, including Artemisia and Gramineae.

4. Compact light yellow loam with chalk rubble, penetrating up to 20-30 centimetres into the layer beneath, in the form of vertical and oblique fissures distinguished by whitish marly loam at the edges.

5. Greyish brown weakly humified loam, porous, speckled, loess-like, with rare fine medium-rounded chalk rubble mainly in the upper part. The concentration of particles decreases in the lower part, but they are larger in size, up to 1 centimetre in diameter. Ferruginous stains appear at the contact with the underlying layer, where they are clearly in evidence.

Cultural layer 1 occurs in all excavated sectors apart from the eastern slope of the promontory (Figure 4, E) in the most intensively humified part of the layer.The arboreal pollen diagram shows some increase in spruce (with pine still dominant) and the NAP spectrum an increase in Artemisia and Chenopodiaceae.

6. Compact whitish loam with ferruginous stains and chalk rubble lenses, particularly in its upper part.

7. Yellowish brown, on the eastern slope greyish brown, weakly humified indistinctly layered loam with rare chalk rubble and ferruginous stains. Underlain by a clear erosional horizon the thickness and intensity of which increases down the slope to the north-east.

Finds attributed to the upper cultural layer have been located in slanting and horizontal lenses of this unit on the eastern slope (Figure 4, E). They consist of mammoth bones and a few culturally undiagnostic flints. Since a numeration system for the cultural layers at the site has existed since the 1950s and they have entered the literature under this name it seems sensible to leave it unaltered. Nonetheless, at present it seems more likely that there was an independent cultural layer on the eastern slope than that a single cultural layer existed in different stratigraphic positions at the site. The question of the unity or otherwise of the upper cultural layer is accentuated by the date which has been obtained of 22,780 +/- 250 BP (OxA-4114) on bones from the find horizon in the eastern part of the site. At the moment it seems preferable not to extend it as an age estimate for cultural layer 1 in the rest of the site.

8. Pale yellow compact layered loam with discontinuous lenses of darker loose loam clearly indicative of intensive colluvial processes. More steeply slanting than either the layers above or below, it extends into the deposits beneath in fissures up to 60

centimetres deep. The thickness of the layer decreases lower down the slope. The arboreal pollen diagram shows a predominance of pine, birch, and spruce. The NAP spectrum from here down to layer 11 shows an increase in variegated types, particularly Aster, but a decrease in Artemisia and Gramineae.

9. Brown weakly humified loam with ferruginous stains and gleyification in the lower part. A network of fine thread-like fissures, sometimes wedge-shaped and polygonal and filled with light marly loam, extends throughout the layer. The fissures begin from the point of contact with the layer above and in places form polygonal blocks up to 10 centimetres wide. A lense of more finely textured marly loam with uncertain boundaries can be observed in the mid part of the layer, dividing it into two horizons of which the lower is more strongly humified. The thickness of the layer increases northwards down the slope, but on the east it does not occur (Figure 4, E).

10. Layered loams, not very clearly visible horizontal lenses of alternating loose brown and lighter compact material, each 5-10 centimetres thick. In various places there are also lenses of chalk rubble, often much deformed, probably by frost action.The pollen and spores content of layers 9 and 10 is similar to 8.

11. Greyish brown compact damp loam. Includes a large amount of chalk rubble partly scattered partly in thin lenses, as well as ferruginous and manganese stains. Lower contact uneven, with tongues of material going down into the layer beneath.

- On the eastern slope (Figure 4, E) layers 8-11 are replaced by a thick colluvial erosion horizon, a breccia-like compacted mass of chalk rubble of various sizes.
- Layers 12-16 constitute the upper humic bed.

12. The upper intensively humified horizon. The colour varies from black to light grey. As a rule the stronger the colour the less compact the material, for example the black lenses are always more porous. They vary in thickness from 10-15 centimetres to very fine thread-like traces. Contact with the layers above and beneath is quite clear but very uneven and tongue-like. Usually these tongues consist of blacker material. The arboreal pollen diagram shows a maximum of spruce and the NAP spectrum an increase up to 60% of Artemisia and Chenopodiaceae.

13. Two sometimes interdigitating horizons, in the upper part a thin whitish loose loam penetrating by fissures and tongues into the layers above and below, in the lower part a light brown more compact loam.

14. The middle intensively humified horizon. Alternating layers of black, brown, and grey loam, including ferruginous stains and thin oblique thread-like lenses filled with fine chalk particles. The black lenses are 2-3 centimetres thick on average and up to 30 centimetres long. In places the horizon contains brick red traces of burning and concentrations of charcoal. The thickness of the layer is uneven, increasing up the slope. It is underlain by a thin (3-7 cm thick) horizon of chalk rubble practically without any other matrix.

- In the central part of the promontory (Figure 3, B; Figure 4, D) the basic find horizon of cultural layer 2 is situated here.

- Arboreal pollen as a percentage of the total increases from 50 to 80%, and there is a corresponding decrease in NAP, from lower down to higher up in the horizon. The AP diagram shows a decrease in pine from 60 to 40% and in birch from 40 to 20% but there is a sharp increase in spruce from 10 to 50%. In the lower part of the cycle deciduous species (elm and willow) are present, but in the upper part there are few deciduous species and elm is missing. Throughout the cycle the NAP spectrum shows a predominance of variegated types, particularly Aster, Cichoriaceae, Leguminosae, and Caryophyllaceae. In the lower part of the layer there is a sharp increase in the number of spores, up to 93% Botrychium.

15. Layered light grey loam with lenses of chalk rubble, ferruginous stains, and thread-like traces of whitish loam. The arboreal pollen diagram shows predominant pine and birch with some deciduous species, and the NAP spectrum shows mainly variegated types, including Artemisia.

16. The lower intensively humified horizon. Alternating lenses of black humus and reddish-brown loam, with thin horizontal and slanting fissures filled with

whitish marly loam. In some places the black humus lenses include brick red burnt horizons up to 5 centimetres thick.

- Cultural layer 3 is found on the western and eastern slopes (Figure 4, C and E) but there is a virtual absence of finds in the central part of the promontory.

- The arboreal pollen diagram shows predominant pine and birch, but an increased proportion of deciduous species (lime, willow and hazel, and in the upper part elm and oak) as compared with the layer beneath. The NAP spectrum shows mainly variegated types, increasing from the base upwards, including Artemisia. There are significant proportions of Gramineae and Chenopodiaceae. The complex is interpreted as the beginning and the first half of an interstadial.

17. Whitish loose marly loam with chalk rubble inclusions. Present only in the central part of the promontory, where it contains finds belonging to cultural layer 4 (Figure 3, B; Figure 4, D). Bones from here have been dated at 27,460 +/- 390 and 27,710 +/- 410 BP (OxA-4116 and OxA-4117). Lower down at this point there are alternating light loess-like loams and marked colluvial erosion horizons in the form of thick compact chalk rubble lenses. Neither the lower humic bed nor volcanic ash deposits have been found in the central part of the promontory.

18. Represented in sections A, C, and E. A thin loess-like loam, whitish above and reddish below, layered in places. Contains lenses of volcanic ash up to 50-60 centimetres long in its midst.

The layer belongs to two distinct pollen complexes, divided by the volcanic ash. The lower part belongs to the complex characteristic of the lower humic bed, with some decrease in spruce (up to 60%) and an increase in pine (up to 20%). The upper part belongs to a complex characterised by a significant increase in NAP, although arboreal pollen as a whole is still predominant. AP dominated by pine, NAP by varigated types, including Artemisia.

19. The lower humic bed. Present on the western and eastern slopes (Figure 4, C and E) and on higher portions of the central part of the promontory (Figure 3, A). In the central and western parts it forms a complex but relatively homogeneous deposit. In the eastern part it is divided by a layer of colluvial loam. The upper part of the deposit here (layer 19a) consists of alternating thin lenses of greyish green and light brown loam which contain remains of the cultural layer designated 4A (Figure 4, E). Judging by the description given, cultural layer 4 was found in analogous deposits on the western slope (Figure 4, C). The second cultural layer located on the eastern slope was designated 4B and was found in a more intensively humified loam which was black in places (layer 19b). It was divided from the upper layer by a colluvial erosion horizon containing a large quantity of chalk rubble (Figure 4, E). The thickness of this horizon increases considerably towards the north east where it can reach 60 centimetres. Towards the south west its thickness decreases and there is a clear tendency for the two cultural layers to merge into one. Since Rogachev described analogous finds as horizons A and B of one layer, it seems preferable to retain this numbering for the present until the nature of their interrelationship has been finally clarified.

- Arboreal pollen is predominant (up to 80% of the total) with preponderant spruce (up to 90% of AP). The NAP spectrum is dominated by variegated types, including a significant proportion of Artemisia.

20. Loose layered loams with lenses of whitish marly loam and reddish ferruginous horizons. Non-arboreal pollen is overwhelmingly predominant, while arboreal pollen (mainly pine) constitutes no more than 10-15% of the total. The NAP spectrum is dominated by Aster, although Cichoriaceae are also present as well as some specimens of Caryophyllaceae and Geraniaceae.

Although as a whole the stratigraphy of the deposits on the promontory is fairly homogeneous, not one of the sections is complete and none of them can be taken as standard. A detailed comparison of the sections comes up against a number of problems both in correlation and in interpretation. Each of the divisions of the Kostenki stratigraphic column also has its own particular problems, as detailed below.

THE OVERLYING LOAMS

The importance of a detailed subdivision of the overlying loams resides in the fact that it is needed in order to try to relate the more than 25 cultural horizons of the sites which are found here to each other. As a whole they constitute the third chronological group at Kostenki but individually they still need to be ordered in relative chronological terms. There are within these loams sites which have 3 or 4 cultural horizons (Kostenki 1, 11, and 21) but the problem of their correlation is far from being finally decided.

Given that there are only relatively few radiocarbon dates for such a large number of sites (Table 1) stratigraphic criteria remain the most important means of correlation. Above all this applies to the weakly humified horizons linked to processes of initial soil formation. At Markina Gora there are up to four such horizons (layers 3, 5, 7, and 8). In all cases however the question of their stratigraphic significance remains open, since in a single section it frequently happens that two horizons join together to become one, or on the other hand they may get separated by slope deposits.

Of the remaining stratigraphic indicators the most important are the fissure horizons, of which there are at least two at Markina Gora (at the junction of layers 3 and 4, at the junction of layers 8 and 9, and within the latter), and the horizons of intense erosion, of which there are also not less than two (at the junction of layers 2 and 3, and below layer 7). If the latter are connected by all observers to an intensification of colluvial slope processes, the fissure horizons are explained in several different ways: from freezing up to drying out and even as a reflection of "one of the first stages in the disintegration of previously monolithic soil horizons" (Lavrushin et al., 1989: 28).

These investigations are so far only at an initial stage. Palaeoclimatic reconstructions based on pollen analyses should be more informative for correlation purposes. But in spite of undoubted successes (Spiridonova, 1991) in this area too the number of unresolved problems is greater than one could have wished. Above all, the boundaries of the pollen zones seldom coincide with those of the stratigraphic horizons, generally speaking on the contrary they pass through them (Figure 17). Thus in spite of traditional expectations the more humified horizons of initial soil formation do not unequivocally correspond to periods of relative climatic improvement established on the basis of palynological data.

At Markina Gora the main problems concern the absolute age of cultural layer 1, the way in which it was formed, and - in view of the discovery of an upper cultural layer on the eastern slope in different deposits - its presumed unity or otherwise. The date of 22,780 +/- 250 BP (OxA-4114) for the upper cultural layer in this part of the site is in full agreement with our present ideas regarding its stratigraphy and chronology in general and the way in which these loams were formed (Praslov and Rogachev, 1982; Rogachev and Anikovich, 1984). The nearest comparable dates, in the order of 22-23,000 BP, are those for Kostenki 1 cultural layer 1 (Table 1). It cannnot be excluded that all the Pokrovsky ravine sites with shouldered points (Kostenki 1 layer 1, Kostenki 14 layer 1, Kostenki 13, and Kostenki 18) constituted one settlement which functioned at the same time or virtually the same time.

THE UPPER HUMIC BED

On the one hand, practically all observers agree that the humic beds at Kostenki do not constitute buried soils as such (Rogachev, 1957; Lazukov, 1957a; Velichko, 1961, 1963; Sawicki, 1964, 1965). On the other hand, several particularly in the 1950s did use the term soil for them (Grishchenko, 1950, 1951, 1961; Moskvitin, 1961). In some cases they not only described them as soils but provided corresponding interpretations. Thus M.N. Grishchenko suggested that "the humified layers represent in part an accumulation of organic material in swampy water and in part a soil formation process on a temporarily dried out surface. Periodic storms produced intense erosion and colluviation, silting up the water source and causing a temporary break in the accumulation of vegetation and/or soil formation processes". At the same time he noted that "the non-universal development of three humic layers indicates the purely local character of these

processes" (Grishchenko, 1961: 64-65). Acknowledging the significant extent to which the soil had been destroyed, he considered the fact of its presence to be undoubted: "A soil of normal profile is present in the mid part of every profile" - doubt attached only to the number of soils and their relationship to the cultural layers (Grishchenko, 1961: 64-65).

Nonetheless the dominant point of view always remained that the Kostenki humuses were redeposited soils, even if their redeposition followed on shortly after their formation or if possibly both processes went on in parallel.

The absolute chronology of the upper humic bed sites, despite the rather large number of radiocarbon dates (Table 1), remains quite a complicated problem, above all because of the marked discordance between them. In the light of our present understanding of the chronology and mode of formation of the upper humic bed, dates younger than 26,000 BP must be regarded as too recent. Most acceptable is the compact series of dates at around 27-28,000 BP for the relevant cultural layers at Kostenki 1, 8, 12, and 17. Although the natural climatic conditions reconstructed on the basis of the palynological data for these sites display considerable differences (Spiridonova, 1989, 1991) and different horizons belong to different climatic cycles, the close cohesion of the dates speaks for itself. There is a difficulty regarding the dates of 30-32,000 BP for Kostenki 12 layer 1a, and these are in need of additional scientific backing.

At Kostenki 14 the basic problem consists in the fact that there is a radiocarbon date for cultural layer 3 of 14,300 +/- 460 BP (GIN-79) which is considerably younger than the dates obtained for cultural layer 2 (Table 1). With isolated dates an inversion of this kind can be explained simply by the inadequacies of the radiocarbon method in the early stages of its development. Nonetheless in this particular case an alternative explanation cannot be excluded.

In all sections (Figures 3, 4) the upper humic bed is characterised by a repeated succession of light whitish, weakly humified brown, and black horizons in reverse order compared with that of a normal profile. Thus at the base of the succession there is a black horizon, then a weakly humified brown horizon, and then a light whitish horizon. This succession is repeated three times altogether in the same order. Hence it can be suggested that the process of redeposition of a normal profile proceeded here in the following way (Figure 5). From portions situated higher up the slope where a soil of a normal profile had developed its constituent parts were successively removed and displaced in reverse order to places lower down the slope: at first the humus horizon, then the B horizon, and then the layer beneath (Figure 5, cycles 1-3).

The probability of this explanation is slight since in the Kostenki region there are soils with normal profiles only on low lying ground. Grishchenko's point of view therefore seems preferable: the accumulation of the humic horizons took place in a deep steep-sided ravine where a considerable flow of water down the slopes led to the creation of an irregular hydrological regime (Grishchenko, 1950: 83). This is confirmed by the presence of whitish marly loam horizons regarded as "chalk sediments formed in a lake or swamp after flooding" (ibid: 79). The increased amounts of Botrychium pollen in the middle humic horizon containing cultural layer 2 are significant in this regard. Botrychium is a plant which does not easily withstand competition. It is characteristic of a flood plain in formation when its surface has not yet been colonised by thick vegetation. It is therefore most likely that the process of formation of the humic deposits coincided with the formation of the first terrace, when the seasonal flooding of its surface had already ceased but it was not yet grassed over.

THE VOLCANIC ASH

The sterile loam horizon dividing the humic beds and containing lenses of volcanic ash has a vital importance for Kostenki in relation to both internal and regional correlation schemes. According to analytical investigations carried out quite recently, the age of the volcanic ash can be regarded as about 38,000 years old and it can be connected to one of the eruptions of Campi Flegrei in Italy (Melekestsev, Kirianov, Praslov, 1984; Zubakov, 1986: 100). Although this dating cannot at the moment be considered final

because there were many such eruptions (Lefevre and Gillot, 1994) and because there is some difficulty in identifying the ash in Central and Eastern Europe (Kholmovoi, 1989; Kholmovoi and Praslov, 1979; Pawlikowski, 1992) an age of this order seems at the moment to correspond best to our ideas concerning the stratigraphy at Kostenki.

THE LOWER HUMIC BED

The age of the lower humic bed is the most problematic, but the age of the volcanic ash mentioned above and the date of 36,400 +1700/-1400 BP for Kostenki 17 cultural layer 2 situated in this bed makes an age for it of 40,000 BP quite probable (Praslov and Rogachev, 1982; Hoffecker, 1988; Anikovich, 1993). The dates of 27,460 +/- 390 and 27,710 +/- 410 BP for Kostenki 14 cultural layer 4 (OxA-4116 and -4117) are certainly too young, probably because the bones used for dating came from a layer of marly loam (layer 17) filled with chalk rubble in an area where there is no layer of volcanic ash nor any lower humic bed as such (Figures 3B and 4D). Their relationship to the cultural remains from the lower humic bed remains unclear.

The most demonstrative sections at Kostenki 14 and 17 clearly show that the deposits of the lower humic bed are distinct from all the layers above both in terms of their physical structure and their pollen spectrum (Fedorova, 1963; Levkovskaya, 1977; Malyasova and Spiridonova, 1982; Spiridonova, 1991). According to the palynologists "the formation of the lower humic horizon corresponds to two interstadials and two stadials" (Malyasova and Spiridonova, 1982: 239) although they do not attempt to say which.

At the present moment the correlation of the Kostenki stratigraphic column with the prevailing schemes for the climatic variations occurring in Europe in the last glacial period is more complex than it seemed to be a few years ago. It was considered that the Kostenki column was comparatively complete, without substantial hiatuses, and that it corresponded to the middle and first half of the last glacial period. The upper humic bed was correlated with the Arcy-Denekamp interstadial of the western European scheme (29 - 32, 000 BP) and the lower with the Hengelo interstadial (c. 38,000 BP).

The palynological analyses carried out by E.A. Spiridonova at a number of Kostenki sites in the 1970s and 80s led her to conclude that the traces of at least seven interstadials were preserved in the deposits (Spiridonova, 1989, 1991; Lavrushin et al., 1989). The scheme of climatic changes elaborated on this basis is in many respects more detailed than analogous schemes in western Europe (Labeyrie, 1984).

In the first place, the results of a palaeomagnetic analysis carried out by S.A. Pisarevsky in the so-called stratigraphic sounding and at Kostenki 28 indicate that the lower part of the sequence is older than previously imagined (Lazukov, 1982, Figure 78). The presence of four geomagnetic events was established (Zubakov, 1986: 99-101; Spiridonova, 1991: 36-41) and their correlation with the section at Kostenki 14 can be suggested at least hypothetically. The most recent (=Gothenburg, 12-12,600 BP) occurs at the base of the contemporary soil horizon, i.e. somewhere at the level of layer 2 at Kostenki 14. The second (=Monod, 28-30,000 BP according to Zubakov, and 24,000 BP according to Spiridonova) was found beneath the Gmelin soil at Kostenki 21 and in the lower part of the upper fossil soil in the stratigraphic sounding, and this probably corresponds to one of the horizons of initial soil formation (layer 5 or 7 and the upper cultural layer) at Markina Gora. The third, equated with the Laschamps-Kargopolovo event (41-43,000 BP), has been discovered in the stratigraphic sounding in a fossil soil comparable to the lower humic bed, i.e. layer 19 at Kostenki 14 and cultural layer 4. The fourth event (=Blake, 113,000 BP) has been found in the stratigraphic sounding within thick black earth deposits with no parallel at Markina Gora.

The TL dating results (Figure 4, E) (Sinitsyn, 1991) at the moment can be taken as characteristic of a certain stage in the development of the TL dating method and must be regarded as too old.

Nonetheless, an age for the lower horizons at Kostenki early in the last glacial period must be seen as quite within the bounds of possibility.

Kostenki 14 also has a capital importance in that it is the only site in the region where two cultural horizons are present in the lower humic bed.

Faunal Remains

At present only the results for the excavations of the 1950 - 1970s have been globally summarised (Vereshchagin and Kuzmina, 1977, 1982) but the new data do not change the general picture and the conclusions to be derived from it (Table 2).

The major point is that only mammoth bones are encountered in the upper cultural layer at Kostenki 14, whereas in layers 2, 3, and 4 the predominant bones are those of horse. The species composition of the cultural layers as well as the time of deposition of the overlying loams and the humic beds is practically the same in all the sites of the Kostenki-Borshchevo region.

The Kostenki horse is significantly distinct from both present day specimens and from those found in other archaeological contexts. According to V.N. Gromova, the Kostenki material "gives the impression of a small but very massive horse, with thick metapodials and wide hooves, and a very long protoconid on the upper molar teeth" (Gromova, 1950: 73). In her opinion this serves as an indicator of cold conditions, particularly in the upper humic bed, where horse remains account for 68% on average of all determinable bones and in some cases (e.g. Kostenki 15) for up to 94%.

There are contradictions in the reconstruction of natural conditions for the lower humic bed, in that the predominant horse is supposed to coexist with widespread coniferous forests.

In general the faunal composition of Kostenki 14 and the rest of the Kostenki sites is indicative of cold conditions and does not permit the affirmation or denial of finer climatic fluctuations such as those suggested by the pollen data.

The same can be said of the molluscan fauna, the study of which is at an initial stage. The fullest species composition so far has been determined for cultural layer 2 at Markina Gora (Table 3). According to V.M. Motuz the molluscan species identified cannot be used to characterise their environment more closely than to say that it was subaerial (Motuz, 1982) and the climatic conditions were "moderate continental in character, cooler than at present" (Motuz, 1979: 23).

THE CULTURAL LAYERS

Cultural layer 1

The upper cultural layer is present over the entire promontory, but the deposits are not very thick, and are relatively sparse in content. It consists principally of mammoth bones, on a few occasions found together in heaps, and small thin ash stains with red ochre.

There are slightly more than 170 flint artefacts, but they include only 10 tools and 3 cores. The raw material consists principally of black Cretaceous heavily patinated flint, analogous to that used for the most part in the upper cultural layer at Kostenki 1. There are isolated examples of semi-transparent smoky flint, coloured pebble flint, and white fine-grained quartzite.

The primary debitage technique is based entirely on blades. The cores are indicative of a block-like prismatic technique with striking platforms at an oblique angle (up to 45 degrees) to the striking surface (Figure 6.8 and 9). Along with medium sized blades 1.5-2 cm in width, on which the majority of the tools were made, there are also bigger ones up to 3 cm in width (Figure 6.3) and microblades including those with secondary retouch (Figure 6.2).

The typological profile of the inventory is determined in the first instance by the miniature shouldered point with ventral retouch at the tip (Figure 6.1) and the large backed point with transverse straight base (Figure 6.5). The notch on the shouldered point and the base of the backed point are made by bidirectional retouch; the upper part of the notch on the shouldered point is made by dorsal and the lower part by ventral retouch; on the tip both types of retouch alternate and are superimposed one on the other.

The endscrapers, burins, and retouched blades are ordinary upper palaeolithic forms such as are met with everywhere (Figure 6, 4-7).

In terms of its technical-typological indices and the specific forms of its tools, the industry from cultural layer 1 at Markina Gora has its closest analogies in the sites of the Kostenki-Avdeevo culture, particularly the upper cultural layer at Kostenki 1 and Kostenki 13.

Cultural layer 2

This is the most important and characteristic layer at the site. In the central part of the promontory it is represented by a thick horizon of cultural remains in the deposits of the upper humic bed (Figures 3B and 4D). The boundaries of the lenses with cultural remains have not been determined up to now, and this makes interpretation difficult. The excavated surface of the cultural layer is about 60 square metres. In spite of the fact that the remains occur in layered deposits, and that there are signs of a little deformation in some places, the presence of localised ashy accumulations, undoubted hearths and a large quantity of bones in anatomical order, indicates that they have not been displaced to any great extent.

In terms of character and structure, three separate sectors of the cultural layer can be distinguished, the boundaries of which unfortunately were not reflected on the plan of the excavation in 1954 (Figure 7). The northern part of the layer is higher up, is relatively thin (10-15 cm), and has an increased concentration of cultural remains. It contains a circular hearth about 65 cm in diametre and several concentrations of horse bones, often in anatomical order. The central part has an intense red and yellow colour particularly at the base. In the centre of this coloured area, among anatomically connected groups of horse vertebrae and extremities, the remains of four horse skulls and that of a bison were found in immediate proximity to each other (Figure 7, squares C-40 and 41). The southern part is thicker (up to 45 cm), is less markedly coloured, and has a large concentration of charcoal. It contained four ashy accumulations up to 50 cm in diametre and 10 cm thick in distinct clearly marked depressions. In two cases the bottoms of the depressions had traces of burning to a depth of 2 cm, and because of this they have been regarded as hearths.

The characteristic trait of cultural layer 2 in general is its abundance of cultural remains: from one square metre one can expect up to 300 artefacts, a figure significantly in excess of the average for Kostenki as a whole. Moreover tools with secondary working constitute almost 9%, also a relatively high figure for an open-air site. The specific characteristics of the layer can be summed up as follows.

1. The unique character of the dominant raw material, unknown at other sites, and so far unknown as a natural occurrence.

2. The non-blade primary technique and the absence of typical upper palaeolithic blades.

3. The unusual character of the flint inventory, almost 50% of which consists of tools of Mousterian appearance (sidescrapers, points, knives). The almost complete absence of burins is unusual for an upper palaeolithic industry dominated by endscrapers of various types.

4. The variety of the bone industry and the large number of decorated bones. Above all this relates to the unusual "shovels" made on mammoth long bones, and above all scapulae, with specific "nail-like" heads (Figure 10. 27,29,31). A decorated point with a zoomorphic head is unique (Figure 10. 26). Ornaments are represented by at least three types of pendant (Figure 10. 2,3,4) and by small beads with biconical apertures (Figure 10. 1). The shafts of the "shovels" and many other bone artefacts are decorated with complex bands of geometric ornament (Figure 10. 6-9, 19, 29). There are points of different types (Figure 10. 16-18) including needle-like ones (Figure 10. 13, 15-16) in some cases with longitudinal grooves (Figure 10. 14). A large number of bones, mainly ribs, have many incisions and notches which in most cases were the result of their use as supports when cutting (Figure 10. 22-23). In some cases however the rhythmic nature of the cuts suggests ornamental relief (Figure 10. 20).

5. The large number of bone retouchers (Figure 10.30) which (in the absence of stone or slate retouchers) allows them to be seen as an important technological indicator of the industry.

The profile of the flint inventory is determined in the first instance by the endscrapers, which are numerous and varied. They extend from miniature round (Figure 8. 2-7) to massive fan-shaped ones (Figure 8. 29-30) sometimes with pointed bases (Figure 8.46). There are thick carenoid (Figure 8. 39-41) and oval examples (Figure 8. 35-37), small fan-shaped ones with pointed bases (Figure 8. 12-14) and arched ones on flat blanks (Figure 8. 9, 38) approximating to points (Figure 8. 42). There are endscrapers with transverse straight ends (Figure 8. 20-21), those on naturally backed flakes (Figure 8. 15), and those with ventral retouch at the edges (Figure 8. 17-19). As a whole the group is extremely varied. In terms of individual characteristics they can be compared with tools belonging to other groups. Some thick carenoid examples with pointed bases (Figure 8. 24, 46) in all their morphological traits apart from the scraping end itself are similar to thick double pointed limaces (Figure 9. 28); the oval endscapers (Figure 8. 35-37) differ from oval sidescrapers (Figure 9. 26) only in the orientation of their retouch; the massive fan-shaped endscrapers (Figure 8. 29-30) differ from convergent sidescrapers (Figure 9. 7,12) only in their symmetry, and so on.

The "archaic" or Mousterian component of the industry is more standardised. It includes subtriangular points (Figure 9. 1-2), naturally backed knives on lames a crete (Figure 9. 3), and asymmetrical sidescrapers with truncated (Figure 9. 4,8) or naturally sharp transverse ends (Figure 9. 22, 24-25). In this context, where bifacial work is almost entirely absent, small handaxe-like tools with practically complete bifacial working (Figure 9. 6) are noticeable, as well as a few disk-like (Figure 9. 27) and chopper-like artefacts (Figure 9. 30). There is a small but definite series of limaces (Figure 9. 28) and artefacts like them with rounded or truncated ends (Figure 9. 26, 29). There are large numbers of sidescrapers of different kinds, transverse (Figure 9. 10-11, 20), convex (Figure 9. 13,15,18,21,23), and convergent (Figure 9. 7,12), as well as a few with alternate or partially bifacial retouch (Figure 9. 14,31). Although this group of tools undoubtedly appears to be Mousterian from the typological point of view, they have the same kind of retouch and were made in the same way as other unquestionably upper palaeolithic type tools found in the same layer.

Apart from the two basic components of the industry (endscrapers and Mousterian type tools together account for more than 90% of the whole inventory) there are a number of other specific forms. There are at least four kinds of outils ecailles (Figure 8. 45, 47-51) including those which were probably the byproduct of the utilisation of endscrapers or cores (Figure 8. 32,49,51). There are some awls (Figure 8. 43-44) and denticulates with alternating retouch (Figure 8. 33-34), as well as some sidescrapers which resemble awls (Figures 8. 44 and 9. 10).

In general the industry from the second cultural layer at Markina Gora is unusual, not only in the context of Kostenki but in the European upper palaeolithic as a whole. It is very difficult to find direct analogies for it, although in a broad technological and typological sense it is nearer to the Aurignacian than to any other technocomplex. P.P. Efimenko (1956: 50; 1958: 436-438), G.P. Grigoriev (1970: 48), Kozlowski and Kozlowski (1975: 244-246), and M.V. Anikovich (Rogachev and Anikovich, 1984: 183) classified it as belonging to the Gorodtsovskaya archaeological culture, although they differed over their understanding of what this amounted to. A.N. Rogachev (1957: 133; Gvozdover and Rogachev, 1969: 495) considered that the industry was original and had no exact parallel.

The arguments on both sides retain their validity today. Therefore it seems best to adopt a relativistic position, dependent on context. It is vitally important to note that within the second chronological group at Kostenki, together with relatively amorphous industries like Kostenki 14 (2), Kostenki 15 and 16, and Kostenki 12 (1), we also have an industry in the second cultural layer at Tel'manskaya (Kostenki 8) which is a typical Gravettian blade-based inventory. In these conditions, and in order to make the contrast between geologically contemporary industries, the idea of a Gorodtsovskaya archaeological culture is sustainable, since all the industries included in it differ among themselves much less than each of them taken separately differs from the second cultural layer at Tel'manskaya (Sinitsyn, 1982).

Cultural layer 3

This layer was found as a distinct horizon only on the western slope (Figure 4C), where the lower part of the upper humic bed forms a continuous deposit. There were no traces of cultural layer 2 in this area. Remains of cultural layer 3 were found throughout the deposit but were concentrated at its base. The slope of the surface (10 or 12 cm per metre) contributed to the deformation of the layer, but the presence of localised ashy patches and the absence of sorting in the material indicates that the deformation was not very considerable. The only features detected were depressions filled with ashy material; they had traces of burning at the base and were interpreted as hearths (Figure 11).

As distinct from the non-blade industry of cultural layer 2, the blanks in this layer were principally blades of black unpatinated flint, used for 80% of the secondarily retouched artefacts. The typological profile of the industry is determined by the broad endscrapers, sometimes with obliquely retouched ends (Figure 12: 1,3). There are a few examples of asymmetrical fan-shaped and arched endscrapers (Figure 12: 2,5). Outils ecailles account for 18% of the retouched artefacts. There are two sorts, firstly flattened subrectangular forms (Figure 12. 8-9,11), and secondly massive core-like pieces (Figure 12. 7,12) which probably do represent worked out bipolar cores. Removal of burin spalls is very rare (Figure 12. 1,4). Notable individual pieces include a triple sidescraper with alternate retouch (Figure 12. 10) and an oblique truncation (Figure 12. 13).

The bone industry is represented by several fragments of rods with subrectangular cross-section (Figure 12. 19-22) and beads made on bird long bones (Figure 12. 15-22).

The cultural appurtenance of the industry from layer 3 has not been finally decided, but within the second chronological group at Kostenki there are more grounds for comparing it to the Gorodtsovskaya cultural tradition than to the Gravettian of the second cultural layer at Tel'manskaya.

The radiocarbon date of 14,300 +\-460 BP (GIN-79) is undoubtedly too young.

Cultural layer 4

The fourth cultural layer was located on both the western and eastern slopes of the promontory (Figure 4 C and E) in the lower humic bed beneath the volcanic ash layer, and in the central sector (Figures 3B and 4D) in whitish marly loam immediately beneath the upper humic bed. On the eastern slope it consists of two horizons divided by an almost 30 cm thick sterile layer (Rogachev, 1957: 85; Sinitsyn, 1991). It is very probable that there were two distinct cultural layers here, but so far very little archaeological material has been found in this area.

Most of the finds come from the central part of the promontory. The primary debitage technique is completely blade-like. Although there are no undoubted cores the blades are indicative of a prevalent unipolar technique with striking platforms at right angles to the striking surface. The inventory contains no diagnostic forms. There are the usual upper palaeolithic endscrapers (Figure 13. 1-2), burins (Figure 13. 4,8,9), retouched blades and flakes (Figure 13. 5-7,10,12-14). The bone industry consists of an awl on the vestigial lateral phalange of a horse and fragments of rods of various cross-sections (Figure 13. 15-17).

The basic importance of the finds from this layer relates to their antiquity. Having regard to the age of the overlying volcanic ash layer and the date of 36,400 + 1700/ -1400 BP from the second cultural layer at Kostenki 17, found in analogous stratigraphic conditions, the likely age of this layer at Markina Gora should be in the range 30-40,000 BP.

THE BURIAL

The significance of the burial found at Markina Gora in 1954 (Figure 4C) relates to three factors: the completeness and excellent standard of preservation of the skeleton, the uniqueness of the funeral ritual, and the problem of the anthropological type which it represents.

It was discovered by accident when deepening the excavation beneath the third cultural layer, since no signs of a burial pit were observed at this level (Figures 14,15,16).

Its depth from the base of the cultural layer was 31-48 cm. The pit had a regular oval form 99 x 39 cm; the long axis was almost perfectly aligned east-west (Rogachev, 1955: 36; 1957: 84). The upper part of the grave and its northern edge were cut through by one of the depressions characteristic of cultural layer 3. The filling of the pit was in no way different from the surrounding loam. In the lower part it was slightly humified, like the lower humic bed in which the base of the grave rested. The fact that the pit had cut through the volcanic ash horizon (which was clearly visible in the walls but was absent from the filling) allowed the contour of the walls to be followed with great accuracy (Figure 4C).

The skeleton lay in a contracted position on its left side with its head to the west and its face to the north, the skull turned to a large extent face downwards. The attitude of the skeleton, very much contracted with knees drawn up to the chest, suggests very probably that it was buried in a bound position (Figure 14,15). The hands were clenched into fists, the left between the rami of the mandible beneath the skull, the right by the chin. The foot bones were stretched out naturally and lay one upon the other with heels touching the pelvis. The bones of the skeleton, particularly the skull, were thickly stained with dark red ochre.

Apart from tiny splinters of flint and animal bone, the filling of the pit contained only a vertebra and a scapula of a hare and a mammoth phalange. Most probably the burial belongs with cultural layer 3 but there is no direct proof of this.

The sex of the skeleton on the basis of the pelvis was determined as male, and his age on the basis of the teeth and cranial sutures as 20-25 years. There are two points of view regarding the anthropological type represented by this skeleton. G.F. Debets, who first described it, classified it as negroid (Debets, 1955). M.M. Gerasimov, who carried out a plastic reconstruction of the specimen (Gerasimov, 1955: 216) (Figure 16) thought the closest analogies were with contemporary Papuans (Gerasimov, 1972: 289). V.P. Yakimov, writing somewhat later, suggested that the criteria for this definition were insufficient, and classified the skeleton as european (Yakimov, 1961, 1980). The unusual nature of the skeleton is nonetheless undeniable, in particular because of its uncommonly small cranial capacity (1160-1170 cc), "considerably lower than all other known fossil neoanthropian specimens. This is the only case of such a small cranial capacity for upper palaeolithic people in Europe" (Kochetkova, 1965: 99).

At the moment the racial type of the man found at Markina Gora remains an open question (Gokhman, 1966: 245; Alexeyev, 1978: 184-185) although Yakimov's point of view has become more popular among Russian anthropologists. Two points deserve emphasis. First, it should be noted that Debets's arguments were hedged with qualifications. For example, while he suggested that "the combination of marked prognathism and a wide nasal aperture indicates similarity with negroids", he added at once that these indicators "could be met with among other races" as individual deviations, and, while low orbits were in his opinion characteristic of negroids, this "not true of all nor only of negroids" (Debets, 1955: 44). Second, "negroid" characteristics have been observed in a whole series of graves and burials belonging to the neolithic and bronze age (Camps, 1980: 432) including Eastern Europe (Gerasimov, 1949: 57; 1955: 392; Bryusov, 1952: 36; Foss, 1952: 65; Akimova, 1961: 31; Bader, 1970: 67) with more or less the same arguments and qualifications. The problem therefore goes wider than the palaeolithic and beyond pure taxonomy. Rather it signifies that the variability of racial types is not stable and that the time when contemporary races came into existence will long be subject to discussion.

CONCLUSION

The current state of research at Kostenki 14 graphically illustrates the main problems concerning the palaeolithic in this area at the moment. Leaving aside questions of archaeological classification and interpretation, these relate in the first place to the comparison of data emerging from different types of scientific analysis particularly with regard to chronology and the natural conditions obtaining at the site. While the number of absolute dates obtained by different methods, and distinctive pollen diagrams, and macro- and micro-faunal determinations, and so forth, have increased, it cannot be said that the number of questions

satisfactorily resolved has thereby decreased. The widening of the analytical basis of archaeology in turn has exercised a direct influence on the methodology of comparative historical investigation, which much more than any other factor has brought about the curent crisis situation in archaeology with regard to culture and its manifestations, and a whole number of other conceptions.

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REFERENCES

AKIMOVA M.S., 1961,
Antropologicheskie dannye po proiskhozhdeniyu narodov Volgo-Kamya. Voprosy Antropologii, 7: 29-40.

ALEXEYEV V.P., 1978,
Paleoantropologiya zemnogo shara i formirovanie chelovecheskikh ras: paleolit. Moscow, AN SSSR.

ANIKOVICH M.V., 1977,
Stroyenie verkhnei gumusirovannoi tolshchi v s. Kostenki i otnositel'nyi vozrast zalegayushchikh v nei stoyanok. in ed. I.K. Ivanova, N.D. Praslov. Paleoekologiya drevnego cheloveka (For the Xth Congress of INQUA): 66-74. Moscow, AN SSSR.

ANIKOVICH M.V., 1983,
K probleme sinkhronizatsii nekotorykh pozdnepaleoliticheskikh pamyatnikov Kostenkovsko-Borshchevskogo rayona. Kratkie Soobshcheniya Instituta Arkheologii AN SSSR, 173: 16-23.

ANIKOVICH M.V., 1993,
O znachenii Kostenkovsko-Borshchevskogo rayona v sovremennom paleolito-vedenii. Peterburgskii Arkheologicheskii Vestnik, 3: 3-19.

BADER O.N., 1970,
Bassein Oki v epokhu bronzy. Moscow, AN SSSR.

BORDES F., 1992,
Lecons sur le Paleolithique, 2: Paleolithique en Europe. Paris, CNRS.

BORISKOVSKY P.I. (ed.), 1984,
Paleolit SSSR. Moscow, AN SSSR.

BRYUSOV A.Ya., 1952,
Ocherki po istorii plemyon Evropeiskoi chasti SSSR v neoliticheskuyu epokhu. Moscow, AN SSSR.

CAMPS G., 1980.,
Manuel de Recherche Prehistorique. Paris.

CHERDYNTSEV V.V., ALEXEYEV V.A., KIND N.V., FOROVA V.S., ZAVELSKY F.C., SULERZHITSKY L.S., FORSENKOVA I.V., 1966,
Dannye laboratorii Geologicheskogo Instituta AN SSSR. Soobshchenie 2. in ed. V.P. Grichuk, I.K. Ivanova, N.V. Kind, E.I. Ravsky. Verkhnii Pleistotsen. Stratigrafiya i absolyutnaya geokhronologiya: 270-276. Moscow, AN SSSR.

DEBETS G.F., 1955,
Paleoantropologicheskie nakhodki v Kostenkakh. Sovietskaya Etnografiya, 1: 43-53.

EFIMENKO P.P., 1956,
K voprosu o kharaktere istoricheskogo protsessa v pozdnem paleolite Vostochnoi Evropy (o pamyatnikakh tak nazyvaemogo seletskogo i grimaldiiskogo tipa). Sovietskaya Arkheo-logiya, 26: 28-53.

EFIMENKO P.P., 1958,
Kostenki I. Moscow-Leningrad, AN SSSR.

FEDOROVA R.V., 1963,
Prirodnye usloviya v period obitaniya verkhnepaleoliticheskogo cheloveka v rayone s. Kostenok Voronezhskoi oblasti (po dannym sporovo-pyltsevogo analiza otlozhenii iz stoyanki Spitsyna (Kostenki XVII). in. P.I. Boriskovsky, Ocherki po paleolitu basseina Dona. Materialy i Issledovaniya po Arkheologii SSSR, 121: 220-229.

FOSS M.E., 1952,
Drevneishyaya istoriya Severa Evropeiskoi chasti SSSR. Materialy i Issledovaniya po Arkheologii SSSR, 29. Moscow, AN SSSR.

GERASIMOV M.M., 1949,
Osnovy vosstanovleniya litsa po cherepu. Moscow.

GERASIMOV M.M., 1955,
Vosstanovlenie litsa po cherepu (sovremennyi i iskopaemyi chelovek). Trudy Instituta Etnografii AN SSSR, N.S., 28.

GERASIMOV M.M., 1972,
La reconstitution documentee de l'homme fossile et la formation de l'homme moderne. in ed. F. Bordes, The Origin of Homo sapiens : 287-290. Paris, Unesco.

GERASIMOVA M.M., 1982,
Paleoantropologicheskie nakhodki. in ed. N.D. Praslov, A.N. Rogachev. Paleolit Kostenkovsko-Borshchevskogo rayona na Donu, 1879-1979: 245-257. Leningrad, Nauka.

GOKHMAN I.I., 1966,
Iskopaemye gominidy i proiskhozdenie cheloveka: Iskopaemye neoantropy. Trudy Instituta Etnografii AN SSSR, N.S., 92: 227-272.

GRIGORIEV G.P., 1970,
Verkhnii Paleolit. in ed. A.A. Formozov, Kamennyi vek na territorii SSSR, Materialy i Issledovaniya po Arkheologii SSSR, 166: 43-63.

GRISHCHENKO M.N., 1950,
Paleogeografiya Kostenkovsko-Borshchevskogo rayona epoki verkhnego paleolita. Kratkie Soobshcheniya Instituta Istorii Material'noi Kul'tury AN SSSR, 31: 75-88.

GRISHCHENKO M.N., 1951,
Opyt geologicheskogo sopostavleniya verkhnepaleoliticheskikh stoyanok Avdeevo na Seime i Kostenok I (Polyakova) na Donu. Byulleten Kommissii po Izucheniyu Chetvertichnogo Perioda, 16: 51-60.

GRISHCHENKO M.N., 1961,
Stratigraficheskoe polozhenie i geologicheskie usloviya Donskikh paleoliti-cheskikh stoyanok. Voprosy stratigrafii i periodizatsii paleolita. Trudy Kommissii po Izucheniyu Chetvertichnogo Perioda, 18: 62-71.

GRISHCHENKO M.N., 1976,
Pleistotsen i Golotsen basseina Verkhnego Dona. Moscow, AN SSSR.

GROMOVA V.I., 1950,
K istorii roda Equus v Vostochnoi Evrope i obshchii ocherk roda v Starom Svete. Materialy po Chetvertichnomu Periodu SSSR, 2: 70-80.

GVOZDOVER M.D. and ROGACHEV A.N., 1969,
Razvitie verkhnepaleoliticheskoi kul'tury na Russkoi Ravnine. in ed. I.P. Gerasimov. Less-Pereglyatsial-Paleolit na territorii Srednei i Vostochnoi Evropy : 487-500.

HOFFECKER J.F., 1988,
Early Upper Paleolithic sites of the European USSR. in ed. J.F. Hoffecker, C.A. Wolf. The Early Upper Paleolithic: evidence from Europe and the Near East. BAR International Series, 437: 237-272. Oxford.

KHOLMOVOI G.V., 1989,
Vulkanicheskie peply v neogen-chetvertichnykh otlozheniyakh i novye voz-mozhnosti tefrostratigraficheskoi korrelyatsii (na primere Tsentral'no-Chernozemskogo rayona). Byulleten Kommisii po Izucheniyu Chetvertichnogo Perioda, 58: 152-155.

KHOLMOVOI G.V. and PRASLOV N.D., 1979,
Vulkanicheskie peply pozdnego Pleistotsena Russkoi ravniny i ikh stratigraficheskoe znachenie. in ed. G.I Goretsky. Verkhnii Pleistotsen i razvitie paleolitiches-koi kul'tury v tsentre Russkoi ravniny : 50-53. Tezisy dokladov Vsesoyuznogo soveshchaniya, posvyashchennogo 100-letiyu otkrytiya paleolita v Kostenkakh, Voronezh.

KLEIN R.G., 1969,
Man and Culture in the Late Pleistocene: a Case Study. San Francisco, Chandler Publishing Company.

KOCHETKOVA V.I., 1965,
Ob'em mozgi paleoliticheskogo cheloveka so stoyanki Markina Gora. Voprosy Antropologii, 20: 99-101.

KOZLOWSKI J.K. and KOZLOWSKI S.K. 1975,
Pradzieje Europy od XL do IV tysiaclecia p.n.e. Warsaw.

LABEYRIE J., 1984,
Le cadre paleoclimatique depuis 140,000 ans. L'Anthropologie, 88: 19-48.

LAVRUSHIN Y.A., PRASLOV N.D., SPIRIDONOVA E.A., CHERNIAKHOVSKY A.G., SOKOLOVA A.L., and TSIPURSKY S.I., 1989,
Evolyutsiya protsessov osadkonakopleniya na sklonakh v svyazi s izmeneniem klimata. Litologiya i poleznye iskopaemye, I : 23-42.

LAZUKOV G.I., 1957a,
Geologiya stoyanok Kostenkovsko-Borshchevskogo rayona. Materialy i Issledov-aniya po Arkheologii SSSR 59: 135-173. Moscow-Leningrad, AN SSSR.

LAZUKOV G.I., 1957b,
Prirodnye usloviya epokhi verkhnego paleolita v Kostenkovsko-Borshchevskom rayone. Sovietskaya Arkheologiya, 3: 84-104.

LAZUKOV G.I., 1961,
Otnositel'nyi vozrast stoyanok Kostenkovsko-Borshchevskogo rayona (po geologo-geomorfologicheskim dannym). Materialy Vsesoyuznogo Soveshchaniya po Izucheniyu Chetver-tichnogo Perioda, I: 405-414. Moscow.

LAZUKOV G.I., 1982,
Kharakteristika chetvertichnykh otlozhenii rayona. in ed. N.D. Praslov, A.N. Rogachev. Paleolit Kostenkovsko-Borshchevskogo rayona na Donu, 1879-1979 : 13-37. Lenin-grad, Nauka.

LEFEVRE, J.C., GILLOT, P.Y. 1994,
Datation potassium-argon des roches volcaniques du pleistocene super-ieur et de l'holocene: exemple de l'Italie du Sud; applications a l'archeologie. Bulletin de la Societe Prehistorique Francaise, 91: 145-148.

LEVKOVSKAYA G.M., 1977,
Palinologicheskaya kharakteristika razrezov Kostenkovsko-Borshchevskogo rayona. in ed. I.K. Ivanova, N.D. Praslov. Paleoekologiya drevnego cheloveka (for the Xth Con-gress of INQUA): 74-83. Moscow, AN SSSR.

MALYASOVA E.S. and SPIRIDONOVA E.A., 1982,
Paleogeografiya Kostenkovsko-Borshchevskogo rayona po dannym palinologicheskogo analiza. in ed. N.D. Praslov, A.N. Rogachev. Paleolit Kostenkovsko-Borshchevskogo rayona na Donu, 1879-1979 : 234-235. Leningrad, Nauka.

MELEKESTSEV I.V., KIRIANOV V.Yu. and PRASLOV N.D., 1984,
Katastroficheskoe izverzhenie v rayone Flegreiskikh polei (Italiya) - vozmozhnyi istochnik vulkanicheskogo pepla v pozdnepleistotsen- ovykh otlozheniyakh evropeiskoi chasti SSSR. Vulkanologiya i Seismologiya, 3: 35-44.

MOSKVITIN A.I., 1961,
Po sledam paleolita i pogrebennym pochvam cherez Dnestr v Chekhoslovakiyu. Voprosy stratigrafii i periodizatsii paleolita. Trudy Kommissii po Izucheniyu Chetvertichnogo Perioda, 18: 160-171.

MOTUZ M.V. ,1979,
Stratigraficheskoe i paleogeograficheskoe znachenie fauny mollyuskov iz verkhne- pleistotsenovykh otlozhenii Kostenkovsko-Borshchevskogo rayona v basseine verkhnego Dona. in ed.G.I. Goretsky.Verkhnii Pleistotsen i razvitie paleoliticheskoi kul'tury v tsentre Russkoi ravniny : 21-23. Tezisy dokladov Vsesoyuznogo soveshchaniya, posvyashchennogo 100-letiyu otkrytiya paleolita v Kostenkakh, Voronezh.

MOTUZ M.V., 1982,
Fauna mollyuskov. in ed. N.D. Praslov, A.N. Rogachev. Paleolit Kostenkovsko-Borshchevskogo rayona na Donu, 1879-1979 : 232-234. Leningrad, Nauka.

PAWLIKOWSKI M., 1992,
Analysis of tephra layers from TD-II and TD-V excavations. in ed. J.K. Kozlowski, H. Laville, B. Ginter. Temnata Cave, excavations in Karlukovo karst area, Bulgaria, I:I. Stratigraphy and Environment, Archaeology of Gravettian layers : 89-92. Krakow.

PRASLOV N.D. and ROGACHEV A.N. (ed), 1982,
Paleolit Kostenkovsko-Borshchevskogo rayona na Donu,1879-1979. Nekotorye itogi polevykh issledovanii. Leningrad, Nauka.

ROGACHEV A.N., 1955,
Pogrebenie drevnekamennogo veka na stoyanke Kostenki 14 (Markina Gora). Sovietskaya Etnografiya, I: 29-38.

ROGACHEV A.N., 1957,
Mnogosloinye stoyanki Kostenkovsko-Borshchevskogo rayona na Donu i problemy razvitiya kul'tury v epokhu verkhnego paleolita na Russkoi ravnine. Materialy i Issledovaniya po Arkheologii SSSR, 59: 9-134. Moscow-Leningrad, AN SSSR.

ROGACHEV A.N. ,1961a,
Nekotorye voprosy stratigrafii i periodizatsii verkhnego paleolita Vostochnoi Evropy (o printsipe geologicheskoi stratigrafii pri izuchenii paleolita). Trudy Kommissii po Izucheniyu Chetvertichnogo Perioda, 18: 40-45.

ROGACHEV A.N., 1961b,
Ob otnositel'noi drevnosti verkhnepaleoliticheskikh stoyanok Sredne-Russkoi vozvyshennosti.Materialy Vsesoyuznogo Soveshchaniya po Izucheniyu Chetvertichnogo Perioda, I: 396-404. Moscow.

ROGACHEV A.N. and ANIKOVICH M.V., 1984,
Pozdnii paleolit Russkoi ravniny i Kryma. in ed. P.I. Boriskov-sky. Paleolit SSSR : 162-271.

ROGACHEV A.N. and SINITSYN A.A., 1982,
Kostenki 14 (Markina Gora). in ed. N.D. Praslov, A.N. Rogachev. Paleolit Kostenkovsko-Borshchevskogo rayona na Donu, 1879-1979 : 145-162.

SAWICKI L., 1964,
Problemes stratigraphiques et chronologiques des stations paleolithiques de Kostenki et de Borsevo. Archaeologia Polona, 7: 7-71.

SAWICKI L., 1965,
Voprosy stratigrafii i geologicheskogo vozrasta paleoliticheskikh stoyanok Kostenok i Borsheva. in ed. O.N. Bader, I.K. Ivanova, A.A. Velichko. Stratigrafiya i Periodizatsiya paleolita Vostochnoi i Tsentral'noi Evropy (k Kongressu INQUA 1965) : 166-199. Moscow.

SINITSYN A.A., 1982,
Gorodtsovskaya pozdnepaleoliticheskaya kul'tura i ee mesto v paleolite Russkoi ravniny. Avtoreferat kandidatskoi dissertatsii. Leningrad.

SINITSYN A.A., 1991,
Kostenki 14 (Markina Gora). in ed. M. Otte. Le Paleolithique superieur Europeen. Bilan quinquennal 1986-1991. ERAUL, 52: 3-6. Liege.

SPIRIDONOVA E.A., 1989,
Opyt vosstanovleniya paleolanshaftov verkhnego pleistotsena po dannym palinologicheskogo analiza. Estestvennonauchnye metody v arkheologii : 176-193. Moscow, AN SSSR.

SPIRIDONOVA E.A., 1991,
Evolyutsiya rastitel'nogo pokrova basseina Dona v verkhnem pleistotsene-golotsene. Moscow.

SVEZHENTSEV Yu.S., 1993,
Radiocarbon chronology for the Upper Paleolithic sites on the East European Plain. in ed. O. Soffer, N.D. Praslov. From Kostenki to Clovis : 23-30. Plenum, New York.

SVEZHENTSEV Yu.S. and POPOV S.G., 1993,
Late paleolithic chronology of the East European Plain. Radio-carbon, 35 (3): 495-501.

VELICHKO A.A., 1961,
O vozmozhnostyakh geologicheskogo sopostavleniya rayonov paleoliticheskikh stoyanok v basseinakh Desny, Dona i na territorii Chekhoslovakii. Voprosy stratigrafii i periodizat-sii paleolita. Trudy Kommissii po Izucheniyu Chetvertichnogo Perioda, 18: 50-61.

VELICHKO A.A., 1963,
Stoyanka Spitsyna (Kostenki XVII) i ee znachenie dlya resheniya osnovnykh voprosov geologii Kostenkovsko-Borshchevskogo rayona. in P.I. Boriskovsky. Ocherki po paleolitu basseina Dona. Materialy i Issledovaniya po Arkheologii SSSR, 121: 201-219.

VELICHKO A.A. and ROGACHEV A.N., 1969,
Pozdnepaleoliticheskie poseleniya na srednem Donu. in ed. I.P. Gerasimov. Priroda i razvitie pervobytnogo obshchestva na territorii Evropeiskoi chasti SSSR (k VIII Kongressu INQUA) : 75-87. Moscow.

VERESHCHAGIN N.K. and KUZMINA I.E., 1977,
Ostatki mlekopitayushchikh iz paleoliticheskikh stoyanok na Donu i verkhnei Desne. Mamontovaya fauna Russkoi ravniny i Vostochnoi Sibiri. Trudy Zoologi-cheskogo Instituta, 72: 77-110.

VERESHCHAGIN,N.K. and KUZMINA I.E., 1982,
Fauna mlekopitayushchikh. in ed. N.D. Praslov, A.N. Roga-chev. Paleolit Kostenkovsko-Borshchevskogo rayona na Donu, 1879-1979 : 223-232.

YAKIMOV V.P., 1961,
Naselenie evropeiskoi chasti SSSR v pozdnem paleolite i mezolite. Voprosy Antropologii, 7: 23-28.

YAKIMOV V.P., 1980,
New materials of skeletal remains of ancient peoples in the territory of the Soviet Union. in ed. L.K. Konigsson. Current Argument on Early Man: 159-169. Oxford,Pergamon Press.

ZUBAKOV V.A., 1986,
Global'nye klimaticheskie sobytiya pleistotsena. Leningrad, Gidrometizdat.

n	LAB CODE	SAMPLE, CONTEXT, MATERIAL	DATE (B.P.)	SIGMA	REFERENCES
Recent chronological group (overlying loams)					
Kostenki 1 (Poliakov), Upper cultural layer					
1	GIN 1870	Burned bone	22300	230	Praslov, Rogachev, 1982
2	GIN 2534	Burned bone	21300	400	Praslov, Rogachev, 1982
3	GIN 2533	Pit-dwelling "A", burned bone	22300	200	Praslov, Rogachev, 1982
4	GIN 2530	Pit-dwelling "Zh", burned bone	22800	200	Praslov, Rogachev, 1982
5	GIN 2528	Pit-dwelling "A", burned bone	23000	500	Praslov, Rogachev, 1982
6	GIN 2527	Pit-dwelling "A", burned bone	23500	200	Praslov, Rogachev, 1982
7	GIN 2529	Pit-dwelling "Z", burned bone	24100	500	Praslov, Rogachev, 1982
8	LE 2800	Sq. Zh-70, mammoth tooth	22760	250	Svezhentsev, 1993
9	LE 2801	Pit-dwelling "with the wall"	21800	200	Svezhentsev, 1993
10	LE 2949	Cultural layer, mammoth tooth	19860	200	Svezhentsev, 1993
11	LE 2950	Storage pit (PR-72), mammoth tooth	19010	120	Svezhentsev, 1993
12	LE 2951	Pit dwelling "F-72,73",mammooth tooth	23770	200	Svezhentsev, 1993
13	LE 2969	Cultural layer, mammoth tooth	22700	250	Svezhentsev, 1993
14	LE 3276	Sq. L-78, burned mammoth tooth	23010	300	Svezhentsev, 1993
15	LE 3279	Sq. L-77, mammoth tooth	21680	700	Svezhentsev, 1993
16	LE 3282	Storage pit, mammoth tooth	22020	310	Svezhentsev, 1993
17	LE 3289	Pit-dwelling "T-H-72-75", mammoth tooth	23260	680	Svezhentsev, 1993
18	LE 3286	Pit-dwelling "T-H-72-75", burned bone	23490	420	Svezhentsev, 1993
19	LE 3277	Cultural layer, burned bone	20100	680	Svezhentsev, 1993
20	LE 3280	Cultural layer, burned bone	18230	620	Svezhentsev, 1993
21	LE 3281	Sq. O-78, burned bone	19620	460	Svezhentsev, 1993
22	LE 3283	Pit, sq. K-78, mammoth tusk	23640	320	Svezhentsev, 1993
23	LE 3290	Sq. P-76, pit, burned bone	22060	500	Svezhentsev, 1993
24	LE 3292	Sq. N-76, pit, burned bone	19540	580	Svezhentsev, 1993
25	GIN 4851	Sq. O-73,74+E49	20800	300	Unpubl.
26	AA 4799	Cultural layer, burned bone	20855	260	Svezhentsev, 1993
27	AA 4800	Cultural layer, burned bone	20315	200	Svezhentsev, 1993
Kostenki 2 (Zamyatnin)					
28	GIN 93	Cultural layer, bone	11000	200	Boriskovsky, 1984
29	LE 1599	Cultural layer, bone	16190	150	Boriskovsky, 1984

Table I. C14 dates of the sites of Kostenki-Borshevo area

n°	LAB CODE	SAMPLE. CONTEXT. MATERIAL	DATE (B.P.)	SIGMA	REFERENCES
Kostenki 11 (Anosovka 2). Cultural layer Ia					
30	LE 1403	Cultural layer, bone	12000	100	Praslov, Rogachev, 1982
31	LE 1637	Cultural layer, bone	14610	120	Praslov, Rogachev, 1982
32	LE 1704a	Cultural layer, bone	16040	120	Praslov, Rogachev, 1982
33	LE 1704b	Cultural layer, bone	17310	280	Praslov, Rogachev, 1982
34	GIN 2532	Cultural layer, burned bone	19900	350	Praslov, Rogachev, 1982
Kostenki 11 (Anosovka 2). Cultural layer II					
35	GIN 2531	Cultural layer, burned bone	21800	200	Praslov, Rogachev, 1982
36	TA 34	Cultural layer, bone	15200	300	Praslov, Rogachev, 1982
Kostenki 11 (Anosovka 2). Cultural layer III					
37	LE 1638a	Cultural layer, bone	16040	120	Praslov, Rogachev, 1982
38	LE 1638b	Cultural layer, bone	22760	340	Praslov, Rogachev, 1982
Kostenki 14 (Markina Gora). Cultural layer I					
39	OxA 4114	Cultural layer, bone	22780	250	
Kostenki 19 (Valukinsky)					
40	GIN 107	Cultural layer, burned bone	11800	500	Praslov, Rogachev, 1982
41	LE 1705a	Cultural layer, bone	17420	150	Praslov, Rogachev, 1982
42	LE 1705b	Cultural layer, bone	18900	300	Praslov, Rogachev, 1982
Kostenki 21 (Gmelinskaya). Cultural layer II					
43	LE 1437a	Cultural layer, bone	19100	150	Praslov, Rogachev, 1982
44	LE 1437b	Cultural layer, bone	20250	100	Praslov, Rogachev, 1982
45	LE 1437c	Cultural layer, bone	22900	150	Praslov, Rogachev, 1982
Kostenki 21 (Gmelinskaya). Cultural layer III					
46	LE 1043	Cultural layer, charcoal	16960	300	Praslov, Rogachev, 1982
47	GrN 7363	(same sample)	22270	150	Praslov, Rogachev, 1982
48	GrN 10513	Cultural layer, charcoal	21260	340	Praslov, Rogachev, 1982
49	TA&TL	Cultural layer, burned clay (loam under hearth)	26765	2000	Praslov, Rogachev, 1982

Table I. C14 dates of the sites of Kostenki-Borshevo area

n	LAB CODE	SAMPLE, CONTEXT, MATERIAL	DATE (B.P.)	SIGMA	REFERENCES
Borshevo 2					
50	GIN 88	Upper cultural layer, plant remains	12300	100	Praslov, Rogachev, 1982
51	LU 742	Upper cultural layer, charcoal	13210	270	Praslov, Rogachev, 1982
52	MO 636	Upper cultural layer, humus	11760	240	Boriskovsky, 1984
Middle chronological group (upper humic bed)					
Kostenki 1 (Poliakov), Cultural layer III					
53	GIN 4850	Cultural layer, sq. D-72, charcoal	24500	1300	Unpubl.
54	GIN 4852	Cultural layer, sq. E-72, charcoal	25600	1000	Anikovich, 1993
55	GIN 4885	Cultural layer, sq. D-74, charcoal	26200	1500	Anikovich, 1993
56	LE 3541	Cultural layer, charcoal	25730	1800	Svezhentsev, Popov, 1993
57	GIN 4899	Cultural layer	25900	2200	Anikovich, 1993
58	AA 5590	Cultural layer, charcoal	38080	5460	Svezhentsev, 1993
Kostenki 8 (Telmanskaya)					
59	GrN 10509	Cultural layer II, charcoal	27700	750	Praslov, Rogachev, 1982
Kostenki 12 (Volkov)					
60	TA 154	Cultural layer I, bone	20900	390	Svezhentsev, 1993
61	GIN 89	Cultural layer I, humus	23060	300	Cherdyntsev et al. 1966
62	LE 1428a	Cultural layer Ia, bone	28700	400	Svezhentsev, 1993
63	LE 1428b	Cultural layer Ia, bone	30240	400	Svezhentsev, 1993
64	LE 1428c	Cultural layer I, mammoth tooth (collagen)	31150	150	Svezhentsev, 1993
65	LE 1428d	Cultural layer Ia,mammoth tooth (DTA)	31900	200	Svezhentsev, 1993
66	GrN 7758	Cultural layer I, charcoal	32700	700	Praslov, Rogachev, 1982
Kostenki 14 (Markina Gora), Cultural layer II					
67	LE 1400	Bone	19300	200	Praslov, Rogachev, 1982
68	LU 59a	Bone	26400	660	Praslov, Rogachev, 1982
69	LU 59b	Bone	28200	700	Praslov, Rogachev, 1982
70	GrN 12598	Charcoal	28380	220	Anikovich, 1993
71	OxA 4115	Bone	28580	420	

Table I. C14 dates of the sites of Kostenki-Borshevo area

n	LAB CODE	SAMPLE CONTEXT MATERIAL	DATE (B.P.)	SIGMA	REFERENCES
Kostenki 14 (Markina Gora). Cultural layer III					
72	GIN 79	Bone	14300	460	Cherdyntsev et al. 1966
Kostenki 15 (Gorodtsov)					
73	LE 1430	Bone	21720	570	Praslov, Rogachev, 1982
Kostenki 16 (Uglianka)					
74	LE 1431	Bone	25100	150	Praslov, Rogachev, 1982
Kostenki 17 (Spitsyn). Cultural layer I					
75	GrN 10511	Charcoal	26750	700	Praslov, Rogachev, 1982
Early chronological group (lower humic bed)					
Kostenki 1 (poliakov). Cultural layer V					
76	LE 2030	Mammoth tooth	27390	300	Anikovich, 1993
77	LE 3542	Charcoal	30170	570	Anikovich, 1993
Kostenki 14 (Markina Gora). Cultural layer IV					
78	OxA 4116	Bone	27460	390	
79	OxA 4117	Bone	27710	410	
Kostenki 17 (Spitsyn). Cultural layer II					
80	GrN 10512	Charcoal	32200	2000	Praslov, Rogachev, 1982
81	LE 1436	Bone	32780	300	Svezhentsev, 1993
82	GrN 12596	Charcoal	36400	1700	Svezhentsev, 1993

Table I. C14 dates of the sites of Kostenki-Borshevo area

Table 2. Kostenki 14 (Markina Gora). Composition of faunal species from 1953 and 1954 excavations (according to Vereshchagin and Kuzmina, 1977).

Species	Layer 1		Layer 2		Layer 3		Layer 4		Total	
	Bones	Individuals	Bones	Individuals	Bones	Individuals	Bones	Individuals	Bones	Individuals
Pleistocene (Palaeolithic)										
1 *Canis lupus L.*	-	-	4	1	38	2	7	1	49	4
2 *Alopex lagopus L.*	-	-	-	-	5	1	-	-	5	1
3 *Ursus arctos L.*	-	-	-	-	-	-	1	1	1	1
4 *Gulo gulo L.*	-	-	-	-	-	-	-	-	-	-
5 *Panthera spelaea goldf.*	-	-	1	1	-	-	-	-	1	1
6 *Lepus sp.*	-	-	818	13	865	17	1514	18	3197	48
7 *Ochotona pusilla Pall.*	-	-	16	5	-	-	-	-	16	5
8 *Cricetus cricetus L.*	-	-	1	1	-	-	-	-	1	1
9 *Lagurus luteus Eversm.*	-	-	8	2	-	-	-	-	8	2
10 *Lagurus lagurus Pall.*	-	-	29	12	-	-	-	-	29	12
11 *Arvicola terrestris L.*	-	-	4	1	-	-	-	-	4	1
12 *Microtinae sp.*	-	-	10	2	-	-	-	-	10	2
13 *Mammuthus primigenius Blum.*	24	2	6	1	3	1	15	1	48	5
14 *Equus caballus latipes Grom.*	-	-	2083	19	101	1	261	3	2445	23
15 *Coelodonta antiquitatis Blum.*	-	-	16	1	-	-	-	-	16	1
16 *Cervus elaphus L.*	-	-	41	1	4	1	-	-	45	2
17 *Megaceros euryceros Aldr.*	-	-	-	-	-	-	-	-	-	-
18 *Rangifer tarandus L.*	-	-	11	1	-	-	-	-	11	1
19 *Saiga tatarica L.*	-	-	1	1	-	-	-	-	1	1
20 *Bos primigenius Boj.*	-	-	1	1	-	-	5	1	6	2
21 *Avis*	-	-	4	-	7	-	34	-	45	-
22 *Reptilia*	-	-	1	-	-	-	-	-	1	-
23 *Pisces*	-	-	1	-	-	-	-	-	1	-
Total	24	2	3056	63	1023	23	1837	25	5940	113

Bones of modern rodents and Pleistocene bones without undoubted stratigraphic position are excuded. Bones of Gulo gulo (n° 4) and Megaceros (n°17) are present, but their stratigraphic position is doubtful.

Tabl. III. Kostenki 14 (Markina gora). Molluscs from the deposits of II cultural layer 2.

1. Succinea oblonga (Draparnaud)	327 sp.
2. Trichia hispida (Linne)	6 sp.
3. Helicopsis sp.	1 sp.
4. Bradybaena sp.	1 sp.
5. Vallonia pulchella (Müller)	65 sp.
6. Vallonia sp.	53 sp.
7. Vallonia tenuilabris (Al. Braun)	75 sp.
8. Pupilla muscorum (Linne)	157 sp.
9. Pupilla muscorum edentula (Slavik)	49 sp.

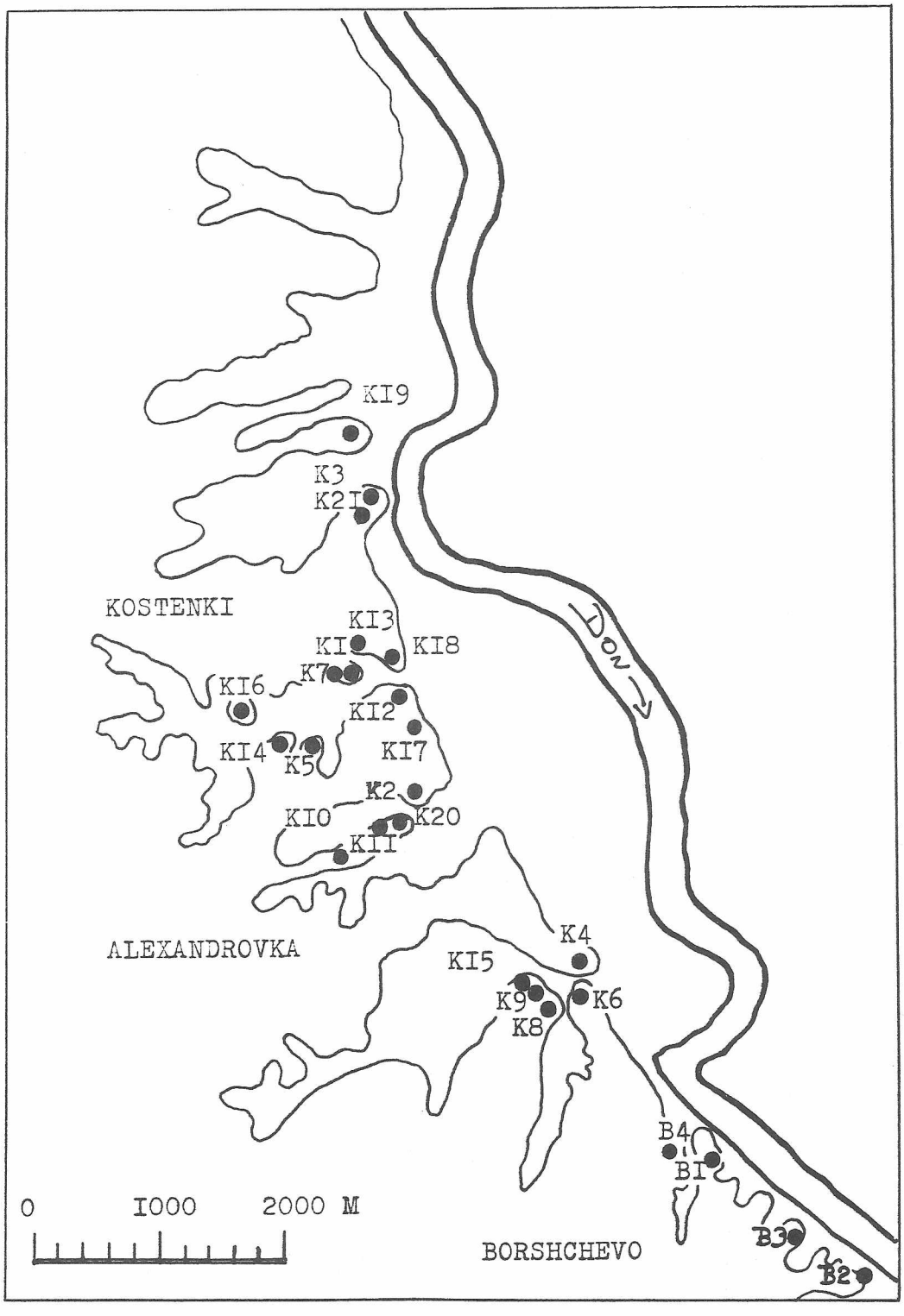

Figure 1. Schematic plan of the upper palaeolithic sites in the Kostenki-Borshchevo region.

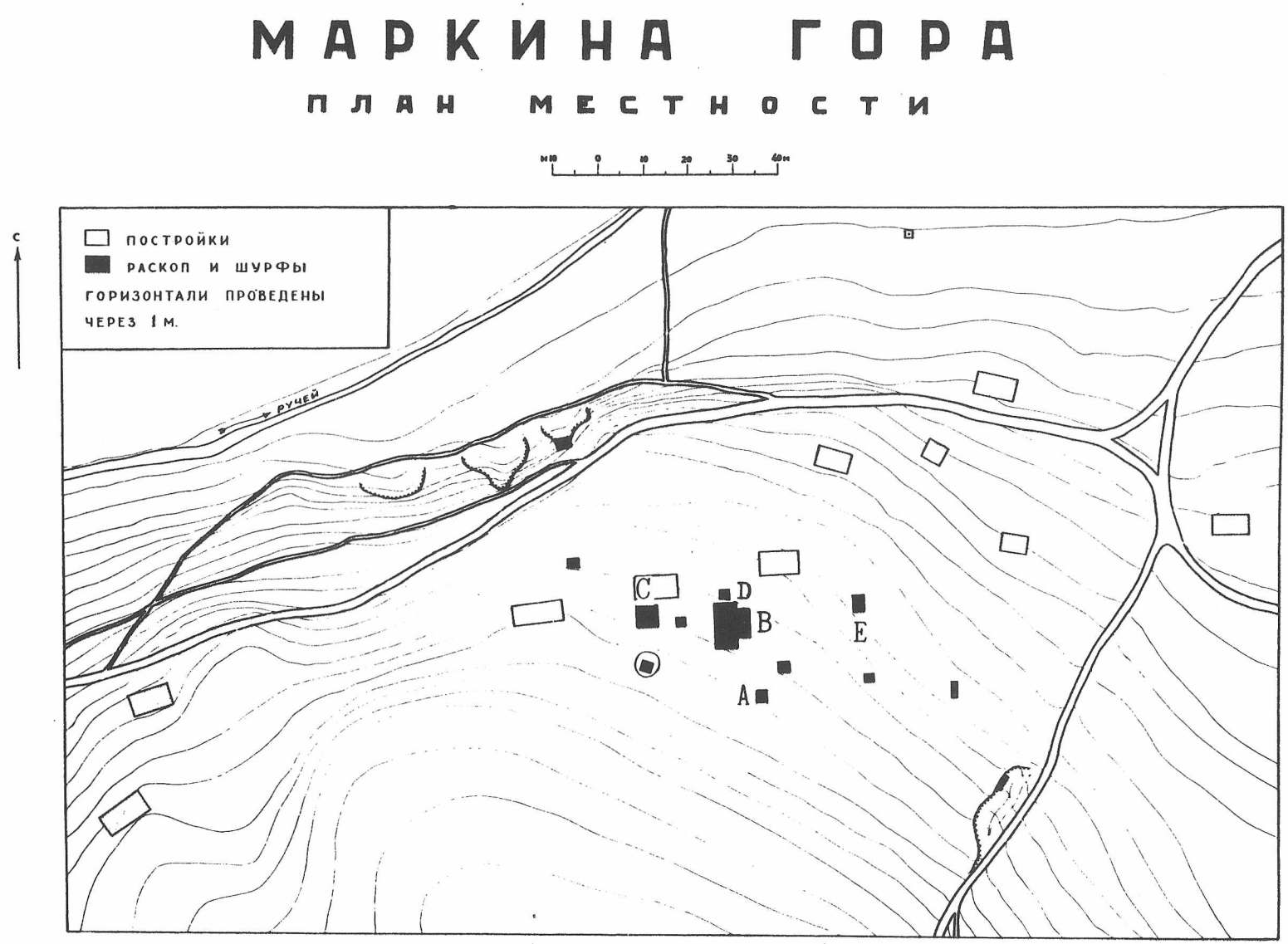

Figure 2. Kostenki 14 (Markina Gora). Schematic plan indicating the position of the excavations. The sections illustrated are those at A, B, C, D, and E. Contours drawn at 1 metre intervals. Hatched rectangles indicate houses.

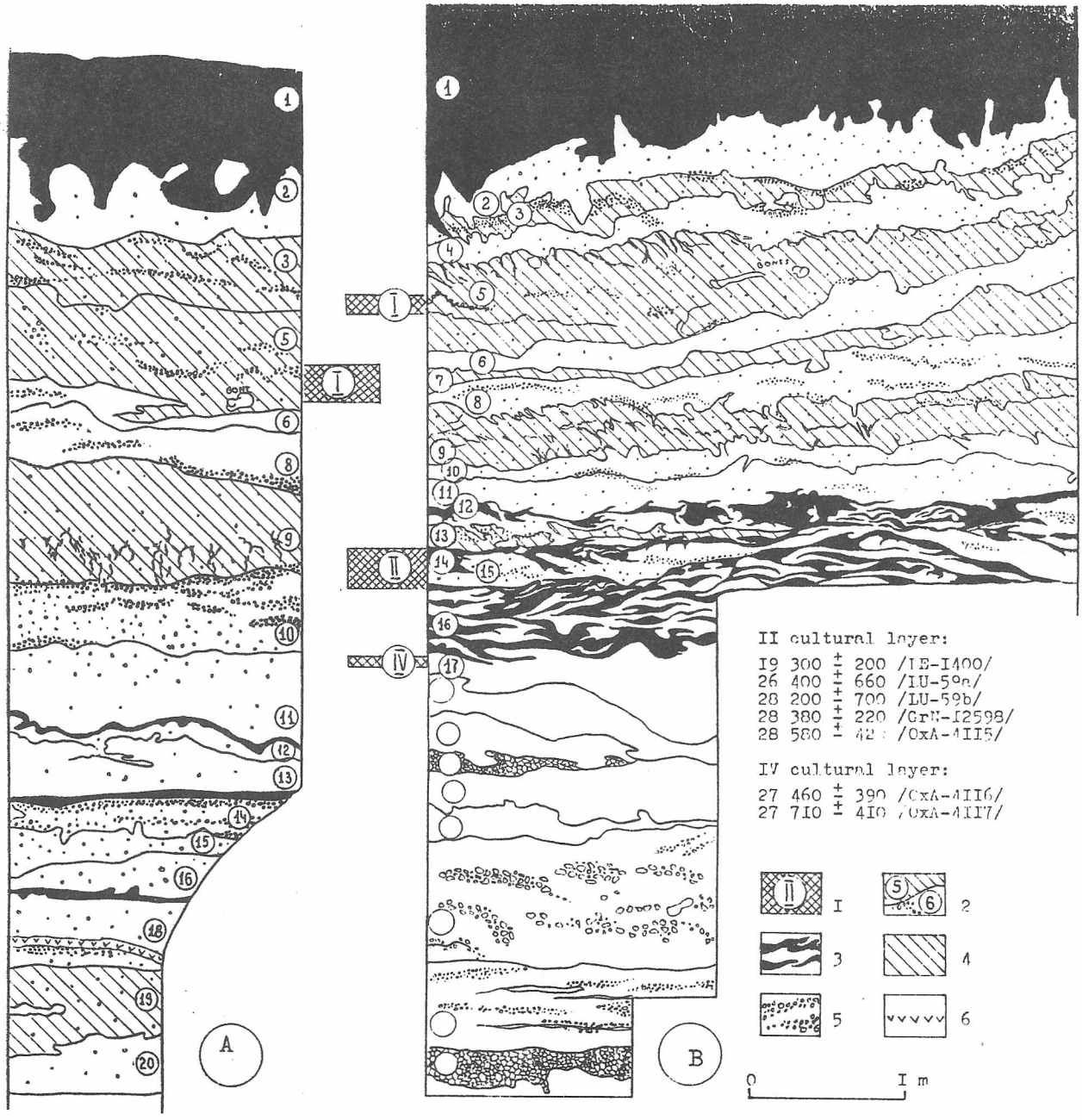

Figure 3. Kostenki 14. A and B longitudinal sections. I cultural layers. 2 stratigraphic horizons. 3 intensive humic horizons. 4 weak humic horizons. 5 colluvial horizons. 6 volcanic ash.

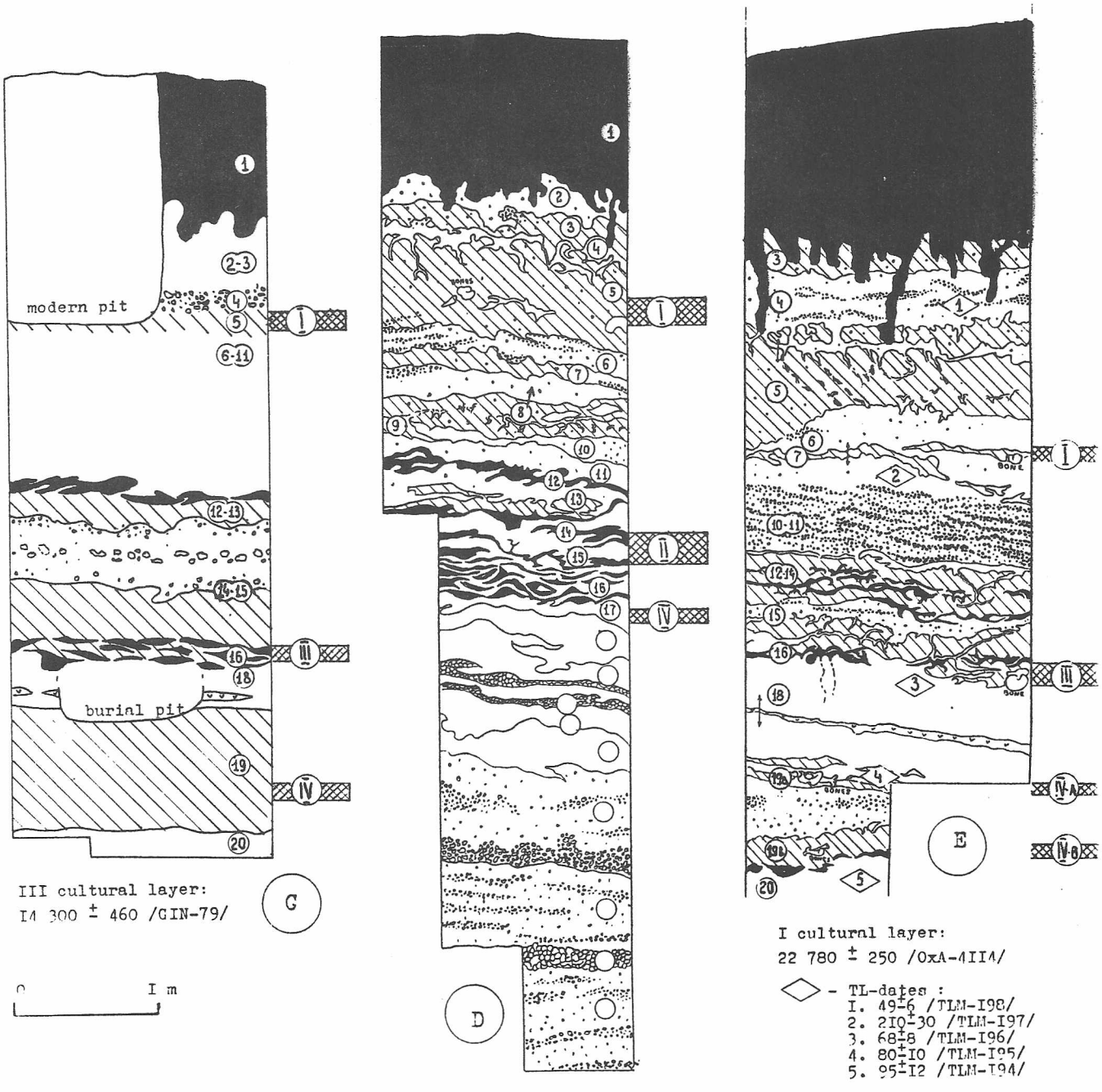

Figure 4. Kostenki 14. C, D and E transverse sections. Key as in Figure 3.

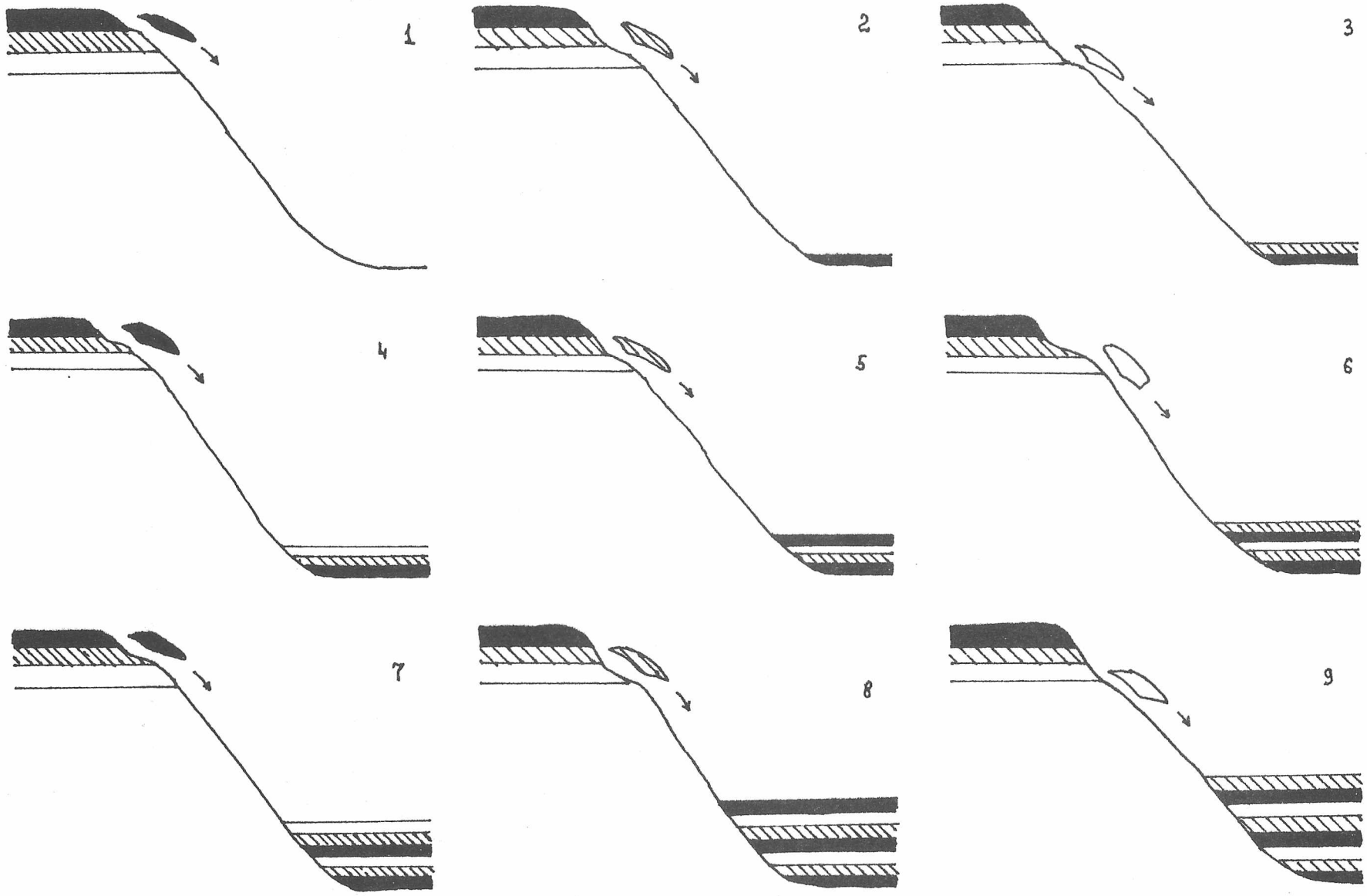

Figure 5. Hypothetical version of the formation of the upper humic bed at Kostenki. Stages 1-9.

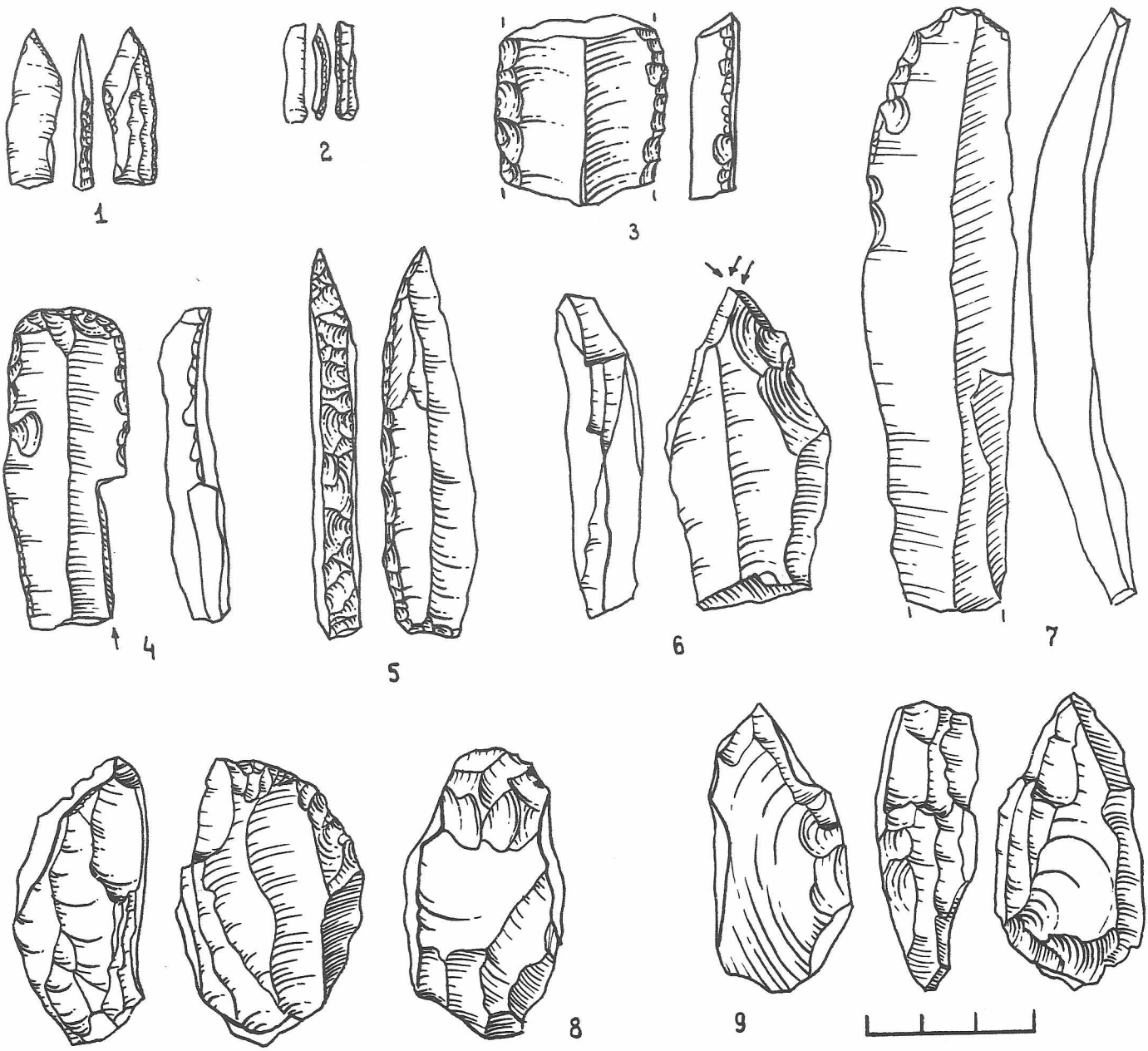

Figure 6. Kostenki 14. Cultural layer 1. Lithic assemblage.

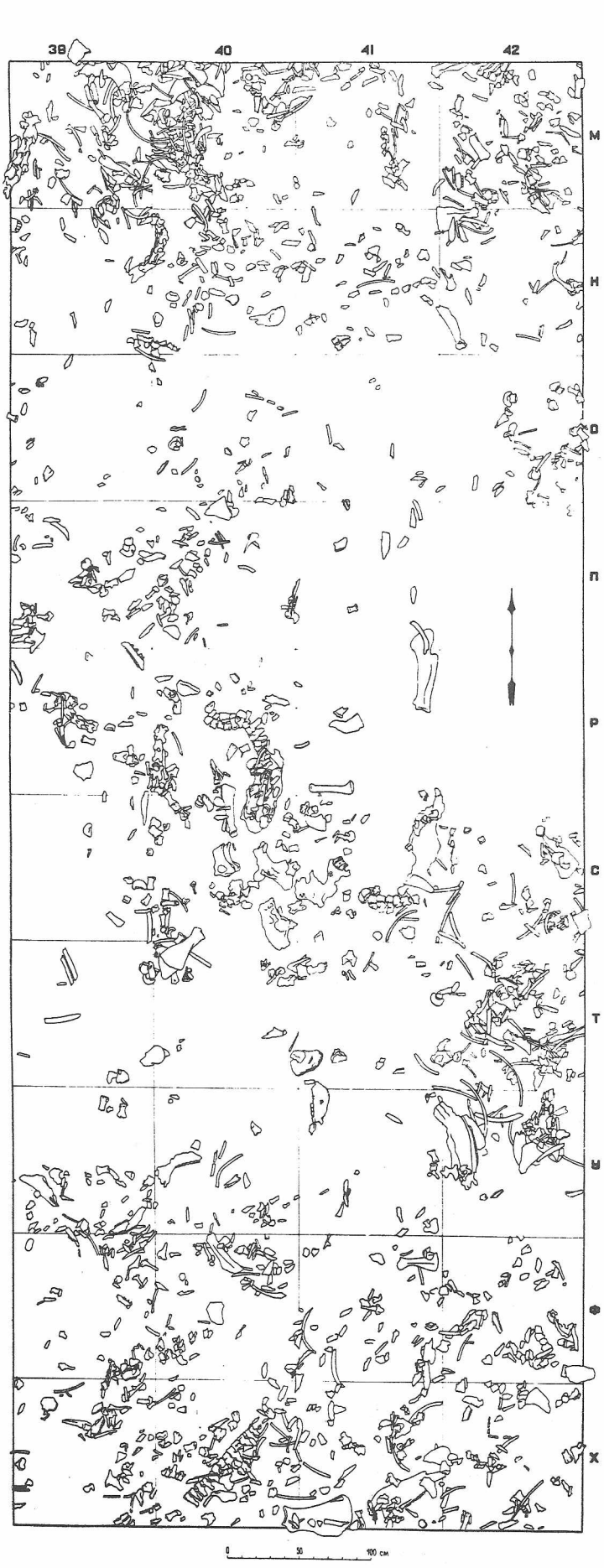

Figure 7. Kostenki 14. Plan of cultural layer 2.

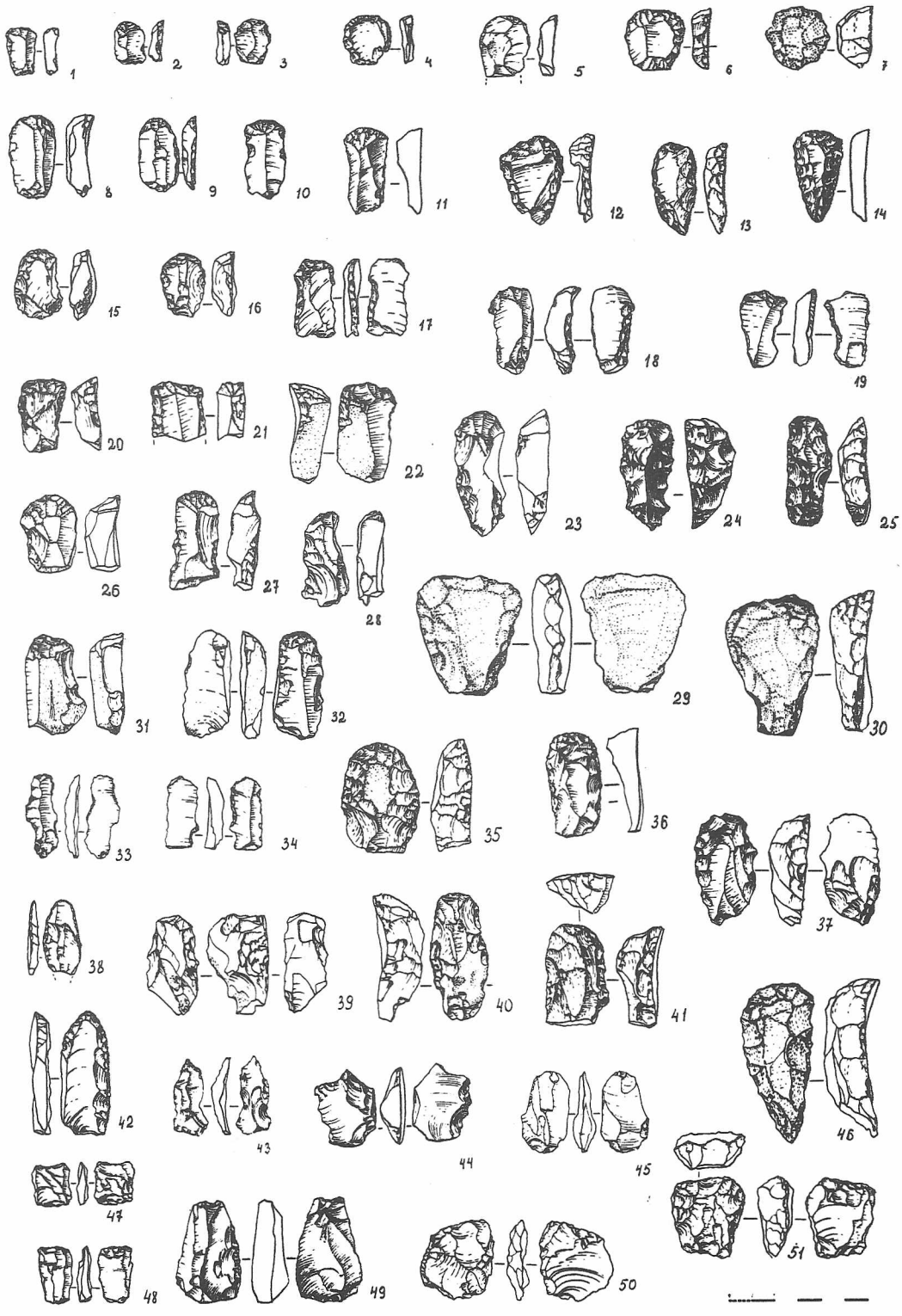

Figure 8. Kostenki 14. Cultural layer 2. Lithic assemblage.

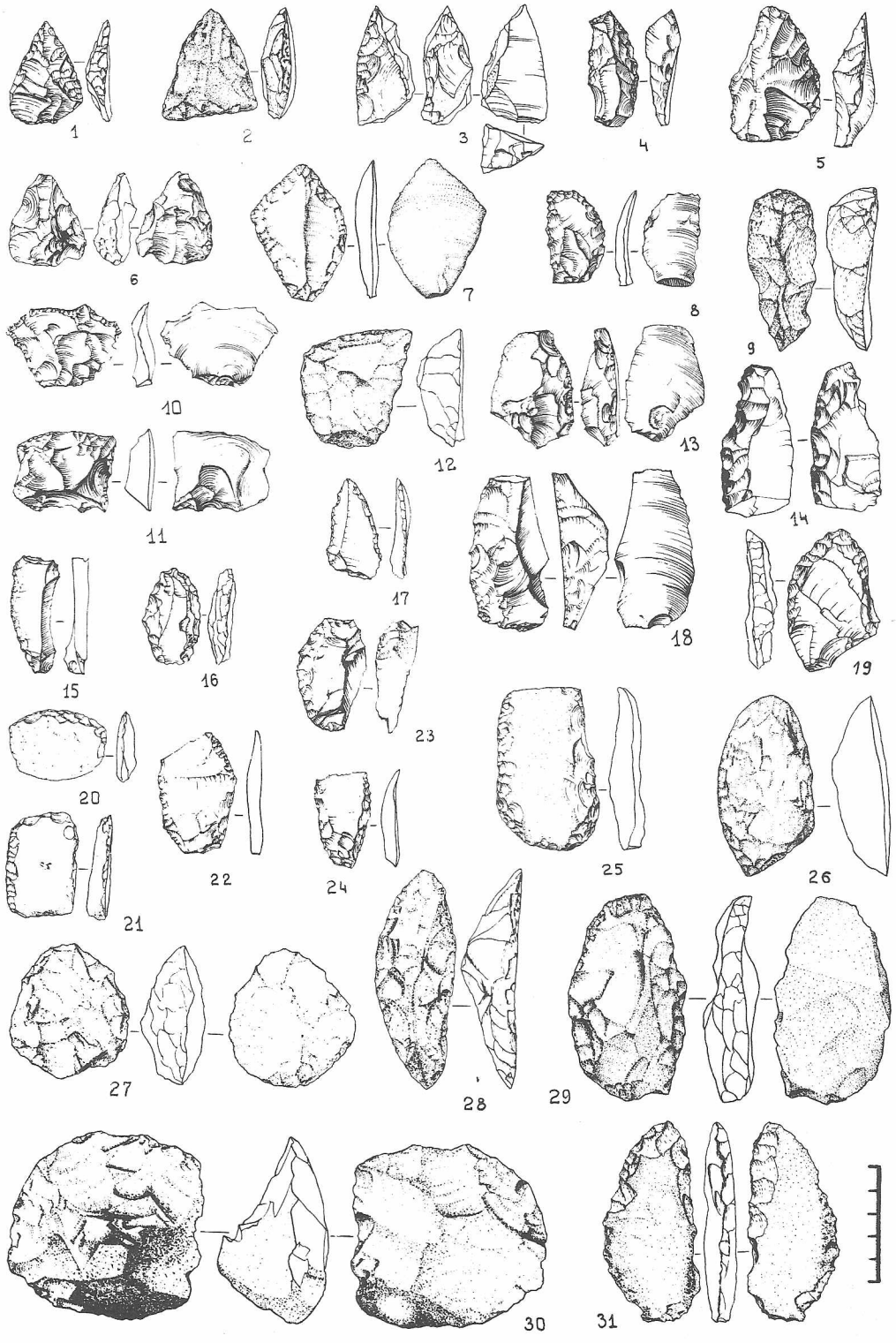

Figure 9. Kostenki 14. Cultural layer 2. Lithic assemblage, "archaic component".

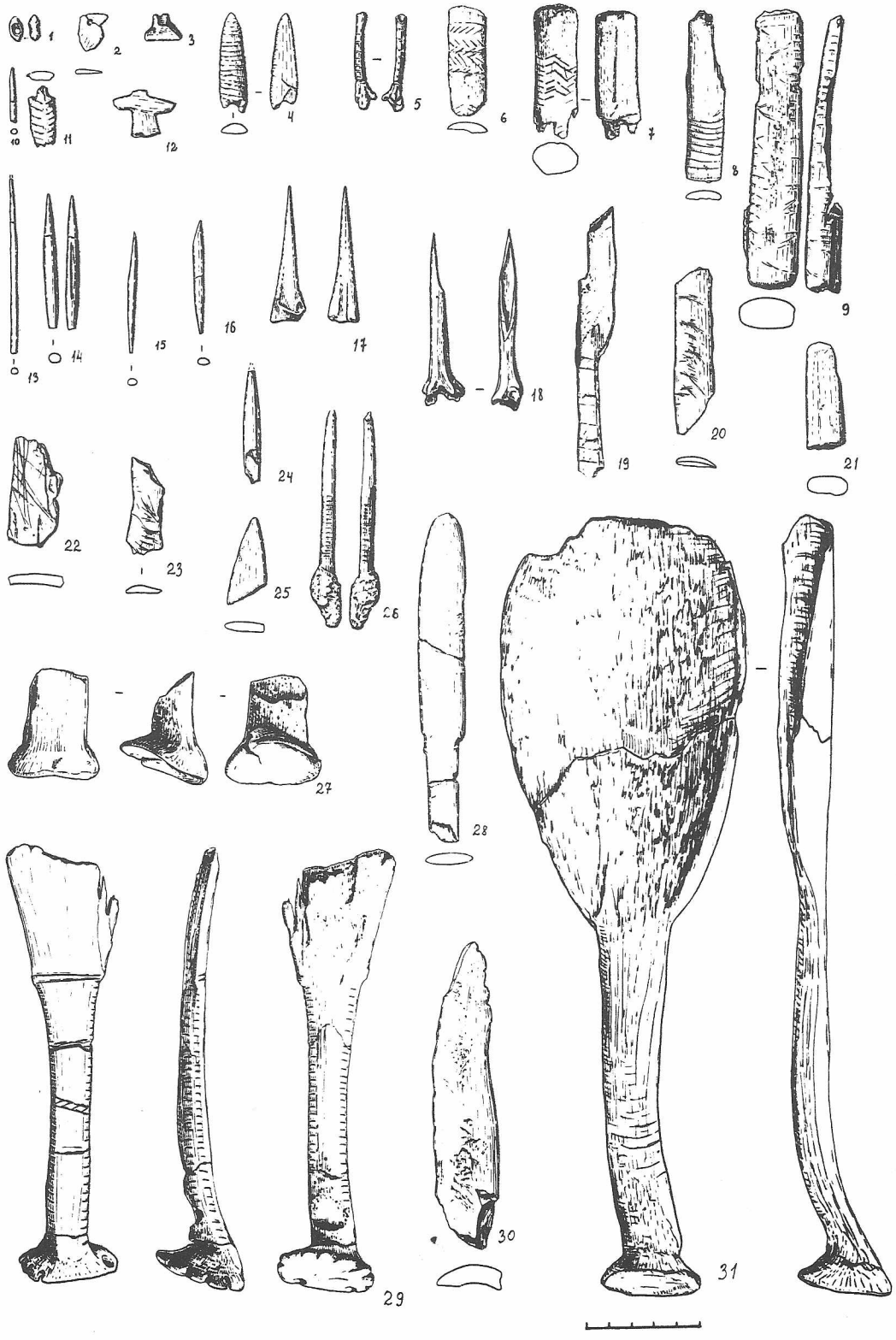

Figure 10. Kostenki 14. Cultural layer 2. Bone industry.

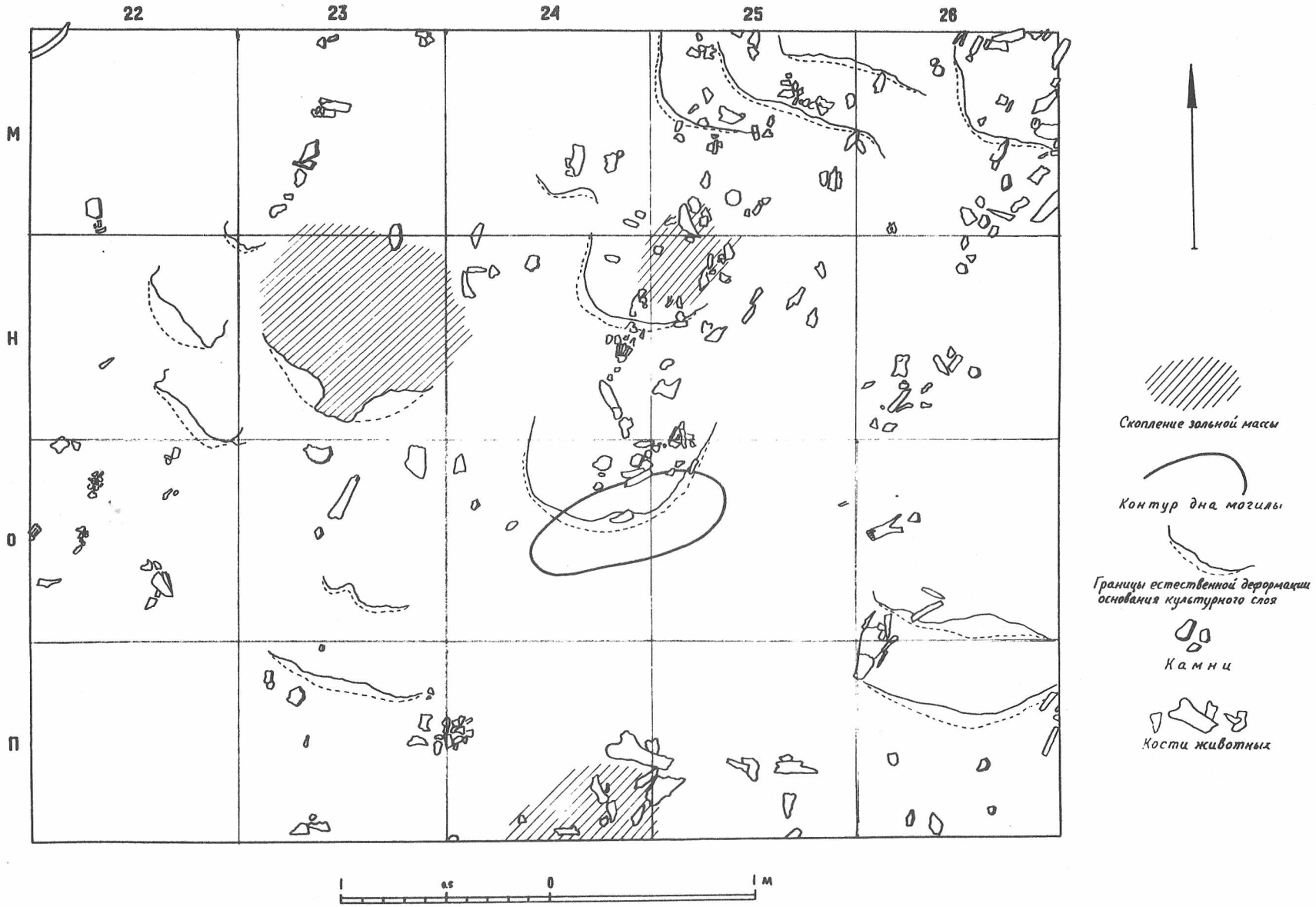

Figure 11. Kostenki 14. Plan of cultural layer 3. Hatching indicates ash accumulations, semicircular continuous and broken lines natural deformations at the base of the cultural layer. Apart from stones and bones, the base of the burial pit is also indicated by a thick oval line.

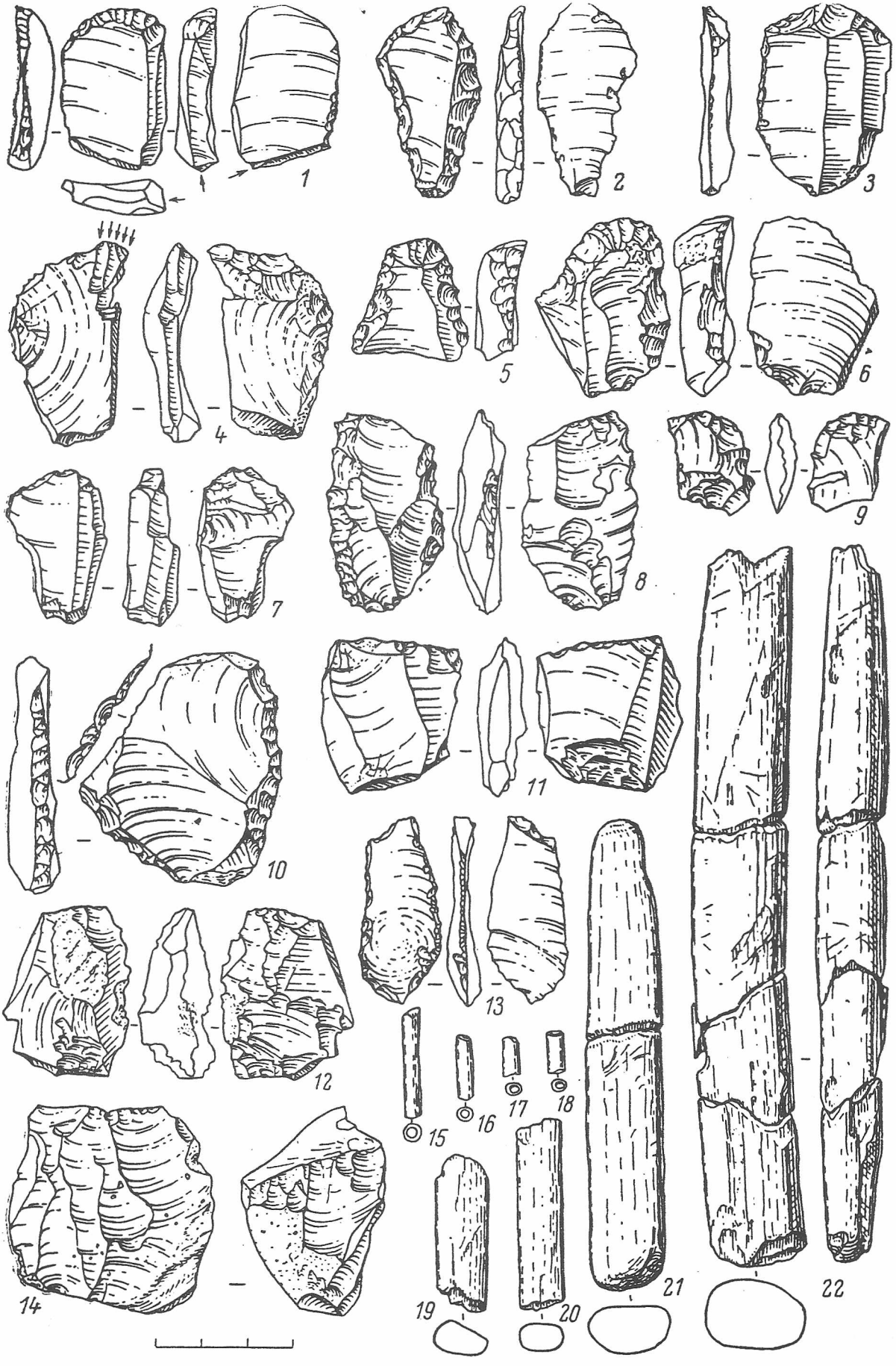

Figure 12. Kostenki 14. Cultural layer 3. Lithic (1-14) and bone (15-22) inventory (after Rogachev and Sinitsyn, 1982).

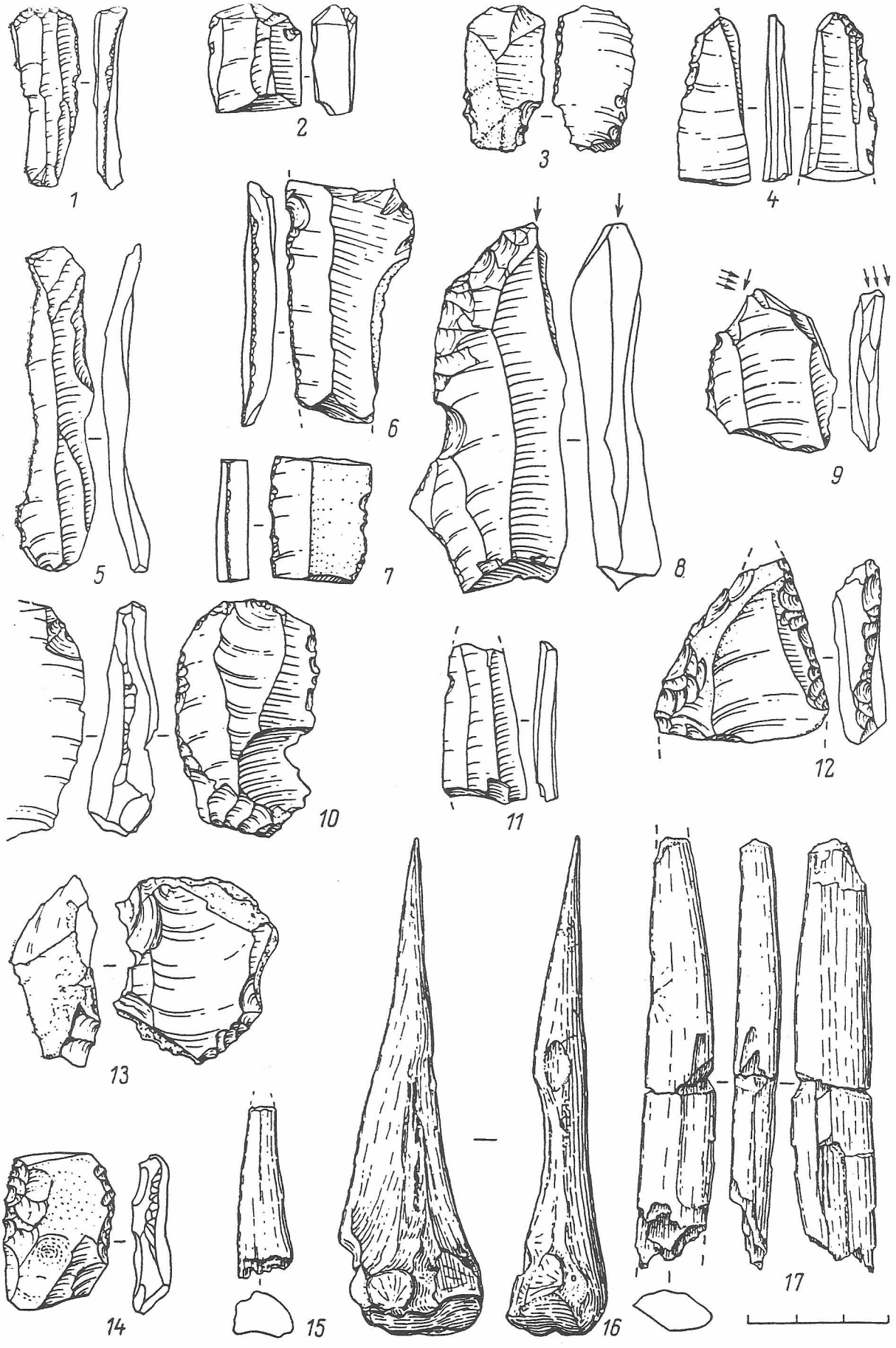

Figure 13. Kostenki 14. Cultural layer 4. Lithic (1-14) and bone (15-17) inventory (after Rogachev and Sinitsyn, 1982).

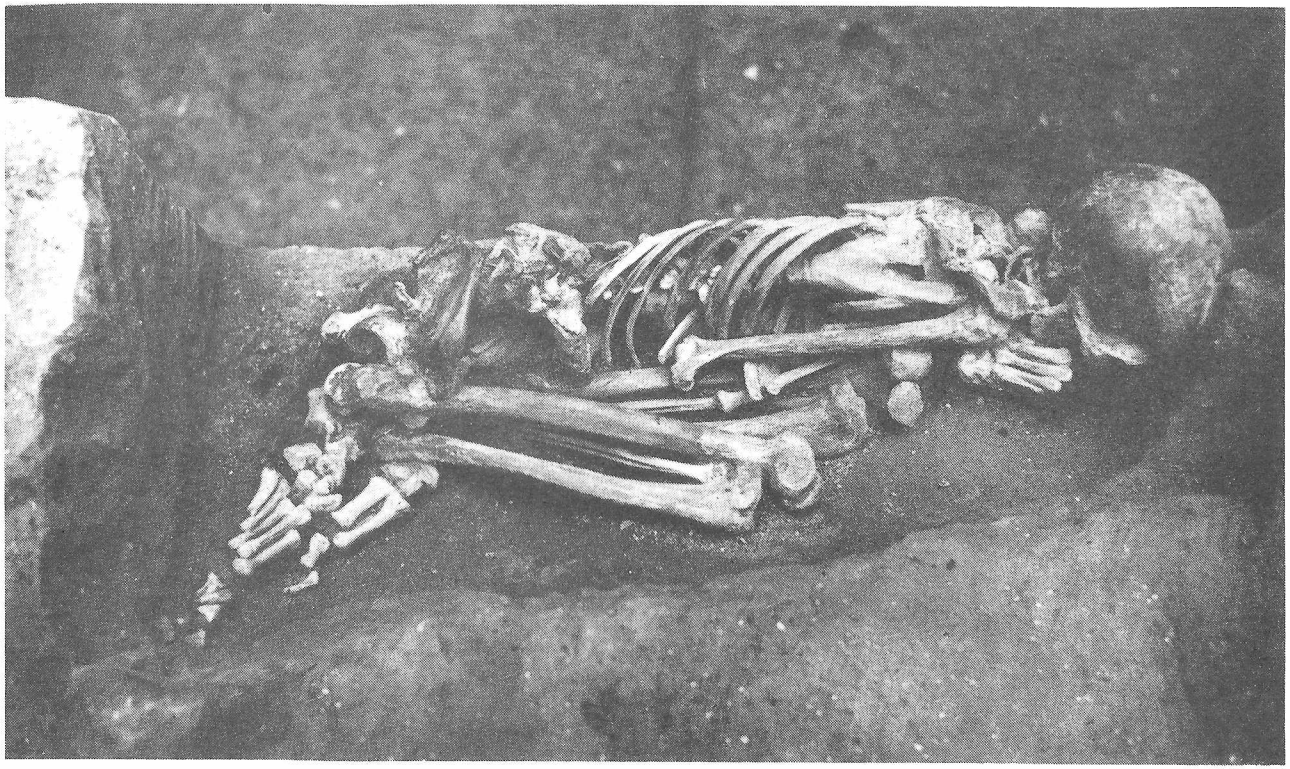

Figure 14. Kostenki 14. The burial beneath cultural layer 3.

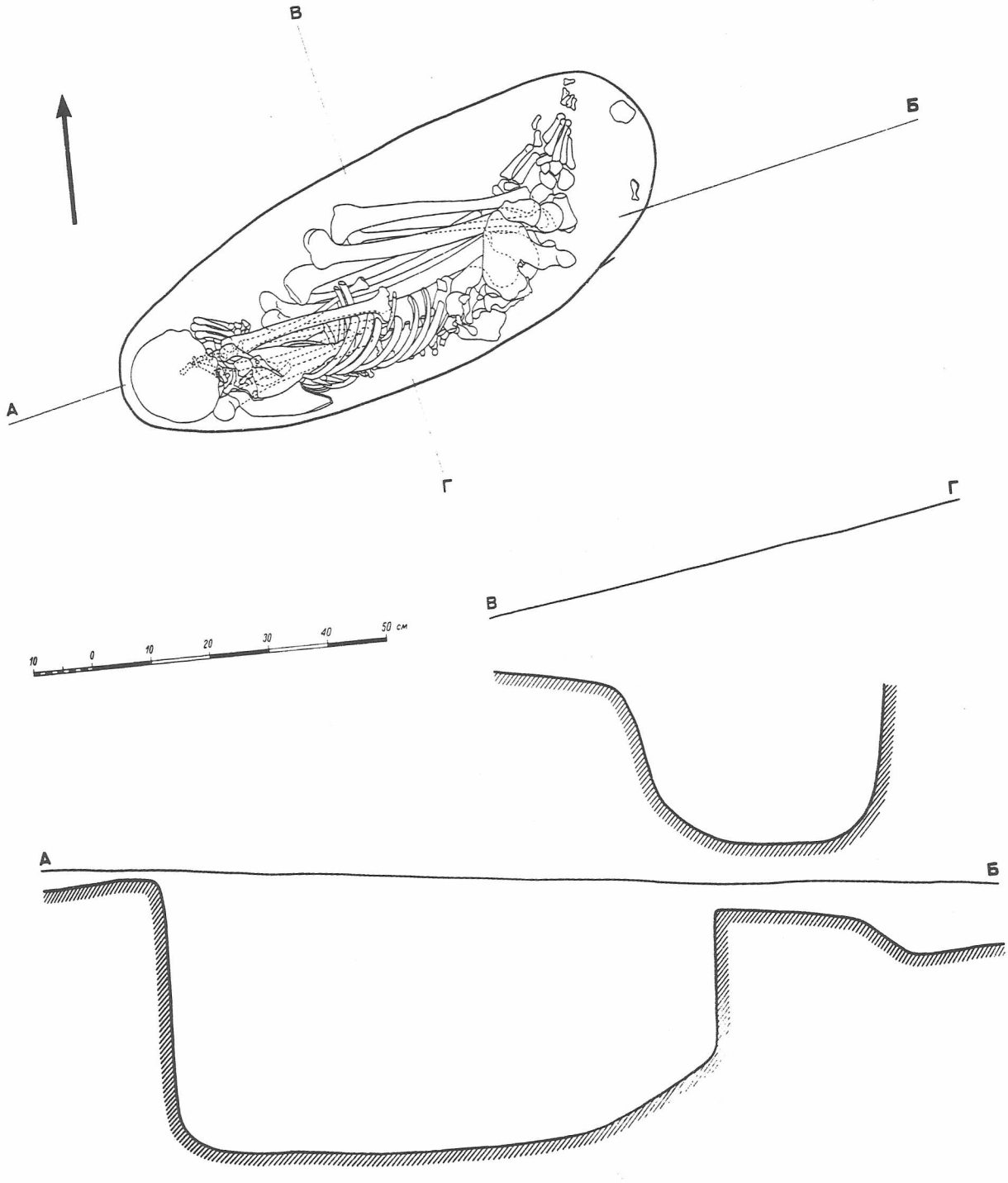

Figure 15. Plan and section of the burial beneath cultural layer 3.

Figure 16. Kostenki 14. Reconstruction of the physical appearance of the person buried beneath cultural layer 3 (after M.M. Gerasimov, 1955, page 216, Figure 90).

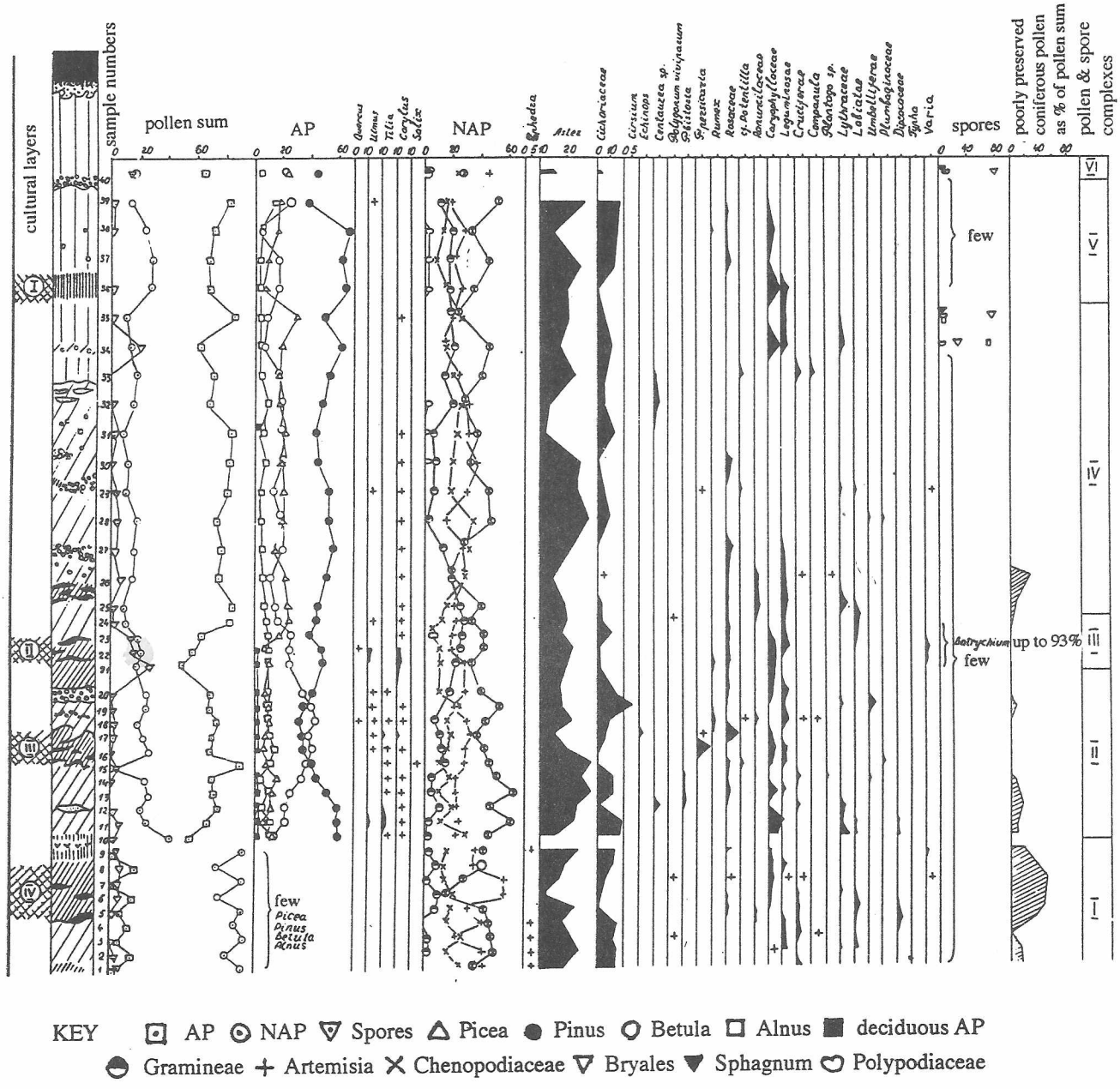

Figure 17. Kostenki pollen diagram (after E.A. Spiridonova).