

Kostënki 17 (Spitsynskaya) and Kostënki 6 (Streletskaya): recent fieldwork and new ¹⁴C dates

Kostënki 17 (Spitsynskaja) und Kostënki 6 (Streletskaja): jüngste Feldforschung und neue ¹⁴C-Daten

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ABSTRACT - Archaeological layers at Kostënki 6 and Kostënki 17 have yielded some of the oldest Upper Palaeolithic material on the East European Plain. Major excavations at both sites were undertaken in the early 1950s, and there are outstanding questions concerning their stratigraphies. Here we summarise recent excavation of both sites and present new radiocarbon dates for material from this work. 2017-2019 excavation of Kostënki 17 confirms its well-stratified sequence, although the upper section shows a greater complexity than was noted during earlier work. Our new ¹⁴C date for the stratigraphically higher Layer I helps to bracket its age in the range 34.3-29 ka BP. The heavily redeposited nature of Kostënki 6's archaeological layer is verified by a small-scale 2017 excavation. Our new ¹⁴C date is, however, consistent with the layer's recorded position underneath the CI tephra. This ¹⁴C date therefore supports an age of >34.3 ka BP for Kostënki 6's archaeological material.

ZUSAMMENFASSUNG - Die archäologischen Schichten von Kostënki 6 und Kostënki 17 haben einige der ältesten jungpaläolithischen Funde in der Osteuropäischen Ebene erbracht. Umfangreiche Ausgrabungen an beiden Fundorten wurden Anfang der 1950er Jahre durchgeführt, aber es gibt noch offene Fragen bezüglich ihrer Stratigraphien. In diesem Beitrag fassen wir die jüngsten Ausgrabungen an beiden Fundorten zusammen und präsentieren neue Radiocarbonaten von Funden dieser Grabungen. Die Ausgrabung von Kostënki 17 in den Jahren 2017-2019 bestätigt ihre gut geschichtete Abfolge, obwohl der obere Abschnitt eine größere Komplexität aufweist, als bei früheren Arbeiten festgestellt wurde. Unser neues ¹⁴C-Datum für die stratigraphisch höhere Schicht I trägt dazu bei, ihr Alter im Bereich von 34,3-29 ka BP einzustufen. Die stark umgelagerte Natur der archäologischen Schicht von Kostënki 6 wird durch eine kleinmaßstäbliche Ausgrabung im Jahr 2017 bestätigt. Unser neues ¹⁴C-Datum stimmt jedoch mit der aufgezeichneten Position der Schicht unter der CI-Tephra überein. Dieses ¹⁴C-Datum unterstützt daher ein Alter von >34,3 ka BP für die archäologischen Funde von Kostënki 6.

KEYWORDS - Radiocarbon dating, Russia, Eastern Europe, Upper Palaeolithic, Late Pleistocene, stratigraphy
Radiokarbonatierung, Russland, Osteuropa, Jungpaläolithikum, Jungpleistozän, Stratigraphie

Introduction

The Kostënki complex of open-air sites (Voronezh region, Russia) is the key locality for the Eastern European Early Upper Palaeolithic (EUP). Kostënki has provided numerous EUP assemblages, including some that are large and/or well stratified. The complex benefits from a well-studied geochronological framework, which includes the Campanian Ignimbrite (CI)/Y5 tephra, currently dated to 34 290 ± 90 BP (Giaccio et al. 2017). This framework means the

chronostratigraphic relationships of different layers is understood, and it has facilitated reliable ¹⁴C chronologies for some Kostënki sites (e.g. Douka & Higham 2017).

Kostënki 6 and 17 are among the oldest Kostënki sites, and are the eponymous sites of, respectively, the Streletskian and the Spitsynian. Recent research on mid-20th century collections from both has proved fruitful but has faced problems common to historical archaeological archives (Dinnis et al. 2019a, forthcoming). Starting in 2017 new excavations at both sites sought to collect new data.

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Kostënki 17

Kostënki 17's main excavations were by P.I. Boriskovskii in 1953 and 1955 (Boriskovskii 1963) (Fig. 1: A). Boriskovskii uncovered a sequence with two archaeological layers separated by sterile sediments including a volcanic ash layer. The higher Layer I yielded only

few retouched lithics (n = 53), the most notable a dorsally retouched point (Fig. 2: A). No clear cultural link has been established with other sites, but a possible Gorodtsovian or Aurignacian attribution has been suggested (e.g. Sinitsyn 1982; Djindjian et al. 1999: 432). The richer Spitsynian Layer II was lower in the sequence. Recent empirical study of Boriskovskii's

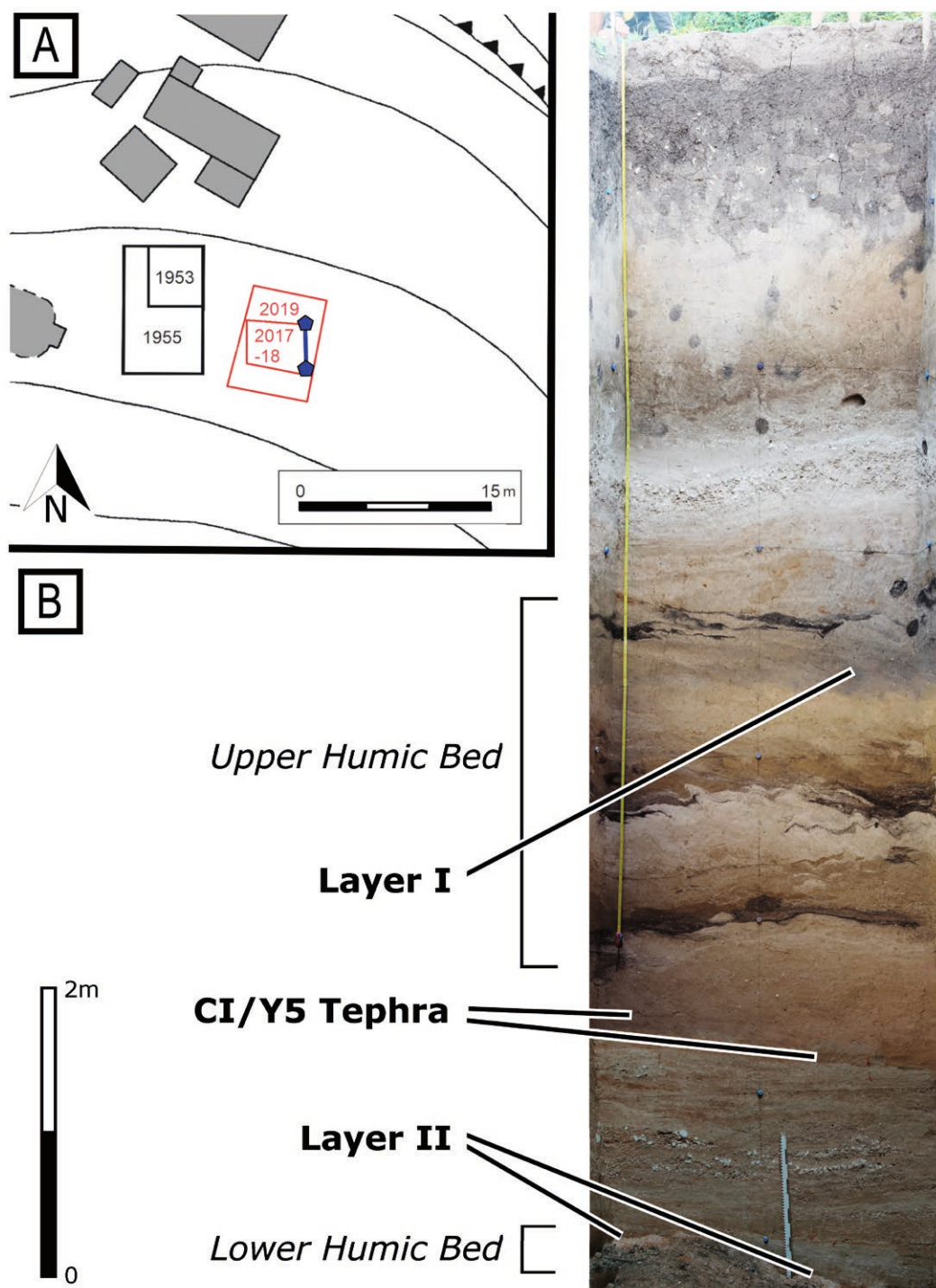


Fig. 1. Kostënki 17: (A) Plan showing the location of the recent excavations in relation to the 1953/1955 work, with the position of the figured section marked by a blue line (contours denote 1 m elevation); (B) west-facing section (П₁-103-104; 2017-2018 excavations).

Abb. 1. Kostënki 17: (A) Plan, der die Lage der jüngsten Ausgrabungen in Bezug auf die Arbeiten von 1953/1955 zeigt, wobei die Position des abgebildeten Profils durch eine blaue Linie markiert ist (die Konturen geben die Höhe von 1 m an); (B) nach Westen gerichteter Schnitt (П₁-103-104; Ausgrabungen 2017-2018).

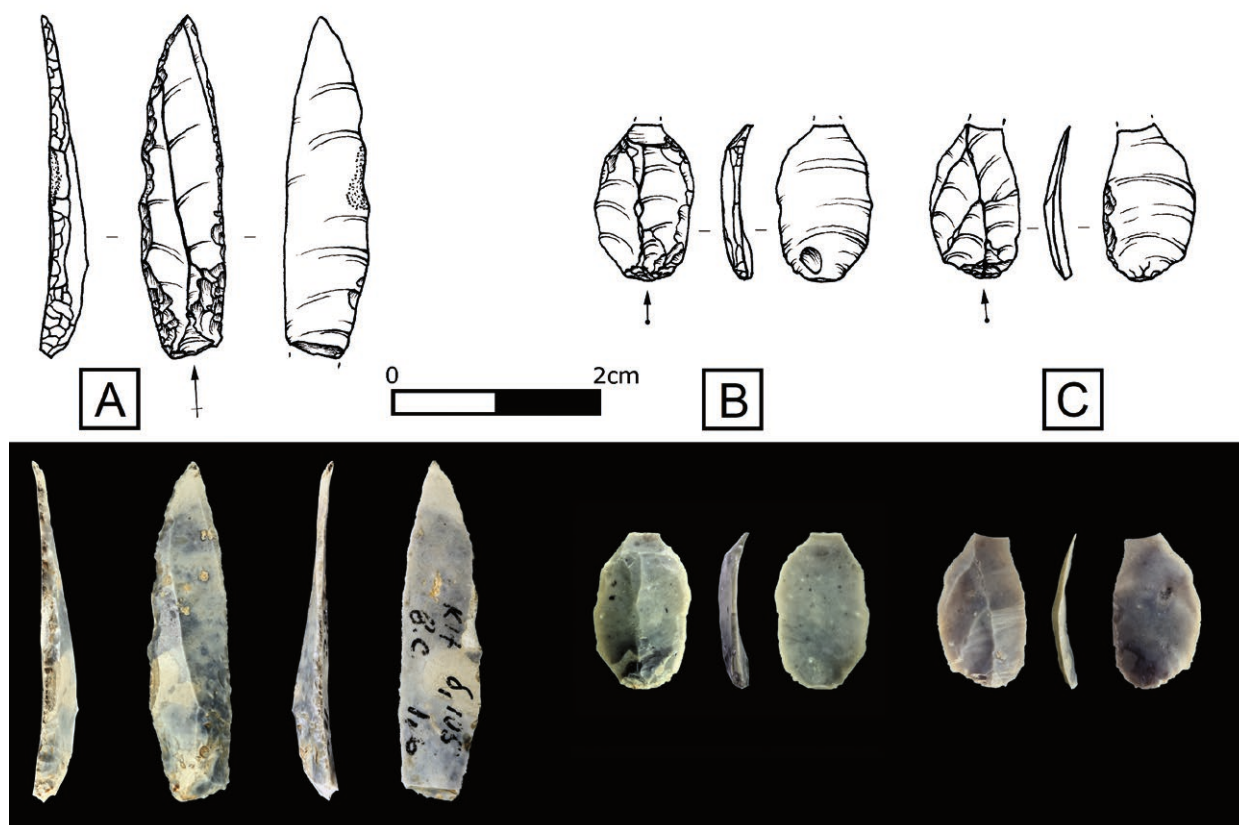


Fig. 2. Artefacts from Kostënki 17 Layer I: (A) Dorsally retouched point (Boriskovskii collection); (B & C) retouched flakes (2017 collection). (Lithics illustrations by AB; photographs courtesy of Ksenia Stepanova).

Abb. 2. Artefakte von Kostënki 17 Schicht I: (A) Dorsal retuschierte Spitze (Sammlung Boriskovskii); (B & C) retuschierte Abschläge (Sammlung 2017). (Zeichnungen von AB; Fotos mit freundlicher Genehmigung von Ksenia Stepanova).

collection identified similarities between Layer II's modified bladelets and those in Proto-Aurignacian assemblages, consistent with new ^{14}C dates for the layer of ~36 ka BP (Dinnis et al. 2019a, 2020). The profoundly selected nature of Boriskovskii's extant collection, however, means detailed characterisation of the assemblage is not possible.

2017-2019 excavations were undertaken east of Boriskovskii's excavations (Fig. 1: A). This work generally confirmed Boriskovskii's (1963) description of the site. One exception is a discernible complexity in the sequence's upper section, with several finds' horizons evident (Bessudnov et al. 2018; Sinitsyn et al. 2019). Except for the main Layer I, however, these contained only very few lithic pieces and bone fragments. Layer I was positioned in humic horizons above the ash deposits (Fig. 1: B) and was generally well defined. Based on its depth, stratigraphic position and the raw material profile of its lithic industry, most of the new Layer I assemblage undoubtedly correlates to Boriskovskii's Layer I. The only exception is the southeastern corner of the 2019 excavation area, where lithic raw material and typological differences may reflect a distinct assemblage (Bessudnov 2020). Notable pieces from the new Layer I collection include two small retouched flakes (Fig. 2: B & C). One

(Fig. 2: C) bears semi-abrupt inverse retouch along its right side, the other (Fig. 2: B) slight dorsal retouching distally on both edges.

Five previous ^{14}C dates for Layer I range ~27-20 ka BP (Cherdyntsev et al. 1968; Sinitsyn et al. 1997). Because the humic deposits within which Layer I is found (Fig. 1: B) are thought to date to >27 ka BP all of these dates appear erroneously young. We therefore dated a bone excavated in 2017. Although our result of $28\,870 \pm 380$ BP should be treated as a minimum age (Figs. 3 & 4) it is still the oldest date for Layer I and is the first to be consistent with Kostënki's geochronology. With the underlying CI tephra providing a maximum age, our new result brackets Layer I in the period ~34.3-29 ka BP.

While the sequence's upper section showed some stratigraphic complexity, the 2017-2019 excavations found good agreement with Boriskovskii's (1963) description of the lower section and Layer II. Importantly, most of Layer II showed no sign of significant post-depositional movement. The exception was the trench's southeast corner, where the layer has clearly been redeposited into a palaeo-ravine (Bessudnov et al. 2018). Despite this, the newly excavated material supports the conclusion that Layer II is well-stratified and homogeneous, and thereby confirms it as crucial

to understanding the early part of the EUP. The 2017-2019 lithic assemblage is consistent in technological character and raw material profile with Boriskovskii's collection, and four new perforated fox teeth are part of the same group found in 1953 and 1955 (Stepanova et al. 2019). The lithic assemblage is reasonably large (n = 4 119 pieces), and will allow better characterisation of the Spitsynian.

An attempt to ¹⁴C date a newly excavated Layer II bone was unsuccessful (Fig. 3), although the layer's current ¹⁴C chronology of ~36 ka BP appears to be sound.

Kostënki 6

The main excavation of Kostënki 6 was in 1952-53 by A.N. Rogachev. An archaeological assemblage was found within a unit of interstratified sand and humic and non-humic loams. Together these underlay lenses of volcanic ash (Rogachev 1957). The archaeological deposits were clearly heavily redeposited into a large palaeo-ravine. Despite this, Rogachev concluded that the site's archaeological horizon was emplaced prior to the deposition of the ash, and thus pre-dated it.

Although Kostënki 6 gives its name to the Streletskian, its lithic assemblage's relatively small size and obviously problematic context means its importance has been limited relative to other sites. One outstanding question is whether the assemblage contains material that post-dates, as well as pre-dates, the ash deposits (Dinnis et al. forthcoming). Two previous ¹⁴C dates were younger than the CI tephra (Sinitsyn et al. 1997), whereas recent results using the most reliable sample pretreatment methods are consistent with a pre-ash age (Dinnis et al. forthcoming).

2017 excavation at Kostënki 6 was carried out on the eastern edge of Rogachev's excavation area (Fig. 5). The revealed stratigraphic sequence was consistent

with Rogachev's (1957) description. Except for three isolated finds found higher in the stratigraphy, archaeological material lay in a unit of redeposited sediments underlying ash deposits (Fig. 5). Only a small area of the archaeological layer was excavated. A lithic assemblage of 52 pieces included an endscraper (Fig. 5) and small flakes that possibly relate to biface manufacture/resharpening. In technotypology and raw materials the assemblage is consistent with Rogachev's collection.

A wolf bone from the archaeological layer was ¹⁴C dated. Although the result of 40 700 ± 1 400 BP should be considered with caution (Fig. 3), it is in agreement with the sample's stratigraphic position beneath ash deposits. It is therefore consistent with other recently produced dates for Kostënki 6 (Dinnis et al. forthcoming).

Conclusions

Started in 2017, new excavations at Kostënki 17 and Kostënki 6 are aimed at better understanding these important sites. 2017-2019 excavations at Kostënki 17 confirmed its well-stratified nature, while also showing stratigraphic complexity in its upper section. A new ¹⁴C date for Layer I—the first consistent with its geochronological position—supports an age of 34.3-29 ka BP for the layer. Small-scale 2017 excavation at Kostënki 6 confirmed its archaeological layer is heavily redeposited. A new ¹⁴C date is, however, consistent with the sample's position beneath the CI tephra. It therefore adds support to a chronology for Kostënki 6's archaeological layer of >34.3 ka BP.

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Sample code	Site	Square/other sample info	Sample	Lab Code	Result BP	Notes
K17-07	Kostënki 17	Layer I, И1-104	Long bone frag, large mammal	OxA-X-2756-16	28 870 ± 380	The result should be considered a minimum age (see Fig. 4).
K17-08	Kostënki 17	Layer II, А1-103	Long bone frag, large mammal	Failed due to no yield		
K6-11	Kostënki 6	X-28 (-676)	<i>Canis lupus</i> , humerus	OxA-X-2751-27	40 700 ± 1 400	The result should be considered a minimum age (see Fig. 4).

Fig. 3. New ¹⁴C dates/failed dates from samples from recent fieldwork at Kostënki 17 and Kostënki 6. No other ¹⁴C dates (or failed dates) were produced for these contexts in the course of this work. Additional data for the dates is given in figure 4.

Abb. 3. Neue ¹⁴C-Daten/fehlgeschlagene Daten von Proben aus der jüngsten Feldarbeit in Kostënki 17 und Kostënki 6. Im Laufe dieser Arbeit wurden keine weiteren ¹⁴C-Daten (oder fehlgeschlagene Daten) für diese Kontexte erstellt. Zusätzliche Daten zu den Datierungen sind in Abbildung 4 dargestellt.

OxA	PCode	Use weight (mg)	Yield (mg)	%Yld	%C	$\delta^{13}\text{C}$ (‰)	$\delta^{15}\text{N}$ (‰)	CN atomic ratio
X-2756-16	AF	600	3.74	0.6	35.7	-20.1	5.7	3.3
X-2751-27	AF	1 000	4.69	0.5	39.4	-18.9	11.4	3.2

Fig. 4. Analytical data for the two ^{14}C dates in figure 3. PCode refers to the pretreatment method applied (ultrafiltration of bone collagen extract, see Brock et al. 2010). Stable isotope ratios of carbon and nitrogen are presented in ‰ relative to VPDB and AIR respectively with a mass spectrometric precision of $\pm 0.2\text{‰}$ and $\pm 0.3\text{‰}$ respectively. Yield represents the weight of ultrafiltered collagen extracted in milligrams. %Yld is the percent yield of extracted collagen with respect to the starting weight of the bone analysed. Used is the weight of bone used, also in mg. %C is the carbon present in the combusted gelatin and ought to be $\sim 40\text{--}43\%$. CN atomic ratios ought to range from 2.9–3.5. Both samples were OxA-X-ed due to their low collagen yields and %yield values, as well as their slightly lower values on combustion.

Abb. 4. Analytische Daten zu den beiden ^{14}C Daten in Abbildung 3. PCode bezieht sich auf die angewandte Vorbehandlungsmethode (Ultrafiltration von Knochenkollagenextrakt, siehe Brock et al. 2010). Stabile Isotopenverhältnisse von Kohlenstoff und Stickstoff sind in ‰ relativ zu VPDB bzw. AIR mit einer massenspektrometrischen Präzision von $\pm 0,2\text{‰}$ bzw. $\pm 0,3\text{‰}$ dargestellt. Die Ausbeute stellt das Gewicht des ultrafiltrierten, extrahierten Kollagens in Milligramm dar. %Yld ist die prozentuale Ausbeute des extrahierten Kollagens in Bezug auf das Ausgangsgewicht des analysierten Knochens. Verwendet wird das Gewicht des verwendeten Knochens, ebenfalls in mg. %C ist der in der verbrannten Gelatine vorhandene Kohlenstoff und sollte $\sim 40\text{--}43\%$ betragen. Die CN-Atomverhältnisse sollten im Bereich von 2,9–3,5 liegen. Beide Proben wurden aufgrund ihrer niedrigen Kollagenausbeute und %-Ausbeutewerte sowie ihrer etwas niedrigeren Werte bei der Verbrennung mit OxA-X-ed behandelt.

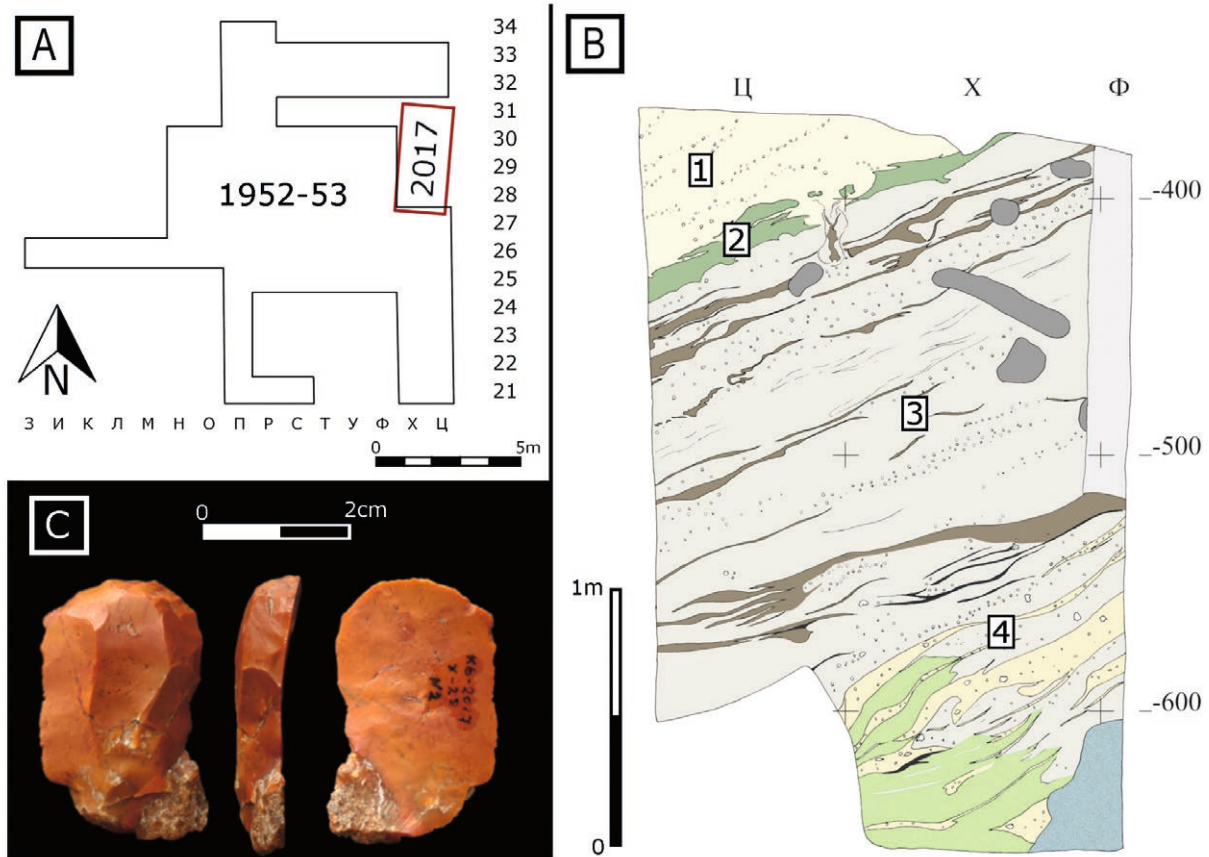


Fig. 5. Kostënki 6: (A) Excavation plan showing the location of the 2017 excavation relative to Rogachev's 1952–1953 work; (B) north-facing section (Ф-X-Ц-28, 2017 excavation) of the lower part of the sequence, showing (1) light brown loam with chalk fragments, (2) layer of volcanic ash, (3) light grey loam unit with weakly expressed humic layers, Cenomanian sand and chalk fragments, and (4) unit within which most archaeological material lay, formed of interstratified layers of humus, light grey loam, Cenomanian sand and chalk fragments (note the eastward dip of the stratigraphic units, the result of their ancient redeposition into a palaeoravine); and (C) endscraper from the archaeological layer (2017 collections).

Abb. 5. Kostënki 6: (A) Ausgrabungsplan, der die Lage der Ausgrabung 2017 im Verhältnis zu Rogatschows Arbeiten von 1952–1953 zeigt; (B) nach Norden ausgerichteter Schnitt (Ф-X-Ц-28, Ausgrabung 2017) des unteren Teils der Sequenz, zeigt (1) hellbraunen Lehm mit Kalkbruchstücken, (2) Schicht vulkanischer Asche, (3) hellgraue Lehmeinheit mit schwach ausgeprägten Humusschichten, Sand und Kalkbruchstücke des Cenoman, und (4) Einheit, in der das meiste archäologische Material lag, gebildet aus ineinander geschichteten Humusschichten, hellgrauem Lehm, Sand und Kalkbruchstücke des Cenoman (man beachte die Neigung der stratigraphischen Einheiten nach Osten, das Ergebnis ihrer frühen Umlagerung in eine Paläoravine); und (C) Kratzer aus der archäologischen Schicht (Sammlungen 2017).

Literature cited

- Bessudnov, A. A. (2020).** Problema kul'turnoi atributsii I sloya Kostënok 17. In: K. N. Gavrilov & E. V. Leonova (Eds.) *Vostochnaya Evropa, Kavkaz, Blizhnii Vostok v kamennom veke: khronologiya, istochniki i kul'turogenez. Mezhdunarodnaya konferentsiya. Tezisy dokladov*. Institut arkheologii RAN, Moscow, 20-21 (In Russian).
- Bessudnov, A. A., Dinnis, R. & Artyushenko A. A. (2018).** Usloviya zaleganiya kul'turnykh gorizontov paleoliticheskoi stoyanki Kostënki 17 (po rezul'tatam rabot 2017 g.). In: A. A. Bessudnov & E. S. Tkach (Eds.) *Aktual'naya arkheologiya 4. Kompleksnyye issledovaniya v arkheologii. Materialy Mezhdunarodnoi nauchnoi konferentsii molodykh uchenykh (St. Petersburg, 2-5 of April 2018)*. IIMK RAN, Saint Petersburg, 69-73. (In Russian).
- Boriskovskii, P. I. (1963).** *Ocherki po paleolitu basseyna Dona. Materialy i issledovaniya po arkheologii SSSR* 161. Izdatel'stvo AN SSSR, Moscow-Leningrad. (In Russian).
- Brock, F., Higham, T., Ditchfield, P. & Ramsey, C. B. (2010).** Current pretreatment methods for AMS radiocarbon dating at the Oxford Radiocarbon Accelerator Unit (ORAU). *Radiocarbon* 52: 103-112.
- Cherdyntsev, V., Alekseyev, V., Kind, N., Forova, V., Zavel'skiy, F., Sulerzhitskiy, L. & Forsenkova, I. (1968).** Geological Institute Radiocarbon Dates II. *Radiocarbon* 10: 426-436.
- Dinnis, R., Bessudnov, A., Reynolds, N., Devière, T., Pate, A., Sablin, M., Sinitsyn, A. & Higham, T. (2019a).** New data for the Early Upper Paleolithic of Kostenki (Russia). *Journal of Human Evolution* 127: 21-40.
- Dinnis, R., Bessudnov, A., Reynolds, N., Pate, A., Sablin, M. & Sinitsyn, A. (2020).** Response to Bataille et al.'s 'Technological differences between Kostenki 17/II (Spitsynskaya industry, Central Russia) and the Protoaurignacian: Reply to Dinnis et al. (2019)' [J. Hum. Evol. (2019), 102685]. *Journal of Human Evolution* 146 (2020): 102792.
- Dinnis, R., Bessudnov, A., Reynolds, N., Devière, T., Dudin, A., Pate, A., Sablin, M., Sinitsyn, A. & Higham, T. (Forthcoming).** Eastern Europe's "Transitional Industry"? Deconstructing the early Streletskian. *Journal of Paleolithic Archaeology*.
- Djindjian, F., Otte, M. & Kozłowski, J. K. (1999).** *Le Paléolithique Supérieur en Europe*. Armand Collin, Paris.
- Douka, K. & Higham, T. (2017).** The chronological factor in understanding the Middle and Upper Paleolithic of Eurasia. *Current Anthropology* 58: S480-490.
- Giaccio, B., Hajdas, I., Isaia, R., Deino, A. & Nomade, S. (2017).** High-precision ^{14}C and $^{40}\text{Ar}/^{39}\text{Ar}$ dating of the Campanian Ignimbrite (Y-5) reconciles the time-scales of climatic-cultural processes at 40 ka. *Scientific Reports* 7: 45940.
- Rogachev, A. N. (1957).** Mnogosloinnye stoyanki Kostenkovsko-Borshevskogo raiona. *Materialy i Issledovaniya po Arkheologii SSSR* 59: 10-134. (In Russian).
- Sinitsyn, A. A. (1982).** *Gorodtsovskaya pozdnepaleoliticheskaya kul'tura i ee mesto v paleolite Russkoi ravniny*. Dissertation aftoreferat, LOIA AS, Leningrad. (In Russian).
- Sinitsyn, A. A., Bessudnov, A. A., Lada, A. R. & Artyushenko, A. A. (2019).** Issledovaniya Kostënkovskoi arkheologicheskoi ekspeditsii IIMK RAN. In: M. V. Ivashov (Ed.) *Arkheologicheskie issledovaniya v Tsentral'nom Chernozem'ye 2018*. Novyi vzglyad, Lipetsk, 80-87. (In Russian).
- Sinitsyn, A. A., Praslov, N. D., Svezhentsev, Y. S. & Sulerzhitskiy, L. D. (1997).** Radiouglerodnaia khronologiya verkhnego paleolita vostochnoi Evropy. In: A. A. Sinitsyn & N. D. Praslov (Eds.) *Radiouglerodnaia Khronologiya Paleolita Vostochnoi Evropy i Severnoi Azii: Problemy i Perspektivy*. AkademPrint, Saint Petersburg, 21-66. (In Russian).
- Stepanova, K. N., Malyutina, A. A. & Bessudnov, A. A. (2019).** Podveski iz organicheskikh i mineral'nykh materialov v kolleksii II sloya Kostënok 17. In: A. A. Bessudnov (Ed.) *Drevneyshii paleolit Kostënok: khronologiya, stratigrafiya, kul'turnoe raznoobrazie (k 140-letiyu arkheologicheskikh issledovaniy v Kostënkovsko-Borshchëvskom raione)*. *Materialy mezhhregional'noi nauchno-prakticheskoi konferentsii (Voronezhskaya oblast', s. Kostënki, 20-22 of August 2019)*. VGU, Voronezh, 40-48. (In Russian).