

Supplementary Online Material (SOM)

New Data for the Kostenki Early Upper Palaeolithic

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SOM S1

Dating of Proto-Aurignacian assemblages

Banks et al. (2013a,b) gave a review of the dating of Proto-Aurignacian assemblages across Europe, but their modeling of the dates uses IntCal09 (we use IntCal13 throughout this paper). In order to accurately compare our new dates with their results, we reran the Banks et al. (2013b) analyses using IntCal13. We modeled the dates provided in Table 1 of their paper using OxCal 4.3, in a model with four phases (Transitional Industries, Proto-Aurignacian, Early Aurignacian and Aurignacian II) with boundaries between them. The first model produced yielded unacceptably low agreement indices (Amodel: 23; Aoverall: 22.5). Therefore, following the method used by Banks et al. (2013a,b), we removed the dates with individual agreement indices <60 and produced a second model, which yielded acceptable agreement indices (Amodel: 76.9; Aoverall: 72.5). The results from the second model are given here. For comparison, we also included the summary ¹⁴C age for the Campanian Ignimbrite given by Giaccio et al. (2017), of 34,290 ± 90 BP (calibrated independently of the model). The results suggest that Proto-Aurignacian assemblages date to ~41–39 ka cal BP (or ~36.25–34.75 ka BP by back-comparison against the IntCal13 curve). The results are provided in SOM Fig. S1 and SOM Table S1; compare Banks et al., 2013: Fig. 1 and Table 1).

SOM S2

Association of Dufour (Dufour subtype) bladelets with Kostënki 17/II

The Kostenki 17/II retouched bladelet assemblage includes two previously unrecognised pieces that meet the typological criteria for Dufour bladelets (Dufour subtype; see Fig. 7a, f). These are clearly important in linking the Kostënki 17/II material to penecontemporary assemblages with straight-profiled retouched bladelets elsewhere. At least one (and possibly both) of these two bladelets is made on a raw material different from the majority black/dark gray flint (Table 9). It is therefore important to verify their association with Kostënki 17/II.

First, we can note that both artefacts were found during excavation of the larger area of Layer II in 1955 (in squares a-101 and 6-103), during the second season excavating this layer. By then the stratigraphy was already understood (Lazukov, 1957; Boriskovskii, 1963).

Secondly, archival evidence ties one of the two artifacts directly to the Layer II assemblage. An annotated sketch of artefact number 188 (Fig. 7f; SOM File S7) is contained in Boriskovskii's (1955) excavation archives (SOM Fig. S2). His note reads (translation by N.R. and A.B.):

“Пластинки с затупленным краем в виде сколько-нибудь выраженной серии совершенно отсутствуют. Налицо лишь 1 экземпляр (N. 188) - узкая, тонкая, с мелкой затупливающей ретушью вдоль одного края с брюшка.

Кроме того 2 обломка широких, крупных пластин с оч. мелкой ретушью вдоль одного края, затупливающей, крутой, но оч.мелкой, их размеры: 4 × 3 см.

Еще один обломок 4 см. шириной и 1,4 см. длиной крупной правильной пластины с сохранившейся тщательной крутой затупливающей ретушью по одному краю.”

“Backed bladelets that form a distinct series are completely absent. Only one example (No. 188) is present - it is narrow and thin, with fine backing retouch along one edge on the ventral side.

Apart from that there are two fragments of wide, large blades with very fine retouch, which is backing and steep but very fine, along one edge, dimensions: 4 × 3 cm.

There is one more fragment, 4 cm wide and 1.4 cm long, of a large straight blade with extant meticulous steep backing retouch on one edge.”

Parts of this text clearly formed the basis for Boriskovskii’s (1963:98) consideration of ‘backed pieces’ in Kostenki 17/II (translation by N.R. and A.B.):

Пластинки и острия с затупленным краем в виде сколько-нибудь выраженных серий отсутствуют. Налицо лишь одна узкая пластинка с мелкой затупливающей ретушью, идущей вдоль одного края с нижней, отбивной поверхности. Кроме того, 3 более крупных обломка пластинок обработаны по краю мелкой затупливающей ретушью.

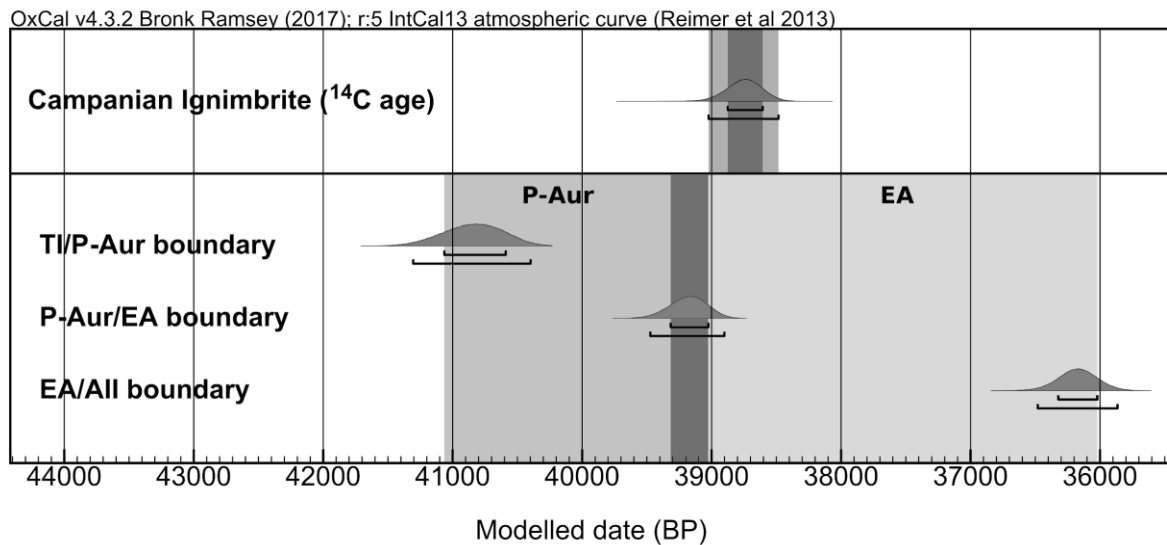
Backed bladelets and points that form a distinct series are absent. There is only one narrow blade with fine backing retouch that runs along one edge on the ventral surface.

Apart from that there are three larger fragments of blade, worked along the edge with fine backing retouch.

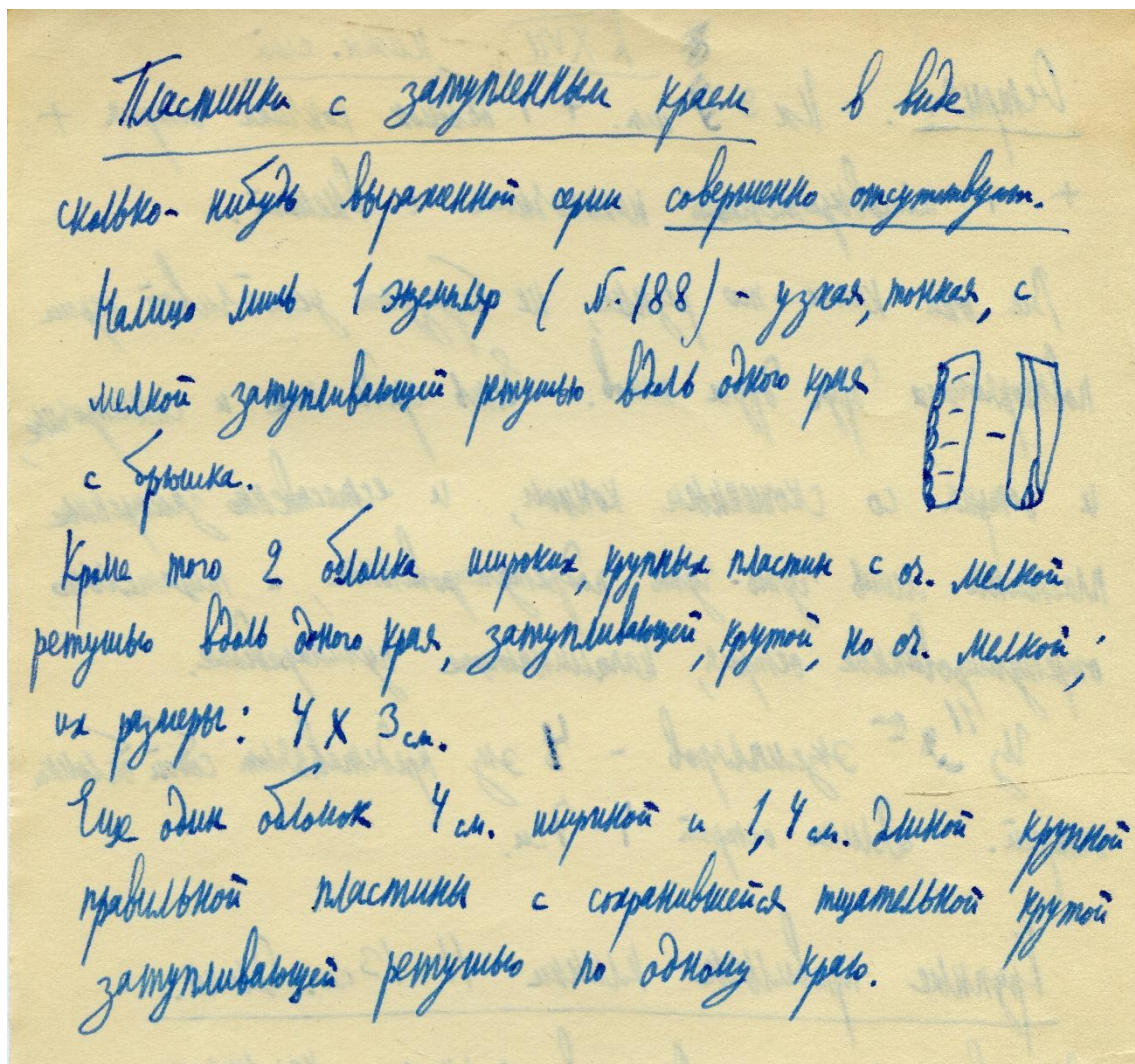
These two excerpts establish that the Dufour (Dufour subtype) bladelet in Fig. 7f (see also SOM File S7) is the one Boriskovskii (1963: 98) referred to as to as a “narrow blade with fine backing retouch that runs along one edge on the ventral surface”, thereby confirming it belongs with the Layer II assemblage.

Although the layer probably represents a palimpsest of activity (see main text)—and therefore the strict contemporaneity of these two artefacts with the rest of the assemblage cannot be demonstrated—all evidence indicates that the layer represents a relatively short and

discrete period. There is no stratigraphic or technological reason to separate them out from the remainder of the assemblage.



SOM Figure S1. Summary of results of repeat of Banks et al. (2013b) model of the chronological distribution of Proto-Aurignacian (P-Aur) and Early Aurignacian (EA) assemblages: the figure shows the modeled boundaries between the four included phases (see SOM Table S1 for further details of the model). We also include the calibrated date for the summary ¹⁴C age of the Campanian Ignimbrite given by Giaccio et al. (2017). Figure based on Banks et al. (2013a: Fig. 1). Model produced using OxCal 4.3 and IntCal13 (Bronk Ramsey, 2009; Reimer et al., 2013).



SOM Figure S2. Annotated sketch of one of the Kostenki 17/II Dufour bladelets from Boriskovskii's excavation archive (IIMK RAN archive reference F.35, op. 1, 1977, d. 107, p.9).

SOM Table S1

Results of repeat of model used in Banks et al. (2013b). Model produced using OxCal 4.3 and IntCal13 (Bronk Ramsey, 2009; Reimer et al., 2013). The table includes dates associated with Proto-Aurignacian and Early Aurignacian assemblages in Europe and modeled boundaries for the phases dated by these results. No upper boundary is provided when calibrated dates approach or exceed the 50,000 cal BP limit of INTCAL13. See Banks et al. (2013b) for further details. Agreement indices: Amodel = 76.9; Aoverall = 72.5. The radiocarbon age of the Campanian Ignimbrite is based on Giaccio et al. (2017). For sources of other dates the reader is referred to Banks et al. (2013b).

Site	Level	Lab code	Age (¹⁴ C BP)	Error	Unmodelled calibrated date (cal BP)				Omitted from final model? (Agreement index in original model given in brackets)	Modeled calibrated date (cal BP)				Agreement indices			
					68.2 %		95.4 %			68.2 %		95.4 %		A	C		
					from	to	from	to					from	to	from	to	
Campanian Ignimbrite (14C age)					38,900	38,600	39,000	38,500									
Phase: Transitional industries																	
Grotte du Renne	VIII	OxA-21683	40,000	1200	44,800	42,800	46,200	42,100		44,900	42,800	46,100	42,100	100	96		
Fumane	A3	LTL-1795A	37,828	430	42,400	41,800	42,700	41,500		42,400	41,800	42,700	41,500	100.2	99		

Grotte du Renne	VIII	OxA-21573	36,800	1000	42,200	40,400	43,000	39,500		42,200	41,000	43,000	40,600	110.4	97.6
Castelcivita	RSA	OxA-22622	36,120	360	41,175	40,379	41,515	39,992		41,386	40,870	41,643	40,618	90.1	99.2
Boundary: Transitional Industries/ Proto- Aurignacian										41,200	40,400	41,500	40,000		99.4
Phase: Proto- Aurignacian															
Arbreda	H- BE111	OxA- 3730	35,480	820	41,000	39,200	41,700	38,600		40,500	39,500	40,900	39,200	120.7	99.6
Les Cottés	US4 inf	MAMS -10808	35,150	280	40,100	39,400	40,400	39,000		40,100	39,400	40,400	39,200	106	99.6
Les Cottés	US4 inf	S-EVA- 13669a vg	34,430	180	39,100	38,700	39,400	38,500	*(41.9)						
Esquicho- Grapaou	SLC 1b	MC- 2161	34,540	2000	41,300	36,800	44,000	35,000		40,400	39,300	40,900	39,100	127.1	99.6
Fumane	A2	OxA- 19584	35,850	310	40,900	40,100	41,200	39,800		40,700	40,100	40,900	39,800	106.6	99.6

Fumane	A2	OxA-17569	35,640	220	40,500	40,000	40,900	39,700		40,500	40,000	40,800	39,700	103.9	99.7
Fumane	A2	OxA-17570	35,180	220	40,000	39,500	40,300	39,100		40,000	39,500	40,300	39,200	103.5	99.7
Fumane	A2	OxA-19412	34,940	280	39,800	39,100	40,100	38,800		39,800	39,300	40,200	39,100	106.9	99.7
Fumane	A2	OxA-19414	34,180	270	39,000	38,400	39,400	38,100	*(21.9)						
Isturitz	C 4c4	AA-69184	40,200	3600	47,600	41,900	40,600	*(33.5)						
Isturitz	C 4c4	AA-69183	37,580	780	42,500	41,400	43,200	40,700	*(21.3)						
Isturitz	C 4c4	AA-69180	37,300	1800	43,400	40,000	46,000	38,600		40,800	39,700	41,000	39,200	87.2	99.6
Isturitz	C 4c4	AA-69179	37,000	1600	42,900	40,000	44,900	38,600		40,800	39,700	41,000	39,200	92.8	99.5
Isturitz	C 4c4	AA-69185	36,990	720	42,100	40,900	42,600	40,200		40,900	40,200	41,200	39,800	44.2	99.6
Isturitz	C 4c4	AA-69181	36,800	860	42,100	40,600	42,700	39,800		40,800	40,100	41,100	39,500	67.4	99.5
Isturitz	4d	GifA-98232	36,510	610	41,700	40,600	42,100	39,900		40,800	40,200	41,100	39,700	75.4	99.5

Isturitz	4d	GifA-98233	34,630	560	39,800	38,600	40,600	38,000		39,900	39,200	40,500	39,000	96.4	99.6
Kozarnika	VII	GifA-99706	36,200	540	41,400	40,300	41,800	39,800		40,800	40,100	41,100	39,600	94.5	99.5
Kozarnika	VII	GifA-101050	37,170	700	42,200	41,100	42,700	40,400	*(40.8)						
Krems-Hundsteig		KN-654	35,500	2000	42,300	38,100	45,000	36,000		40,500	39,400	40,900	39,100	140.4	99.6
La Mère Clochette		OxA-19622	35,460	250	40,400	39,700	40,700	39,400		40,300	39,800	40,600	39,500	102.5	99.7
Riparo Mochi	E. trench	OxA-3591	35,700	850	41,200	39,500	41,900	38,700		40,600	39,600	40,900	39,200	117.9	99.6
Riparo Mochi	E. trench	OxA-3592	34,870	800	40,300	38,600	41,400	37,700		40,200	39,300	40,800	39,100	115	99.6
Riparo Mochi	E. trench	OxA-3590	34,680	760	40,100	38,500	41,200	37,500		40,100	39,200	40,700	39,100	107.8	99.5
Riparo Mochi	G	OxA-19569	36,350	260	41,300	40,700	41,500	40,400		40,900	40,400	41,100	40,200	68	99.6
Morin	8	GifA-96263	36,590	770	41,900	40,500	42,400	39,700		40,800	40,100	41,100	39,500	77	99.5
Paglicci	24b1	Utc?	34,000	900	39,500	37,200	40,600	36,300		40,100	39,200	40,700	39,000	72.4	99.6
Serino	cult. level	OxA-21869	34,830	330	39,700	38,900	40,100	38,600		39,800	39,200	40,200	39,100	103	99.7

Serino	cult. level	OxA- 22061	34,300	1100	40,200	37,400	41,300	36,300		40,200	39,200	40,800	39,100	101.3	99.6
Serino	cult. level	OxA- 21870	34,530	310	39,400	38,700	39,800	38,400		39,600	39,200	39,900	39,000	76.1	99.6
Serino	cult. level	OxA- 22626	34,760	360	39,700	38,900	40,100	38,600		39,800	39,200	40,200	39,000	99	99.6
Serino	cult. level	OxA- 22583	34,400	450	39,400	38,500	40,100	37,900		39,700	39,200	40,200	39,000	74.3	99.6
La Viña	XIII- inf	Ly- 6390	36,500	750	41,800	40,400	42,300	39,700		40,800	40,000	41,100	39,500	82	99.6
Boundary: Proto- Aurignacian/Early Aurignacian										39,300	39,000	39,500	38,900		99.9
Phase: Early Aurignacian															
Bacho Kiro	6b	OxA- 3182	33,300	820	38,500	36,500	39,700	35,700		38,400	36,700	39,000	36,300	111	99.3
Bacho Kiro	7	OxA- 3181	32,200	780	37,200	35,200	38,400	34,800		37,600	36,200	38,400	36,000	91.9	99.3
Brassempouy	2DE	GifA- SM- 11034	33,600	240	38,400	37,700	38,600	37,100		38,400	37,700	38,600	37,100	100	99.5

Brasempouy	2DE	GifA-96105	32,410	370	36,800	35,900	37,600	35,500		36,900	36,200	37,700	36,000	100.2	99.5
Caminade	F	GifA-97186	35,400	1100	41,100	38,900	42,300	37,800		39,200	38,400	39,400	37,100	66	99.4
Castanet	131	GifA-99166	34,320	520	39,500	38,300	40,200	37,500		39,100	38,300	39,300	37,500	110.2	99.4
Castanet	114	OxA-21559	33,250	500	38,200	36,800	38,700	36,300		38,200	36,800	38,600	36,300	101.8	99.3
Castanet	122	GifA-99180	32,950	520	37,800	36,400	38,500	36,000		37,800	36,400	38,400	36,200	104.3	99.4
Castanet	110	OxA-21564	32,950	500	37,800	36,400	38,500	36,000		37,800	36,400	38,400	36,200	104	99.3
Castanet	Engr. surf.	OxA-21639	32,900	500	37,700	36,300	38,400	35,900		37,700	36,400	38,400	36,200	104.5	99.4
Castanet	114	OxA-21560	32,800	450	37,600	36,300	38,300	35,900		37,500	36,300	38,200	36,200	104.7	99.4
Castanet	131	GifA-97313	32,750	460	37,500	36,200	38,300	35,800		37,500	36,300	38,200	36,200	105.4	99.3
Castanet	110	OxA-21563	32,600	450	37,300	36,000	38,100	35,600		37,300	36,200	38,100	36,100	105.4	99.3
Castanet	110	OxA-21566	32,550	600	37,500	35,800	38,400	35,400		37,500	36,200	38,300	36,100	105.2	99.3
Castanet	110	OxA-	32,550	450	37,200	35,900	38,100	35,600		37,200	36,200	38,100	36,100	104.6	99.2

			21562												
Castanet	Purple	OxA-21642	32,500	450	37,100	35,900	38,000	35,500		37,200	36,200	38,000	36,100	103.5	99.3
Castanet	131	GifA-97312	32,460	420	37,000	35,800	37,900	35,500		37,100	36,200	37,900	36,000	102.3	99.4
Castanet	114	OxA-21558	32,350	450	36,800	35,700	37,800	35,300		37,000	36,100	37,900	36,000	96.3	99.3
Castanet	Purple	OxA-21644	32,350	450	36,800	35,700	37,800	35,300		37,000	36,100	37,900	36,000	96.3	99.3
Castanet	122	GifA-99179	32,310	520	36,900	35,600	37,900	35,100		37,200	36,100	38,100	36,000	94	99.3
Castanet	Purple	OxA-21643	32,200	450	36,600	35,600	37,500	35,100		36,900	36,100	37,800	36,000	84.2	99.3
Castanet	110	OxA-21561	32,050	450	36,400	35,400	37,200	34,900		36,800	36,100	37,600	36,000	69.7	99.3
Castanet	Purple	OxA-21645	32,000	450	36,400	35,400	37,100	34,900		36,800	36,100	37,600	36,000	64.6	99.4
Castanet	Purple	OxA-21641	31,950	450	36,300	35,400	37,000	34,800		36,700	36,100	37,500	35,900	59.5	99.3
Castanet	Purple	OxA-21640	31,900	450	36,300	35,300	36,900	34,800		36,700	36,100	37,500	35,900	54.7	99.3
Castanet	114	GifA-99165	31,430	390	35,700	34,900	36,200	34,600	* (19.5)						

Combe Saunière	VIII	OxA-6507	34,000	850	39,500	37,300	40,500	36,300		39,000	37,400	39,200	36,600	111.9	99.3
Les Cottés	US4 sup.	S-EVA-9706avg	34,260	180	38,900	38,500	39,200	38,400		38,900	38,500	39,100	38,400	104.3	99.8
Les Cottés	US4 sup.	S-EVA-9711avg	33,180	160	37,700	37,000	38,100	36,700		37,700	37,000	38,100	36,700	100	99.5
Les Cottés	US4 sup.	S-EVA-9709avg	34,610	140	39,300	38,900	39,500	38,700		39,100	38,800	39,300	38,700	105.6	99.8
Les Cottés	US4 sup.	S-EVA-9720avg	33,860	160	38,600	38,200	38,800	37,900		38,600	38,200	38,800	37,900	99.9	99.7
Divje Babe I	2	RIDDL-734	35,300	700	40,600	39,100	41,400	38,600		39,200	38,700	39,400	38,200	60.9	99.6
Ferrassie	K6	GrN-5751	33,220	570	38,200	36,700	38,800	36,100		38,200	36,700	38,700	36,300	103.5	99.3
Flageolet I	XI	GifA-95559	34,300	1100	40,200	37,400	41,300	36,300		39,100	37,500	39,200	36,500	109	99.3
Flageolet I	XI	OxA-598	33,800	1800	40,300	36,200	42,500	34,800		39,000	36,900	39,200	36,300	125.9	99.3
Flageolet I	XI	GifA-95538	32,040	850	37,000	35,000	38,400	34,500		37,500	36,200	38,500	36,000	84.4	99.1

Istállós-kő	7/9	ISGS-A-0187	32,701	316	37,100	36,200	37,900	36,000		37,100	36,300	37,800	36,100	103.7	99.4
Istállós-kő	7/9	ISGS-A-0184	33,101	512	38,000	36,600	38,600	36,100		38,000	36,600	38,500	36,300	102.9	99.4
Lommersum		GrN-6191	33,420	500	38,400	37,000	38,900	36,400		38,400	37,000	38,800	36,400	101.7	99.4
La Mère Clochette		OxA-19621	33,750	350	38,700	37,700	39,000	37,000		38,600	37,700	38,900	37,000	101	99.4
Pataud	9	OxA-21673	33,400	500	38,400	37,000	38,800	36,400		38,400	37,000	38,700	36,400	101.7	99.3
Pataud	10	OxA-21679	33,650	500	38,600	37,300	39,200	36,500		38,600	37,300	39,000	36,600	103.1	99.3
Pataud	11	GrN-4326	32,000	800	36,900	35,000	38,300	34,600		37,500	36,200	38,400	36,000	80	99.1
Pataud	11	GrN-4309	32,600	550	37,500	36,000	38,300	35,500		37,400	36,200	38,300	36,100	105.9	99.3
Pataud	11	OxA-21602	33,500	500	38,500	37,100	39,000	36,400		38,500	37,100	38,800	36,500	102	99.3
Pataud	11	OxA-21580	33,550	550	38,500	37,100	39,200	36,400		38,500	37,100	38,900	36,500	103.4	99.4
Pataud	11	OxA-21581	33,550	550	38,500	37,100	39,200	36,400		38,500	37,100	39,000	36,500	103.4	99.3
Pataud	11	OxA-	34,150	550	39,400	38,000	40,000	37,000		39,100	38,000	39,300	37,100	109.8	99.4

		21601													
Pataud	12	GrN-4310	31,000	500	35,500	34,500	36,000	34,100	* (9.4)						
Pataud	12	GrN-4327	33,000	500	37,900	36,400	38,500	36,100		37,800	36,500	38,400	36,200	103.5	99.4
Pataud	12	GrN-4719	33,260	425	38,200	36,900	38,600	36,400		38,200	36,900	38,500	36,400	100.9	99.4
Pataud	12	OxA-21670	33,450	500	38,400	37,000	38,900	36,400		38,400	37,100	38,800	36,500	101.8	99.4
Pataud	12	OxA-21672	34,050	550	39,300	37,800	39,900	36,900		39,000	37,900	39,200	37,000	109.2	99.3
Pataud	12	OxA-21671	34,300	600	39,600	38,200	40,300	37,100		39,100	38,200	39,300	37,200	109.1	99.4
Pataud	13	OxA-21600	34,200	550	39,500	38,100	40,100	37,100		39,100	38,100	39,300	37,200	109.9	99.3
Pataud	13	OxA-21598	34,750	600	39,900	38,700	40,900	38,100		39,100	38,500	39,400	37,900	97.8	99.5
Pataud	13	OxA-21599	34,850	600	40,000	38,700	40,900	38,300		39,200	38,600	39,400	38,000	92.4	99.5
Pataud	13	OxA-15216	35,400	750	40,800	39,200	41,600	38,600	* (54)						
Pataud	14	GrN-4610	33,300	760	38,400	36,600	39,500	35,800		38,400	36,700	38,900	36,300	109	99.3

Pataud	14	GrN-4507	34,250	675	39,700	38,000	40,400	36,900		39,100	38,000	39,300	37,000	108.8	99.3
Pataud	14	OxA-21596	34,500	600	39,700	38,400	40,600	37,600		39,100	38,400	39,400	37,500	106.2	99.4
Pataud	14	OxA-21579	35,000	600	40,200	38,900	41,000	38,400		39,200	38,600	39,400	38,200	81.9	99.5
Pataud	14	OxA-21597	35,000	650	40,200	38,800	41,100	38,400		39,200	38,600	39,400	38,000	83	99.6
Pataud	14	OxA-21578	35,750	700	41,200	39,700	41,700	38,900	*(23.9)						
Quina	3	OxA-6147	32,650	850	38,000	35,800	38,900	35,000		37,800	36,300	38,700	36,100	109.2	99.3
Roc de Combe	7c	OxA-1263	34,800	1200	40,900	38,200	41,900	36,700		39,200	37,800	39,300	36,700	93.3	99.2
Roc de Combe	7b	OxA-1262	33,400	1100	38,900	36,300	40,500	35,400		38,600	36,700	39,100	36,300	119	99.3
Solutre	M12	SRLA-058	33,970	360	38,900	38,000	39,400	37,300		38,900	38,100	39,200	37,400	104.2	99.4
Tuto de Camalhot	7E+81	GifA-99093	34,750	570	39,900	38,700	40,800	38,200		39,200	38,600	39,400	38,000	98	99.5
Tuto de Camalhot	7E+81	GifA-99674	32,180	570	36,800	35,400	37,900	34,900		37,200	36,100	38,100	36,000	85	99.3
Velika Pecina	I	GrN-4979	33,850	520	38,900	37,500	39,500	36,700		38,900	37,600	39,100	36,900	106.1	99.3

Vogelherd	V	KIA-8969	32,500	260	36,700	36,100	37,300	35,800		36,800	36,200	37,400	36,100	103.7	99.6
Vogelherd	V	KIA-8970	33,080	320	37,800	36,700	38,300	36,400		37,800	36,700	38,300	36,400	100.6	99.4
Vogelherd	V	PL1337 A	35,810	710	41,200	39,700	41,800	39,000	* (21.1)						
Wildscheuer	III	OxA-7394	34,200	900	39,800	37,600	40,800	36,500		39,100	37,600	39,300	36,600	109.9	99.3
Wildscheuer	III	OxA-6920	34,100	1200	39,900	37,000	41,400	36,000		39,100	37,300	39,200	36,400	114.5	99.3
Wildscheuer	III	OxA-7393	33,350	750	38,500	36,600	39,500	35,900		38,400	36,800	39,000	36,300	108.7	99.3
Wildscheuer	III	OxA-7390	32,650	700	37,800	35,900	38,600	35,300		37,700	36,300	38,500	36,100	107.5	99.3

Boundary:

Early

Aurignacian/

Aurignacian

II

36,300 36,000 36,500 35,900 99.7

Phase:

Aurignacian

II

Pataud	7	OxA- 21680	32,850	500	37,700	36,300	38,400	35,900	* (28.5)						
Pataud	7	OxA- 21583	32,400	450	36,900	35,700	37,900	35,400		36,200	35,600	36,300	35,200	93.8	99.3
Pataud	7	OxA- 21584	32,200	450	36,600	35,600	37,500	35,100		36,100	35,600	36,300	35,100	109.6	99.1
Pataud	7	OxA- 2276-	32,150	450	36,600	35,500	37,400	35,000		36,100	35,500	36,300	35,100	111.2	99.1

SOM Table S2

Technical details of new radiocarbon dates for Kostenki 17/II, reported in Table 4.

Sample ref.	Material	Species	Museum accession ref	Excavation info	Lab ref	P Code ^a	Collagen yield (%) ^b	%C ^c	$\delta^{13}\text{C}$ (‰) ^c	$\delta^{15}\text{N}$ (‰) ^c	C/N ^d	CRA ^e \pm 1 σ SD	AMS LAB No (OxA)
K2014/1	Tooth	<i>Vulpes lagopus</i>	-	r101, 19	P36813	AF*	5.0	43.6	-19.7	9.3	3.2	26,830 \pm 250 BP	30,824
K2014/2	Tooth	<i>Vulpes lagopus</i>	-	65, 20	P36814	AF*	4.2	43.6	-19.7	10.4	3.2	25,480 \pm 220 BP	30,825
K17-01	Bone	<i>Canis lupus</i>	28468	-	P38750	AF*	6.4	43.3	-18.0	10.8	3.3	32,350 \pm 450 BP	32,594
K17-01	Bone	<i>Canis lupus</i>	28468	-	P38750	HYP	10.7	30.4	-25.3	13.7	5.0	35,650 \pm 690 BP	X-2677-56
K17-02	Bone	<i>Canis lupus</i>	28468	-	P38751	AF*	5.5	42.8	-18.1	12.3	3.3	31,250 \pm 400 BP	32,595
K17-03	Bone	<i>Canis lupus</i>	28468	-	P38752	AF*	4.6	43.3	-17.8	10.7	3.3	33,050 \pm 500 BP	32,596
K17-03	Bone	<i>Canis lupus</i>	28468	-	P38752	HYP	11.6	36.2	-24.1	13.7	5.0	36,020 \pm 740 BP	X-2677-57
K2014/1 + K2014/2	Bone	<i>Vulpes lagopus</i>	N/A	N/A	P42925	HYP	/	38.9	-25.6	11.7	5.0	35,840 \pm 520 BP	X-2717-26

^a P Code refers to pretreatment code: AF = ultrafiltered collagen (an asterisk denotes samples that have been solvent washed prior to the AF treatment); HYP = extraction of hydroxyproline from hydrolyzed bone collagen (Brock et al., 2010; Devière et al., 2018).

^b Collagen yield (%) is the percent yield of extracted collagen as a function of the starting weight of the bone analyzed. When further purification (AF or HYP) was performed on previously extracted collagen, the yields are not reported.

^c%C is the carbon present in the combusted sample (gelatin or hydroxyproline). Stable isotope ratios are expressed in per mil (‰) relative to Vienna Pee Dee Belemnite with a mass spectrometric precision of $\pm 0.2\text{‰}$ (Coplen, 1994).

^dC/N is the atomic ratio of carbon to nitrogen and is acceptable if it ranges between 2.9–3.5 in the case of collagen or ~ 5.0 in the case of hydroxyproline.

^eCRA is conventional radiocarbon age, expressed in years BP (Stuiver and Polach, 1977).

SOM Table S3

Technical details of new radiocarbon dates for Kostenki 14/IVw, reported in Table 5. See caption of SOM Table S2 for details of the terms used.

Sample ref.	Material	Species	Excavation info	Lab ref	P Code	Collagen yield (%)	%C	$\delta^{13}\text{C}$ (‰)	$\delta^{15}\text{N}$ (‰)	C/N	CRA	AMS LAB No (OxA)
K14-03	Bone	<i>Lepus</i> sp.	П-34 н/у -250	P41032	AF	3.0	44.0	-19.9	1.7	3.2	35,800 ± 700 BP	33,981
K14-04	Bone	<i>Lepus</i> sp.	П-37 яма, н/у -258	P41033	AF	5.6	45.7	-20.7	4.0	3.2	36,350 ± 750 BP	33,982
K14-05	Bone	<i>Lepus</i> sp.	P-33 -247	P41034	AF	5.1	44.1	-19.5	1.4	3.2	35,750 ± 700 BP	33,983

SOM Table S4

Technical details of new radiocarbon dates for Kostenki 14/LVA, reported in Table 6. See caption of SOM Table S2 for details of the terms used.

Sample ref.	Material	Species	Excavation info	Lab ref	P Code	Collagen yield (%)	%C	$\delta^{13}\text{C}$ (‰)	$\delta^{15}\text{N}$ (‰)	C/N	CRA	AMS LAB No (OxA)
K14-11	Bone	<i>Equus</i> sp.	K-14-2000 M-74 (-204) Г.П.	P42563	AF*	1.4	43.6	-19.9	7.1	3.2	34,400 ± 600 BP	35,311
K14-12	Bone	<i>Equus</i> sp.	K14-ГП-03 M-Н76	P42564	AF*	3.5	43.5	-19.3	0.7	3.2	34,400 ± 550 BP	35,312
K14-13	Bone	<i>Equus</i> sp.	K14-ГП-03 M77	P42565	AF*	1.8	43.2	-19.5	6.7	3.2	33,400 ± 500 BP	35,313
K14-14	Bone	<i>Equus</i> sp.	K14-03-ГП M-76 (-196) вне зольной линзы	P42566	AF*	3.0	44.3	-19.8	10.0	3.2	33,150 ± 500 BP	35,314

SOM File S1. Carved stone pendant from Kostenki 17/II. (Provided as a separate U3D file.)

SOM File S2. Fox canine pendant from Kostenki 17/II. (Provided as a separate U3D file.)

SOM File S3. Blade core from Kostenki 17/II. (Provided as a separate U3D file.)

SOM File S4. One of Boriskovskii's group of 'large blades' (see Table 1) from Kostenki 17/II. (Provided as a separate U3D file.)

SOM File S5. Burin on truncation with burin-core morphology from Kostenki 17/II (see also SOM File S6). (Provided as a separate U3D file.)

SOM File S6. Burin on truncation with burin-core morphology from Kostenki 17/II (see also SOM File S5). (Provided as a separate U3D file.)

SOM File S7. Dufour (Dufour subtype) bladelet from K17/II. (Provided as a separate U3D file.)

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