

## Supplementary Information

**Table S1.** List of samples that yielded DNA in this study (EE2-EE26), followed by successfully amplified samples of cave lion from the study by Barnett *et al.* 2009. ALA=Alaska, EUR=Europe, SIB=Siberia, NC=not calibrated as out of range. The asterisk (\*) denotes the approximate age as reported in Barnett *et al.* 2009.

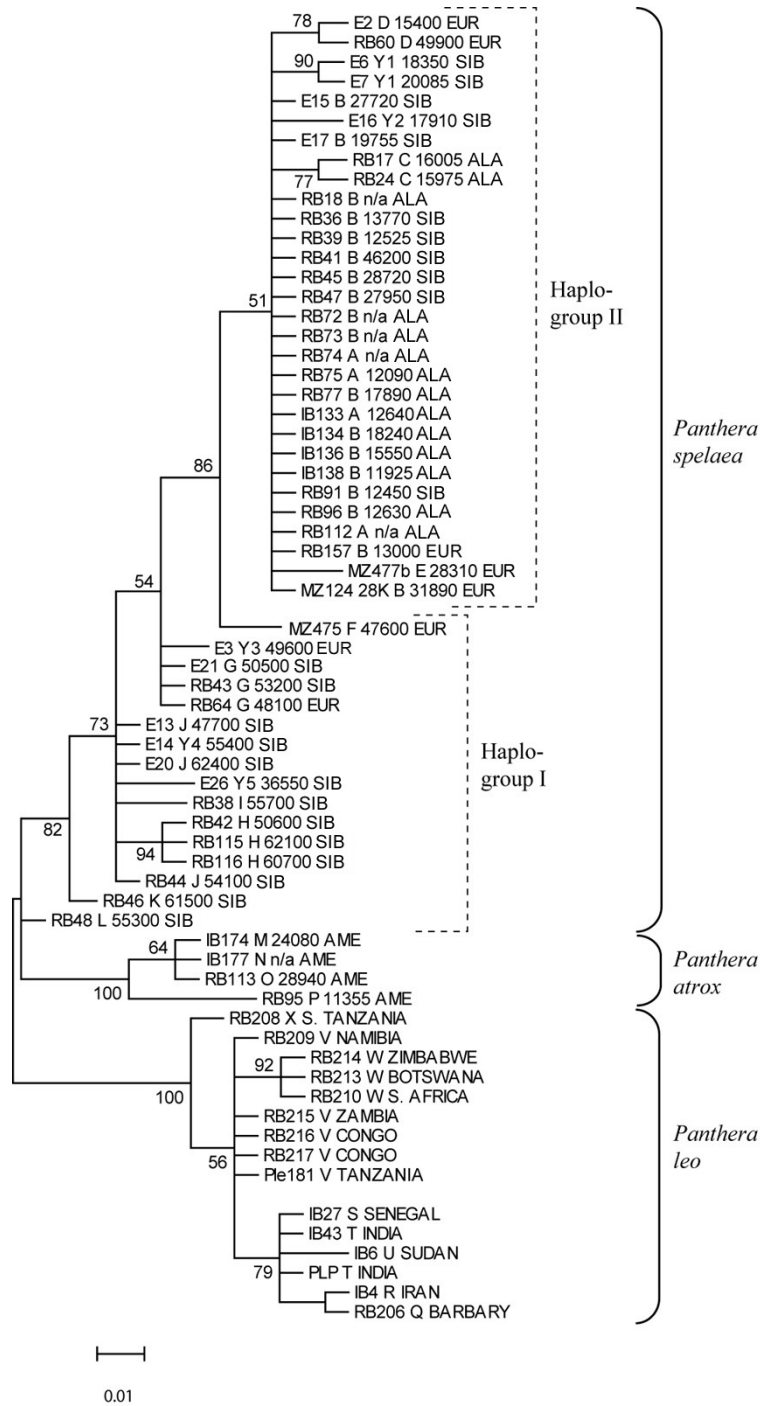
Sample ID	CR haplotype/ Genbank nr.	Site and geographic region	Uncalibrated <sup>14</sup> C date	Calendar years before present
EE2	D/ DQ899903	Schusterlucke cave (EUR)	15400 ± 130	18521 ± 1844
EE4	-	Tyung, C Siberia (SIB)	46700±1300	48181 ± 6747
EE3	Y3	Tain cave, Urals (EUR)	>49600	NC
EE6	Y1	Elovka, Baikal (SIB)	18350 ± 75	21634 ± 1504
EE7	Y1	Volchika, C Siberia (SIB)	20085 ± 80	23266 ± 576
EE13	J/ DQ899909	New Siberian Islands (SIB)	47700 ± 800	48970 ± 6009
EE14	Y4	Yakutia, NE Siberia (SIB)	>55400	NC
EE15	B/ DQ899901	Yakutia, NE Siberia (SIB)	27720 ± 140	30880 ± 1543
EE16	Y2	Irkutsk, Baikal (SIB)	17910 ± 75	21024 ± 1041
EE17	B/ DQ899901	Khroma river, Yakutia (SIB)	19755 ± 80	20006 ± 404
EE19	-	New Siberian Islands (SIB)	52000±1500	54373 ± 6396
EE20	J/ DQ899909	Yakutia, NE Siberia (SIB)	>62400	NC
EE21	G/ DQ899906	Nizhnyaya, C Siberia (SIB)	50500 ± 290	52785 ± 10541
EE26	Y5 (partial)	Kytytk Peninsula (SIB)	36550 ± 290	41025 ± 970
IB133	A/ DQ899900	Gold Run Creek, Yukon (ALA)	12640 ± 75	15016 ± 1463
RB112	A	Caribou Creek, Yukon (ALA)	n/a	-
RB74	A	Fairbanks Creek, Alaska (ALA)	n/a	-
RB75	A	Ester Creek, Alaska (ALA)	12090 ± 80	13822 ± 341
IB134	B/ DQ899901	Gold Hill, Alaska (ALA)	18240 ± 90	21533 ± 1335
IB136	B	Hunker Creek, Dawson (ALA)	15550 ± 90	18596 ± 1212
IB138	B	Fairbanks Creek, Alaska (ALA)	11925 ± 70	13290 ± 549
MZ124	B	Tischhoferhöhle, Austria (EUR)	31890 ± 300	36186 ± 3009
RB18	B	Engineer Creek, Alaska (ALA)	n/a	-
RB36	B	Alazeya River, NE Siberia (SIB)	13770 ± 55	17031 ± 53
RB39	B	Arga-Yurekh River (SIB)	12525 ± 50	14797 ± 334
RB41	B	Duvanny Yar, NE Siberia (SIB)	46200 ± 1500	47780 ± 8967
RB45	B	Duvanny Yar, NE Siberia (SIB)	28720 ± 160	32717 ± 1351
RB47	B	Beryozovska river (SIB)	27950 ± 140	31277 ± 1832
RB72	B	Fairbanks Creek, Alaska (ALA)	n/a	-
RB73	B	Lower Gold Stream (ALA)	n/a	-
RB77	B	Fairbanks Creek, Alaska (ALA)	17890 ± 100	20977 ± 1054
RB91	B	Lena River, NE Siberia (SIB)	12450 ± 60	14640 ± 714
RB96	B	North Slope, Alaska (ALA)	12630 ± 60	15002 ± 506
RB157	B	Ural Mountains (EUR)	13000*	ca 16000
RB17	C/ DQ899902	Fairbanks Creek, Alaska (ALA)	16005 ± 65	18949 ± 386
RB24	C	Banner Creek, Alaska (ALA)	15975 ± 65	18945 ± 400
RB60	D/ DQ899903	Gamssulenhöhle, Austria (EUR)	49900 ± 1500	52042 ± 10551
MZ47b	E/ DQ899904	Gremsdorf, Germany (EUR)	28310 ± 50	31723 ± 1416
MZ475	F/ DQ899905	Zoolithenhöhle, Germany (EUR)	47600 ± 900	48877 ± 6120
RB43	G/ DQ899906	Duvanny Yar, NE Siberia (SIB)	>53200	NC
RB64	G	Sibyllenhöhle, Germany (EUR)	>48100	NC
RB115	H/ DQ899907	B. Liakhovsky Island (SIB)	>62100	NC
RB116	H	B. Liakhovsky Island (SIB)	>60700	NC
RB42	H	Khromskaya Guba (SIB)	>50600	NC
RB38	I/ DQ899908	Chukochya, Kolyma (SIB)	55700 ± 3000	57262 ± 7671
RB44	J/ DQ899909	Krestovka River (SIB)	54100 ± 1800	55728 ± 1820
RB46	K/ DQ899910	Duvanny Yar, NE Siberia (SIB)	>61500	NC
RB48	L/ DQ899911	Alazeya River, NE Siberia (SIB)	55300 ± 2500	55881 ± 5416

**Table S2.** Detailed list of cave lion samples radiocarbon dated at the Oxford Radiocarbon Accelerator Unit (ORAU), where samples that were analysed for mtDNA are indicated.

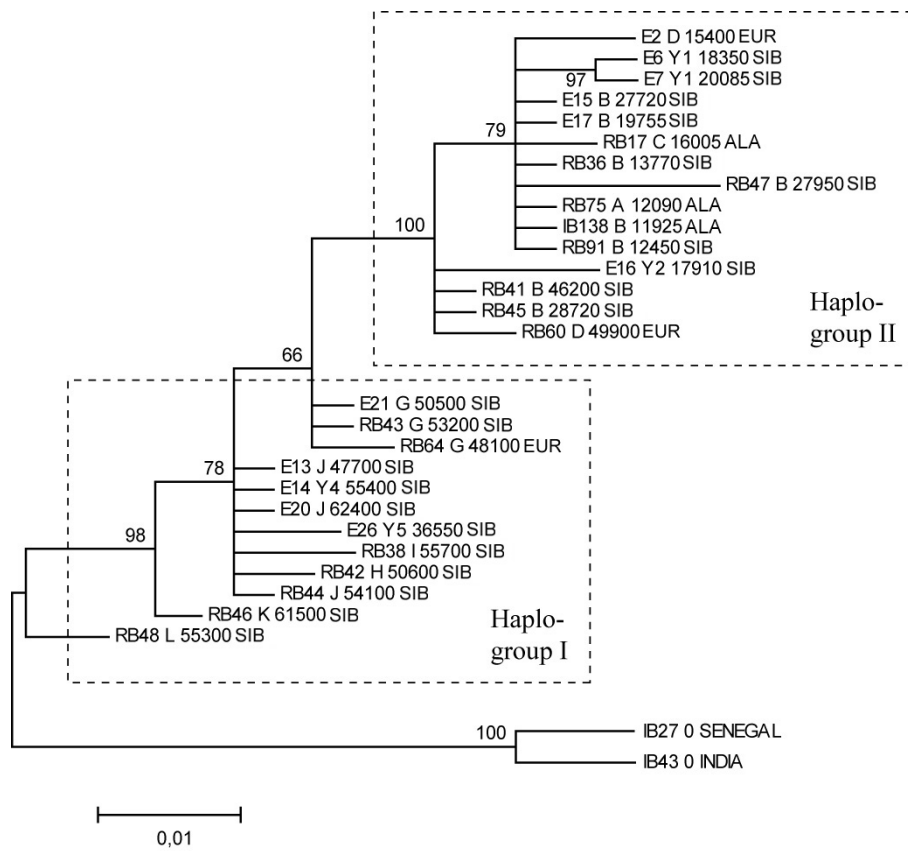
Sample ID	ORAU sample nr.	ORAU analysis nr.	Element	Site	Region	mtDNA recovered	Uncalibrated 14C date
EE1	p13175	OxA-11422	metatarsal III	Lakatnik cave	Bulgaria	-	31200 ± 330
EE2	p12041	OxA-10513	phalanx	Schusterlucke cave	Austria	Y	15400 ± 130
EE3	p12556	OxA-10888	pelvis	Tain cave	Urals, Russia	Y	>49600
EE4	p19306	OxA-17010	femur	Tyung	C Siberia, Russia	Y	46700 ± 1300
EE5	p19311	OxA-17033	metapodial	Malta, Irkutsk	Baikal, Russia	-	21500 ± 100
EE6	p24281	OxA-20672	radius	Elovka	Baikal, Russia	Y	18350 ± 75
EE7	p23780	OxA-20251	humerus	Volchika II, 2002	SC Siberia, Russia	Y	20085 ± 80
EE8	p23781	OxA-20252	mandible	Derbina IV 2001	SC Siberia, Russia	-	35750 ± 400
EE9	p23782	OxA-20257	R mandible	Derbina IV 2001	SC Siberia, Russia	-	35390 ± 280
EE10	p19309	OxA-17031	femur	Volga-Don Canal	Eur. Russia	-	28480 ± 200
EE11	p12583	OxA-10908	vertebra	Grotto Viasher 2	Urals, Russia	-	13570 ± 70
EE12	p19312	OxA-17034	skull	Smolensk region	Eur. Russia	-	14055 ± 60
EE13	p19313	OxA-17035	mandible	Bolshoy Lyakhovskiy Island	NE Siberia, Russia	Y	47700 ± 800
EE14	p19307	OxA-17029	mandible	Kolyma R., Vtrennyy Creek	NE Siberia, Russia	Y	>55400
EE15	p19317	OxA-16983	mandible	Keremsit River, Indigirka	NE Siberia, Russia	Y	27720 ± 140
EE16	p19316	OxA-16982	radius	Onon River, Transbaikalia	Baikal, Russia	Y	17910 ± 75
EE17	p19323	OxA-17040	humerus	Khroma River, Indigirka	NE Siberia, Russia	Y	19755 ± 80
EE18	p19315	OxA-16981	ulna	Priobskoye Steppe Plateau	SC Siberia, Russia	-	52800 ± 1600
EE19	p21436	OxA-18812	tibia	Bolshoy Lyakhovskiy Island	NE Siberia, Russia	Y	52000 ± 1500
EE20	p19318	OxA-17036	maxilla	Khomus-Yuryakh Bol. R	NE Siberia, Russia	Y	>62400
EE21	p19314	OxA-16980	ulna	Nizhnyaya Tunguska R	C Siberia, Russia	Y	50500 ± 1300
EE22	p15999	OxA-14285	canine	Kent's Cavern, Devon	Britain	-	43600 ± 3600
EE23	p12870	OxA-11096	atlas	RaJ Cave	Poland	-	25190 ± 350
EE24	p12872	OxA-11156	R premolarP4	Zawalona Cave	Poland	-	38800 ± 1100
EE25	p19310	OxA-17032	metacarpal III	Kostenki I	Eur. Russia	-	23190 ± 120
EE26	p22222	OxA-19359	canine	Kytyk Peninsula	NE Siberia, Russia	Y	36550 ± 290
EE27	p18959	OxA-17268	upper canine	Zigeunerfels Cave	Germany	-	12375 ± 50
EE28	p12584	OxA-10909	scapula	Grotto Verhnequbahinsky	Urals, Russia	-	13560 ± 70
EE29	p19324	OxA-17042	maxilla, palate	Kostenki IV	Eur. Russia	-	23080 ± 100

**Table S3.** List of primer sequences used in this study for amplification of the mitochondrial ATP8 and control region (CRA+CRB).

<b>ATP8</b>	<b>Sequence</b>
ATP8_1F:	5'-GCCACAGTTAGATACATC-3'
ATP8_3R:	5'-GAGGTGAATAGATTTTCGTTC-3'
<b>CRB</b>	
CR_2F:	5'-GTGCTTGCCCAGTATGTC-3'
CR_4R:	5'-ATATAAACTACTGTACATGC-3'
RS2_Seq2:	5'-GCACGATATACATAGTATGCC-3'
<b>CRA</b>	
Tpro_1F:	5'-GCTGAAATTCTTTCTTAAACTATTCC-3'
CR_X2R:	5'-TGTGGAGGCTGGGGGTTTTTCAC-3'



**Fig S1.** Phylogeny of Late Pleistocene cave lions (*Panthera spelaea*), American lions (*Panthera atrox*) and modern lions (*Panthera leo*), estimated with Bayesian analysis of the mitochondrial control region (CR). Samples are labeled with sample ID, haplotype code, mean uncalibrated radiocarbon date and region of origin: AME=America (*Panthera atrox*), ALA=Alaska, EUR=Europe, SIB=Siberia. Nodes supported by posterior probability values above 50% are shown in the phylogeny.



**Fig S2.** Phylogeny of Pleistocene cave lions (*Panthera spelaea*) and modern lions (*Panthera leo*). The tree is estimated with Bayesian analysis of ATP8 and the mitochondrial control region (CR) combined, using samples with sequences for both. Samples are labeled with sample ID, haplotype code, mean uncalibrated radiocarbon date and region of origin. Nodes supported by posterior probability values above 50% are shown in the phylogeny.