Supplemental Information for

Impact of climate and humans on the range dynamics of woolly mammoth (*Mammuthus primigenius*) in Europe during MIS 2

Adam Nadachowski1\*, Grzegorz Lipecki1, Mateusz Baca2, Michał Żmihorski3, Jarosław Wilczyński1

1Institute of Systematics and Evolution of Animals Polish Academy of Sciences, Sławkowska 17, 31-016 Kraków, Poland;

2Center of New Technologies, University of Warsaw, Banacha 2c, 02-097 Warszawa, Poland

3Institute of Nature Conservation, Polish Academy of Sciences, Mickiewicza 33, 31-120 Kraków, Poland.

\*Corresponding author: [nadachowski@isez.pan.krakow.pl](mailto:nadachowski@isez.pan.krakow.pl)

Figure S1. Generalized additive models explaining relative mammoth abundance between 28,355 and 14,128 years BP. Different subplots refer to models using different degree of smoothing, ranging from k = 3 to k = 30.

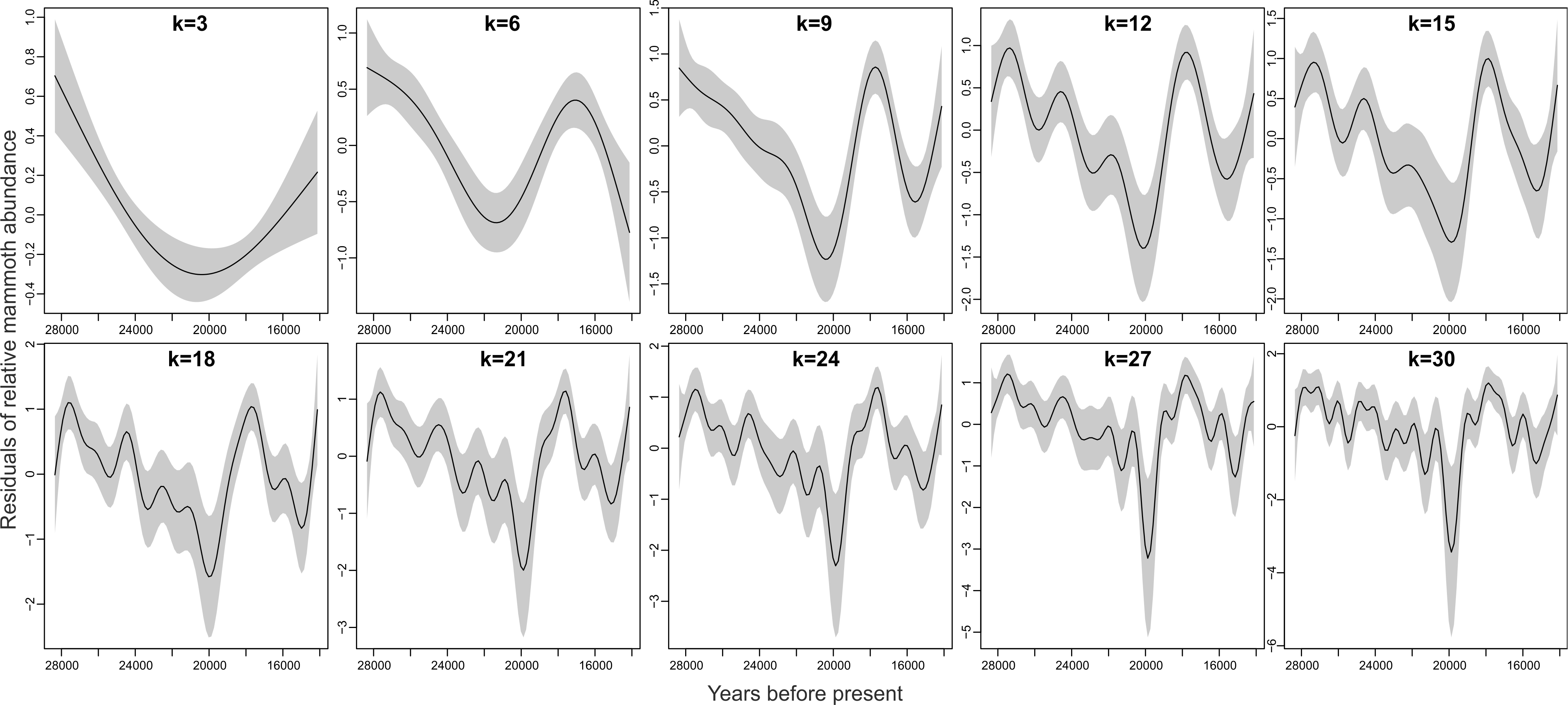


Table S1. The list of localities with directly dated remains of woolly mammoth (*Mammuthus primigenius*) in Europe.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Site | Country | Longitude | Latitude |
| 1 | Kraków Spadzista E1 | Poland | 19.897400 | 50.056600 |
| 2 | Paviland Cave | UK | -4.255000 | 51.550000 |
| 3 | Jaksice II | Poland | 20.504000 | 50.142000 |
| 4 | Dolni Věstonice | Czech Republic | 16.653500 | 48.883400 |
| 5 | Kostenki 12 | Russia | 39.050100 | 51.395400 |
| 6 | Kraków Spadzista B | Poland | 19.897400 | 50.056600 |
| 7 | Goyet, Third Cave | Belgium | 5.007000 | 50.445000 |
| 8 | Hochwacht | Austria | 9.775800 | 47.488000 |
| 9 | Copenhagen, Kamstrup | Denmark | 12.443000 | 55.684700 |
| 10 | Zastruże | Poland | 16.497000 | 50.973500 |
| 11 | Berdyzh | Belarus | 30.945000 | 52.820000 |
| 12 | Leski | Ukraine | 29.181000 | 48.116000 |
| 13 | Halych I | Ukraine | 24.733300 | 49.116700 |
| 14 | Kraków Spadzista C2 | Poland | 19.897400 | 50.056600 |
| 15 | Żywiec, Koszarawa River | Poland | 19.210000 | 49.678000 |
| 16 | Khotylevo 2 | Russia | 34.110000 | 53.346000 |
| 17 | Kostenki 1 | Russia | 39.043300 | 51.393200 |
| 18 | Sungir | Russia | 40.509000 | 56.176000 |
| 19 | Pogon | Ukraine | 33.298000 | 52.193400 |
| 20 | Świlcza | Poland | 21.900000 | 50.070000 |
| 21 | Helsinki, Töölö | Finland | 24.924000 | 60.179000 |
| 22 | Willendorf II | Austria | 15.404600 | 48.323400 |
| 23 | Kostenki 2 | Russia | 39.052000 | 51.385600 |
| 24 | Jarošov I | Czech Republic | 17.490000 | 49.080000 |
| 25 | Sandomierz | Poland | 21.749000 | 50.682000 |
| 26 | Pámanes | Spain | -3.773000 | 43.356000 |
| 27 | Kostenki 17 (Spicynskaya st.) | Russia | 39.052000 | 51.395000 |
| 28 | Hornbæk | Denmark | 12.456000 | 56.086000 |
| 29 | Kraków Zwierzyniec | Poland | 19.900000 | 50.050000 |
| 30 | Kostenki 4 (Alexandrovka) | Russia | 39.070000 | 51.376000 |
| 31 | Kraków Spadzista C | Poland | 19.897400 | 50.056600 |
| 32 | Moravany-Podkovica | Slovakia | 17.875000 | 48.599000 |
| 33 | Sokmarskaya Cave | Russia | 55.371740 | 51.957690 |
| 34 | Opole - Groszowice | Poland | 17.960000 | 50.625000 |
| 35 | Mokrzec,Wisłoka River | Poland | 21.316000 | 49.974000 |
| 36 | Avdeevo | Russia | 35.800000 | 51.687000 |
| 37 | Borshchevo 5 | Russia | 39.132000 | 51.327000 |
| 38 | Lublin - Zemborzyce | Poland | 22.500000 | 51.170000 |
| 39 | Tsuren, Prut River | Ukraine | 26.114000 | 48.237200 |
| 40 | Nilsiä | Finland | 28.090000 | 63.207000 |
| 41 | Hüntwangen | Switzerland | 8.505000 | 47.587000 |
| 42 | Tarnobrzeg - Machów | Poland | 21.630000 | 50.530000 |
| 43 | Kostenki 8 (Tel'manskaya st.) | Russia | 39.071000 | 51.367600 |
| 44 | Jenerálka | Czech Republic | 14.357000 | 50.106000 |
| 45 | Krasnoborsk | Russia | 45.950000 | 61.550000 |
| 46 | Kraków Spadzista trench III | Poland | 19.897400 | 50.056600 |
| 47 | Mezin | Ukraine | 33.070000 | 51.816000 |
| 48 | Zaraysk | Russia | 38.872000 | 54.758000 |
| 49 | Gagarino | Russia | 38.952000 | 52.751400 |
| 50 | Myrup Banke | Denmark | 11.824000 | 55.180000 |
| 51 | Wil | Switzerland | 8.511000 | 47.599000 |
| 52 | Turžėnų Quarry | Lithuania | 24.090000 | 54.982000 |
| 53 | Villefranche-sur-Saône | France | 4.750000 | 45.990000 |
| 54 | Sagaidak I | Ukraine | 32.350000 | 47.728000 |
| 55 | Kostenki 6 | Russia | 39.073300 | 51.373000 |
| 56 | Rond-du-Barry | France | 3.857360 | 45.062280 |
| 57 | Pushkari I | Ukraine | 33.296000 | 52.194000 |
| 58 | Kostenki 5 (Svyatoy log) | Russia | 39.031100 | 51.388500 |
| 59 | Molodova | Ukraine | 27.052000 | 48.559000 |
| 60 | Valea Morilor, Chişinău | Moldova | 28.813000 | 47.019000 |
| 61 | Obolonnya | Ukraine | 32.940500 | 51.618600 |
| 62 | Kostenki 18 (Hvoikovskaya site) | Russia | 39.050000 | 51.399000 |
| 63 | Nowy Targ | Poland | 20.030000 | 49.480000 |
| 64 | Mellikon | Switzerland | 8.350000 | 47.565000 |
| 65 | Kostenki 11 (Anasovka 2) | Russia | 39.051700 | 51.385600 |
| 66 | Wildscheuer Cave | Germany | 8.115000 | 50.421000 |
| 67 | Lukhnevschina | Russia | 42.079000 | 63.141000 |
| 68 | Dresden | Germany | 13.740000 | 51.050000 |
| 69 | Castlepook Cave | Ireland | -8.565000 | 52.244000 |
| 70 | Wróblowa-Ujazd | Poland | 21.407000 | 49.800000 |
| 71 | Binningen | Germany | 8.732000 | 47.806000 |
| 72 | Minsk, “Mashinostroiteley” site | Belarus | 27.661000 | 53.850000 |
| 73 | Spytihněv-Duchonce | Czech Republic | 17.499000 | 49.158000 |
| 74 | Højballegård | Denmark | 9.871000 | 55.910000 |
| 75 | Kostenki 14 (Markina gora) | Russia | 39.030500 | 51.387000 |
| 76 | Hardtwald | Germany | 8.368000 | 47.616000 |
| 77 | Böttstein | Switzerland | 8.241800 | 47.574200 |
| 78 | Arrie | Sweden | 13.100000 | 55.520000 |
| 79 | Novgorod-Severskii | Ukraine | 33.270000 | 52.000000 |
| 80 | Kostenki 3 (Glinishche) | Russia | 39.042200 | 51.412000 |
| 81 | Cueto de la Mina E | Spain | -4.854000 | 43.428000 |
| 82 | English Channel | UK | -0.417000 | 50.450000 |
| 83 | Mezhirichi | Ukraine | 31.430000 | 49.630000 |
| 84 | Kiev-Kirillovskaya | Ukraine | 30.491000 | 50.474900 |
| 85 | Radomyshl | Ukraine | 29.227000 | 50.517000 |
| 86 | Kostenki 19 (Valukinsky site) | Russia | 39.042700 | 51.415000 |
| 87 | Wrocław-Oporów | Poland | 16.966000 | 51.084000 |
| 88 | Markelfingen | Germany | 8.984000 | 47.767000 |
| 89 | Byzovaya | Russia | 57.416000 | 65.024000 |
| 90 | Archangelsk | Russia | 40.560000 | 64.550000 |
| 91 | Breitenbach B | Germany | 12.085000 | 51.008000 |
| 92 | Turgi-Geelig | Switzerland | 8.247000 | 47.493000 |
| 93 | Cae Gwyn Cave | UK | -3.371900 | 53.241000 |
| 94 | Zók | Hungary | 18.100000 | 45.990000 |
| 95 | Cosăuţi 1 | Moldova | 28.246000 | 48.214000 |
| 96 | Eliseevichi 1 | Russia | 33.650000 | 53.146500 |
| 97 | Svobodné Dvory | Czech Republic | 15.778000 | 50.231000 |
| 98 | Pieny | Russia | 35.510000 | 51.647000 |
| 99 | Pushkari IX | Ukraine | 33.297000 | 52.193000 |
| 100 | Borshchevo 1 | Russia | 39.090000 | 51.362700 |
| 101 | Szeged–Öthalom | Hungary | 20.141000 | 46.265000 |
| 102 | Karacharovo | Russia | 42.081400 | 55.548300 |
| 103 | Wustermark 22 | Germany | 12.945600 | 52.537500 |
| 104 | Kelsterbach | Germany | 8.530000 | 50.060000 |
| 105 | Gebensdorf | Switzerland | 8.242000 | 47.491000 |
| 106 | Yudinovo | Russia | 33.257000 | 52.654600 |
| 107 | Brno - Štýřice III (Vídeňská St. - Hospital grounds) | Czech Republic | 16.594530 | 49.183740 |
| 108 | Brno - Štýřice III (Vídeňská St.) | Czech Republic | 16.593886 | 49.185105 |
| 109 | Eliseevichi 2 | Russia | 33.650000 | 53.146500 |
| 110 | Izbica | Poland | 23.157000 | 50.892000 |
| 111 | European Russia, center | Russia | 34.300000 | 53.200000 |
| 112 | Brno - Štýřice III | Czech Republic | 16.594600 | 49.183800 |
| 113 | Timonovka 2 | Russia | 34.316000 | 53.198000 |
| 114 | Kesslerloch Cave | Switzerland | 8.693500 | 47.745200 |
| 115 | Bryansk Region | Russia | 33.400000 | 53.100000 |
| 116 | Steißlingen | Germany | 8.926000 | 47.771000 |
| 117 | Timonovka 1 | Russia | 34.316000 | 53.198000 |
| 118 | Chulatovo 1 | Ukraine | 33.341400 | 51.957500 |
| 119 | Gontsy | Ukraine | 32.753000 | 50.151500 |
| 120 | Kawęczyn | Poland | 22.947000 | 50.677000 |
| 121 | Engen | Germany | 8.798000 | 47.855700 |
| 122 | Gönnersdorf | Germany | 7.415500 | 50.447700 |
| 123 | Zamość | Poland | 23.260000 | 50.720000 |
| 124 | Kniegrotte | Germany | 11.641000 | 50.690000 |
| 125 | Pekárna | Czech Republic | 16.746000 | 49.24200 |
| 126 | Shatrishchi 1 | Russia | 40.420000 | 54.390000 |
| 127 | Buzhanka 2 | Ukraine | 33.104000 | 51.666000 |
| 128 | Zbranki | Ukraine | 28.650000 | 51.297000 |
| 129 | La Croze | France | 5.350000 | 46.083330 |
| 130 | Suponevo | Russia | 34.343500 | 53.207000 |
| 131 | Brno-Štýřice III (Kamenná St.) | Czech Republik | 16.594000 | 49.185000 |
| 132 | Semenivka 2 | Ukraine | 25.330000 | 48.778000 |
| 133 | Dzierżysław | Poland | 17.981300 | 50.049500 |
| 134 | Lublin-Kalinowszczyzna | Poland | 22.585600 | 51.253700 |
| 135 | Oelknitz | Germany | 11.623600 | 50.851300 |
| 136 | European Russia, center (Sevsk) | Russia | 34.480000 | 52.150000 |
| 137 | Risch-Rotkreuz | Switzerland | 8.433700 | 47.151000 |
| 138 | Sevsk | Russia | 34.500000 | 52.150000 |
| 139 | Obukhiv | Ukraine | 30.633300 | 50.100000 |
| 140 | Bzianka | Poland | 21.895000 | 50.036700 |
| 141 | Jiesia River | Lithuania | 23.933600 | 54.832300 |
| 142 | Praz-Rodet | Switzerland | 6.180300 | 46.571000 |
| 143 | La Colombière Rock Shelter | France | 5.398100 | 46.085600 |
| 144 | Uster-Oberuster | Switzerland | 8.694000 | 47.351400 |
| 145 | Csajág | Hungary | 18.170000 | 47.031000 |
| 146 | Lockarp | Sweden | 13.047000 | 55.545000 |
| 147 | Jičín | Czech Republik | 15.356000 | 50.434500 |
| 148 | Kopachiv | Ukraine | 30.483330 | 50.116660 |
| 149 | Wilczyce | Poland | 21.656000 | 50.747000 |
| 150 | La Grotte des Romains | France | 5.720500 | 45.701400 |
| 151 | Rucava | Latvia | 21.162000 | 56.162000 |
| 152 | Marolles-sur-Seine | France | 3.030000 | 48.380000 |
| 153 | Dobranichivka | Ukraine | 31.880000 | 50.047000 |
| 154 | Cherepovets | Russia | 37.840000 | 59.120000 |
| 155 | Gough’s Cave | UK | -2.765500 | 51.281900 |
| 156 | Pin Hole Cave | UK | -1.202400 | 53.261500 |
| 157 | Mamontovaya Kurya | Russia | 62.416700 | 66.566700 |
| 158 | Condover | UK | -2.743000 | 52.663000 |
| 159 | Robin Hood’s Cave | UK | -1.200600 | 53.262100 |
| 160 | Etiolles | France | 2.465600 | 48.633000 |
| 161 | Shatrishchi 2 | Russia | 40.420000 | 54.390000 |
| 162 | Verberie | France | 2.7333000 | 49.316700 |

Table S2. Radiocarbon datings of mammoth remains used in this study.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No | Site | Site No | Lab code | 14C date | Calibrated age (BP) | | |
| 95.4% range | | median |
| 1 | Yudinovo | 106 | SPb-105 | 12,200 ± 200 | 15,018 | 13,624 | 14,202 |
| 2 | Timonovka 1 | 117 | IGAN-82 | 12,200 ± 300 | 15,220 | 13,470 | 14,278 |
| 3 | Condover | 158 | OxA-20129 | 12,230 ± 50 | 14,327 | 13,965 | 14,128 |
| 4 | Verberie | 162 | OxA-12018 | 12,235 ± 75 | 14,567 | 13,859 | 14,149 |
| 5 | Shatrishchi 2 | 161 | GIN-3753 | 12,270 ± 120 | 14,840 | 13,819 | 14,271 |
| 6 | Condover | 158 | OxA-1316 | 12,300 ± 180 | 15,050 | 13,790 | 14,380 |
| 7 | Etiolles | 160 | OxA-12019 | 12,315 ± 55 | 14,660 | 14,070 | 14,279 |
| 8 | Robin Hood’s Cave | 159 | OxA-1462 | 12,320 ± 120 | 14,975 | 13,965 | 14,379 |
| 9 | Condover | 158 | OxA-1456 | 12,330 ± 120 | 14,982 | 13,983 | 14,398 |
| 10 | Yudinovo | 106 | SPb-107 | 12,350 ± 80 | 14,835 | 14,068 | 14,396 |
| 11 | Condover | 158 | OxA-19903 | 12,375 ± 50 | 14,752 | 14,133 | 14,413 |
| 12 | Mamontovaya Kurya | 157 | LU-4008 | 12,380 ± 60 | 14,805 | 14,123 | 14,434 |
| 13 | Pin Hole Cave | 156 | OxA-1204 | 12,460 ± 160 | 15,190 | 14,075 | 14,623 |
| 14 | Gough’s Cave | 155 | OxA-17846 | 12,470 ± 55 | 15,015 | 14,260 | 14,640 |
| 15 | Yudinovo | 106 | SPb-106 | 12,500 ± 95 | 15,115 | 14,231 | 14,703 |
| 16 | Dzierżysław | 133 | LuS-7739 | 12,585 ± 70 | 15,203 | 14,479 | 14,916 |
| 17 | Cherepovets | 154 | GIN-8676 | 12,620 ± 500 | 16,438 | 13,546 | 14,933 |
| 18 | Eliseevichi 1 | 96 | GIN-4137 | 12,630 ± 360 | 16,013 | 13,797 | 14,912 |
| 19 | Dobranichivka | 153 | OxA-700 | 12,700 ± 200 | 15,720 | 14,226 | 15,047 |
| 20 | Marolles-sur-Seine | 152 | OxA-12020 | 12,800 ± 65 | 15,546 | 15,070 | 15,254 |
| 21 | Rucava | 151 | LuS 7538 | 12,875 ± 70 | 15,645 | 15,145 | 15,373 |
| 22 | Mezhirichi | 83 | OxA-709 | 12,900 ± 200 | 16,072 | 14,700 | 15,418 |
| 23 | Lublin-Kalinowszczyzna | 134 | Poz-39516 | 13,120 ± 70 | 16,013 | 15,444 | 15,748 |
| 24 | la Grotte des Romains | 150 | Lyon-1772 | 13,140 ± 80 | 16,056 | 15,455 | 15,777 |
| 25 | Wilczyce | 149 | OxA-26545 | 13,155 ± 65 | 16,052 | 15,561 | 15,804 |
| 26 | Dzierżysław | 133 | Poz-10135 | 13,180 ± 60 | 16,061 | 15,629 | 15,839 |
| 27 | Kopachiv | 148 | GIN-11200 | 13,200 ± 100 | 16,186 | 15,516 | 15,860 |
| 28 | Dzierżysław | 133 | GdA-70 | 13,220 ± 70 | 16,125 | 15,660 | 15,891 |
| 29 | Jičín | 147 | GdA-538 | 13,230 ± 70 | 16,136 | 15,676 | 15,903 |
| 30 | Gönnersdorf | 122 | OxA-26361 | 13,250 ± 60 | 16,136 | 15,722 | 15,929 |
| 31 | Lockarp | 146 | Poz-3941 | 13,310 ± 60 | 16,219 | 15,794 | 16,009 |
| 32 | Csajág | 145 | GdA-2011 | 13,315 ± 35 | 16,187 | 15,832 | 16,016 |
| 33 | Uster-Oberuster | 144 | UZ-2346/ ETH-5522 | 13,350 ± 260 | 16,853 | 15,288 | 16,062 |
| 34 | Dzierżysław | 133 | GdA-193 | 13,370 ± 80 | 16,320 | 15,820 | 16,086 |
| 35 | La Colombière Rock Shelter | 143 | Ly-433 | 13,390 ± 300 | 17,029 | 15,255 | 16,126 |
| 36 | Gontsy | 119 | QC-898 | 13,400 ± 185 | 16,733 | 15,585 | 16,129 |
| 37 | Dzierżysław | 133 | GdA-69 | 13,500 ± 80 | 16,543 | 16,000 | 16,255 |
| 38 | Suponevo | 130 | GIN-3381 | 13,500 ± 100 | 16,597 | 15,950 | 16,258 |
| 39 | Yudinovo | 106 | LU-153 | 13,650 ± 200 | 17,101 | 15,925 | 16,493 |
| 40 | Sevsk | 138 | GIN-6209 | 13,680 ± 60 | 16,781 | 16,267 | 16,499 |
| 41 | Gontsy | 119 | GIN-8410 | 13,700 ± 400 | 17,696 | 15,437 | 16,584 |
| 42 | Praz-Rodet | 142 | OxA-12982 | 13,705 ± 55 | 16,808 | 16,303 | 16,538 |
| 43 | Jiesia River | 141 | LuS 7529 | 13,800 ± 80 | 16,989 | 16,385 | 16,694 |
| 44 | Bzianka | 140 | Poz-39511 | 13,900 ± 70 | 17,104 | 16,548 | 16,844 |
| 45 | Avdeevo | 36 | IGAN-78 | 13,900 ± 200 | 17,441 | 16,270 | 16,845 |
| 46 | Suponevo | 130 | GIN-7729a | 13,920 ± 140 | 17,337 | 16,410 | 16,873 |
| 47 | Obukhiv | 139 | OxA-11974 | 13,945 ± 50 | 17,128 | 16,646 | 16,917 |
| 48 | Sevsk | 138 | GIN-5778 | 13,950 ± 70 | 17,176 | 16,615 | 16,923 |
| 49 | Yudinovo | 106 | IGAN-1266 | 13,980 ± 180 | 17,490 | 16,405 | 16,963 |
| 50 | Kesslerloch Cave | 114 | OxA-10237 | 13,980 ± 110 | 17,358 | 16,578 | 16,967 |
| 51 | Yudinovo | 106 | ISGS-2085 | 13,980 ± 110 | 17,358 | 16,578 | 16,967 |
| 52 | Yudinovo | 106 | IGAN-1270 | 14,010 ± 230 | 17,629 | 16,320 | 17,003 |
| 53 | Risch-Rotkreuz | 137 | combined (ETH-63071, ETH-63072) | 14,081 ± 35 | 17,355 | 16,944 | 17,119 |
| 54 | European Russia, center (Sevsk) | 136 | OxA-20059 (P23375) | 14,095 ± 55 | 17,400 | 16,928 | 17,144 |
| 55 | Eliseevichi 1 | 96 | GIN-4139 | 14,100 ± 400 | 18,150 | 16,050 | 17,115 |
| 56 | Oelknitz | 135 | OxA-10240 | 14,100 ± 100 | 17,482 | 16,809 | 17,152 |
| 57 | Gontsy | 119 | OxA-7387 | 14,120 ± 90 | 17,485 | 16,878 | 17,183 |
| 58 | Lublin-Kalinowszczyzna | 134 | Poz-28222 | 14,140 ± 70 | 17,467 | 16,972 | 17,213 |
| 59 | Byzovaya | 89 | LE-3048 | 14,150 ± 150 | 17,635 | 16,729 | 17,214 |
| 60 | Dzierżysław | 133 | Poz-10136 | 14,150 ± 70 | 17,476 | 16,988 | 17,226 |
| 61 | Semenivka 2 | 132 | Ki- 5509 | 14,200 ± 180 | 17,794 | 16,727 | 17,275 |
| 62 | Brno-Štýřice III (Kamenná St.) | 131 | OxA-24105 | 14,235 ± 60 | 17,536 | 17,116 | 17,335 |
| 63 | Suponevo | 130 | GIN-3719 | 14,260 ± 120 | 17,702 | 17,001 | 17,361 |
| 64 | Gontsy | 119 | OxA-8409 | 14,280 ± 110 | 17,703 | 17,055 | 17,389 |
| 65 | Mezhirichi | 83 | QC-897 | 14,320 ± 270 | 18,094 | 16,633 | 17,419 |
| 66 | La Croze | 129 | Ly-357 | 14,330 ± 260 | 18,085 | 16,679 | 17,434 |
| 67 | Zbranki | 128 | Poz-51401 | 14,340 ± 70 | 17,691 | 17,211 | 17,475 |
| 68 | Gebensdorf | 105 | ETH-35484 | 14,345 ± 125 | 17,839 | 17,115 | 17,476 |
| 69 | Buzhanka 2 | 127 | GrA-38555 | 14,350 ± 160 | 17,908 | 17,048 | 17,478 |
| 70 | Shatrishchi 1 | 126 | GIN-2913 | 14,360 ± 150 | 17,898 | 17,085 | 17,493 |
| 71 | Gönnersdorf | 122 | OxA-10239 | 14,380 ± 100 | 17,839 | 17,212 | 17,526 |
| 72 | Mezhirichi | 83 | OxA-712 | 14,400 ± 250 | 18,166 | 16,833 | 17,528 |
| 73 | Gontsy | 119 | OxA-5933 | 14,400 ± 110 | 17,875 | 17,221 | 17,551 |
| 74 | Pekárna | 125 | OxA-11353 | 14,400 ± 90 | 17,849 | 17,269 | 17,552 |
| 75 | Mezhirichi | 83 | AA-1317 | 14,420 ± 190 | 18,022 | 17,050 | 17,564 |
| 76 | Gontsy | 119 | OxA-7609 | 14,420 ± 100 | 17,884 | 17,280 | 17,577 |
| 77 | Kniegrotte | 124 | OxA-4851 | 14,470 ± 140 | 17,976 | 17,247 | 17,634 |
| 78 | Eliseevichi 1 | 96 | LU-126 | 14,470 ± 100 | 17,924 | 17,365 | 17,640 |
| 79 | Yudinovo | 106 | Beta-199779 | 14,480 ± 80 | 17,905 | 17,430 | 17,652 |
| 80 | Zamość | 123 | Poz-28774 | 14,510 ± 70 | 17,910 | 17,480 | 17,687 |
| 81 | Timonovka 1 | 117 | GIN-8414 | 14,530 ± 120 | 18,000 | 17,399 | 17,704 |
| 82 | Gontsy | 119 | OxA-5932 | 14,550 ± 150 | 18,090 | 17,330 | 17,722 |
| 83 | Mezhirichi | 83 | GrN-29876 | 14,550 ± 70 | 17,941 | 17,526 | 17,730 |
| 84 | Gönnersdorf | 122 | OxA-10199 | 14,570 ± 90 | 17,980 | 17,510 | 17,748 |
| 85 | Eliseevichi 1 | 96 | GIN-4136 | 14,590 ± 140 | 18,114 | 17,420 | 17,764 |
| 86 | Gontsy | 119 | OxA-717 | 14,600 ± 200 | 18,289 | 17,270 | 17,774 |
| 87 | Kostenki 11 (Anasovka 2) | 65 | LE-1637 | 14,610 ± 120 | 18,078 | 17,485 | 17,785 |
| 88 | Engen | 121 | Hv-11569 | 14,610 ± 90 | 18,015 | 17,550 | 17,787 |
| 89 | Gontsy | 119 | OxA-8368 | 14,620 ± 100 | 18,045 | 17,537 | 17,797 |
| 90 | Kawęczyn | 120 | Poz-28221 | 14,620 ± 80 | 18,010 | 17,577 | 17,799 |
| 91 | Gontsy | 119 | OxA-6142 | 14,670 ± 110 | 18,135 | 17,565 | 17,851 |
| 92 | Mezhirichi | 83 | combined (GrN-29877, OxA-15587); Warning! X-Test fails at 5% - 4 X2-Test: df=1 T=6.194(5% 3.8) | 14,695± 46 | 18,041 | 17,706 | 17,888 |
| 93 | Mezhirichi | 83 | GIN-2593 | 14,700 ± 500 | 19,036 | 16,552 | 17,875 |
| 94 | Chulatovo 1 | 118 | OxA-715 | 14,700 ± 250 | 18,516 | 17,289 | 17,895 |
| 95 | Bryansk Region | 115 | OxA-21004 (P24753) | 14,715 ± 65 | 18,095 | 17,695 | 17,908 |
| 96 | Timonovka 1 | 117 | GIN-8413 | 14,750 ± 120 | 18,271 | 17,642 | 17,951 |
| 97 | Mezhirichi | 83 | combined (GrA-38810, SacA-11177) | 14,764 ± 44 | 18,129 | 17,801 | 17,962 |
| 98 | Steißlingen | 116 | Hv-10654 | 14,800 ± 120 | 18,322 | 17,700 | 18,013 |
| 99 | Pushkari IX | 99 | OxA-17799 | 14,820 ± 60 | 18,226 | 17,846 | 18,025 |
| 100 | Bryansk Region | 115 | OxA-21033 (P24757) | 14,820 ± 60 | 18,226 | 17,846 | 18,025 |
| 101 | Bryansk Region | 115 | OxA-21005 (P24754) | 14,840 ± 65 | 18,258 | 17,863 | 18,047 |
| 102 | Brno - Štýřice III | 112 | OxA-28114 | 14,870 ± 90 | 18,332 | 17,862 | 18,086 |
| 103 | Yudinovo | 106 | LE-3835 | 14,870 ± 150 | 18,462 | 17,721 | 18,096 |
| 104 | Mezhirichi | 83 | combined (SacA-12041, SacA-14984, SacA-12259) | 14,907 ± 52 | 18,303 | 17,936 | 18,118 |
| 105 | Bryansk Region | 115 | OxA-21006 (P24755) | 14,910 ± 65 | 18,324 | 17,927 | 18,124 |
| 106 | Mezhirichi | 83 | combined (SacA-12041, OxA-15587", SacA-14986); Warning! X-Test fails at 5% - 4 X2-Test: df=1 T=6.194(5% 3.8) | 14,914 ± 44 | 18,300 | 17,948 | 18,125 |
| 107 | Bryansk Region | 115 | OxA-21007 (P24756) | 14,955 ± 65 | 18,365 | 17,964 | 18,176 |
| 108 | Yudinovo | 106 | LE-3302 | 14,980 ± 110 | 18,489 | 17,927 | 18,207 |
| 109 | Kesslerloch Cave | 114 | Oxa-10298 | 15,020 ± 180 | 18,670 | 17,864 | 18,257 |
| 110 | Berdyzh | 11 | OxA-716 | 15,100 ± 250 | 18,874 | 17,801 | 18,341 |
| 111 | Mezin | 47 | OxA-719 | 15,100 ± 200 | 18,767 | 17,907 | 18,343 |
| 112 | Timonovka 2 | 113 | LU-358 | 15,110 ± 530 | 19,655 | 17,092 | 18,361 |
| 113 | Borshchevo 1 | 100 | GIN-11197 | 15,140 ± 100 | 18,645 | 18,110 | 18,400 |
| 114 | Borshchevo 1 | 100 | GIN-11199 | 15,200 ± 200 | 18,850 | 17,987 | 18,448 |
| 115 | Obolonnya | 61 | SPb-442 | 15,200 ± 200 | 18,850 | 17,987 | 18,448 |
| 116 | Brno - Štýřice III | 112 | OxA-28298 | 15,215 ± 70 | 18,669 | 18,302 | 18,484 |
| 117 | Mezhirichi | 83 | QC-900 | 15,245 ± 1080 | 21,644 | 15,969 | 18,617 |
| 118 | Karacharovo | 102 | GIN-8567 | 15,250 ± 400 | 19,471 | 17,628 | 18,506 |
| 119 | European Russia, center | 111 | OxA-17798 | 15,535 ± 70 | 18,934 | 18,634 | 18,792 |
| 120 | Borshchevo 1 | 100 | GIN-8085 | 15,600 ± 70 | 19,002 | 18,698 | 18,847 |
| 121 | Izbica | 110 | Poz-38125 | 15,620 ± 100 | 19,110 | 18,660 | 18,868 |
| 122 | Eliseevichi 2 | 109 | IGAN-556 | 15,620 ± 200 | 19,409 | 18,480 | 18,894 |
| 123 | Brno - Štýřice III (Vídeňská St.) | 108 | OxA-26961 | 15,625 ± 75 | 19,043 | 18,710 | 18,868 |
| 124 | Brno - Štýřice III (Vídeňská St. - Hospital grounds) | 107 | GdA-459 | 15,650 ± 70 | 19,062 | 18,738 | 18,890 |
| 125 | Yudinovo | 106 | LU-127 | 15,660 ± 180 | 19,399 | 18,567 | 18,932 |
| 126 | Gebensdorf | 105 | ETH-35485 | 15,780 ± 100 | 19,320 | 18,805 | 19,039 |
| 127 | Karacharovo | 102 | GIN-8412 | 15,800 ± 150 | 19,475 | 18,768 | 19,079 |
| 128 | Wustermark 22 | 103 | Ua-24105 | 15,825 ± 180 | 19,553 | 18,744 | 19,115 |
| 129 | Karacharovo | 102 | GIN-8018 | 15,850 ± 150 | 19,518 | 18,813 | 19,134 |
| 130 | Karacharovo | 102 | GIN-8411 | 15,900 ± 150 | 19,562 | 18,858 | 19,190 |
| 131 | Szeged–Öthalom | 101 | Deb-3344 | 15,920 ± 170 | 19,620 | 18,832 | 19,216 |
| 132 | Avdeevo | 36 | QC-886 | 16,565 ± 270 | 20,670 | 19,330 | 19,996 |
| 133 | Avdeevo | 36 | GIN-9863a | 16,800 ± 1200 | 23,771 | 17,865 | 20,538 |
| 134 | Eliseevichi 1 | 96 | GIN-4138 | 16,850 ± 120 | 20,629 | 20,011 | 20,325 |
| 135 | Avdeevo | 36 | QC-621 | 16,960 ± 420 | 21,647 | 19,511 | 20,503 |
| 136 | Borshchevo 1 | 100 | LE-3727 | 17,200 ± 150 | 21,191 | 20,355 | 20,754 |
| 137 | Pushkari IX | 99 | Ki-11900 | 17,200 ± 250 | 21,465 | 20,129 | 20,772 |
| 138 | Pieny | 98 | GIN-8408a | 17,200 ± 300 | 21,601 | 20,040 | 20,783 |
| 139 | Kostenki 2 | 23 | GIN-8570 | 17,300 ± 160 | 21,361 | 20,476 | 20,880 |
| 140 | Svobodné Dvory | 97 | GrA-29390 | 17,340 ± 130 | 21,325 | 20,575 | 20,925 |
| 141 | Eliseevichi 1 | 96 | LU-360 | 17,340 ± 170 | 21,437 | 20,500 | 20,936 |
| 142 | Cosăuţi 1 | 95 | Oxa-12000 | 17,720 ± 80 | 21,755 | 21,145 | 21,452 |
| 143 | Zók | 94 | AA-80678 | 17,760 ± 200 | 22,014 | 20,915 | 21,492 |
| 144 | Hüntwangen | 41 | no data | 17,850 ± 265 | 22,304 | 20,929 | 21,605 |
| 145 | Kostenki 18 (Hvoikovskaya site) | 62 | GIN-8028 | 17,900 ± 300 | 22,395 | 20,919 | 21,666 |
| 146 | Gagarino | 49 | GIN-7991 | 17,900 ± 120 | 22,016 | 21,317 | 21,683 |
| 147 | Cae Gwyn Cave | 93 | Birm-146 | 18,000 +1400/-1200 | 25,706 | 18,881 | 21,999 |
| 148 | Mezhirichi | 83 | Ki-1055 | 18,020 ± 600 | 23,319 | 20,394 | 21,806 |
| 149 | Breitenbach B | 91 | KN-3332 | 18,100 ± 200 | 22,408 | 21,435 | 21,939 |
| 150 | Turgi-Geelig | 92 | ETH-17256 | 18,150 ± 140 | 22,365 | 21,640 | 22,010 |
| 151 | Halych I | 13 | Gd-13092 | 18,200 ± 700 | 23,801 | 20,397 | 22,033 |
| 152 | Hüntwangen | 41 | ETH-17254 | 18,240 ± 130 | 22,410 | 21,805 | 22,106 |
| 153 | Zaraysk | 48 | GIN-3727 | 18,300 ± 200 | 22,554 | 21,663 | 22,149 |
| 154 | Archangelsk | 90 | GrA-42227 | 18,300 ± 70 | 22,380 | 21,925 | 22,175 |
| 155 | Byzovaya | 89 | TA-121 | 18,320 ± 280 | 22,820 | 21,491 | 22,160 |
| 156 | Kostenki 1 | 17 | LE-4351 | 18,400 ± 3300 | 43,165 | 15,759 | 24,314 |
| 157 | Avdeevo | 36 | GIN-9863 | 18,500 ± 600 | 23,870 | 20,948 | 22,385 |
| 158 | Markelfingen | 88 | Hv-10655 | 18,530 ± 1045/925 | 25,253 | 20,120 | 22,510 |
| 159 | Pogon | 19 | LU-361 | 18,690 ± 770 | 24,565 | 20,753 | 22,646 |
| 160 | Kostenki 11 (Anasovka 2) | 65 | GIN-8079 | 18,700 ± 80 | 22,796 | 22,383 | 22,553 |
| 161 | Wrocław-Oporów | 87 | Gd-10412 | 18,700 ± 270 | 23,251 | 21,937 | 22,598 |
| 162 | Kostenki 19 (Valukinsky site) | 86 | GIN-8577 | 18,700 ± 600 | 24,104 | 21,194 | 22,633 |
| 163 | Kraków Spadzista C2 | 14 | Poz-51375 | 18,950 ± 90 | 23,077 | 22,531 | 22,811 |
| 164 | Radomyshl | 85 | OxA-697 | 19,000 ± 300 | 23,666 | 22,325 | 22,922 |
| 165 | Kostenki 1 | 17 | LE-2950 | 19,010 ± 120 | 23,267 | 22,535 | 22,885 |
| 166 | Gagarino | 49 | GIN-7990 | 19,160 ± 130 | 23,482 | 22,722 | 23,088 |
| 167 | Kiev-Kirillovskaya | 84 | OxA-718 | 19,200 ± 250 | 23,735 | 22,526 | 23,141 |
| 168 | Mezhirichi | 83 | Ki-1058 | 19,280 ± 600 | 24,847 | 21,941 | 23,297 |
| 169 | Kostenki 18 (Hvoikovskaya site) | 62 | GIN-8576 | 19,300 ± 200 | 23,780 | 22,740 | 23,251 |
| 170 | English Channel | 82 | Gif-1110 | 19,300 ± 700 | 25,186 | 21,831 | 23,345 |
| 171 | Avdeevo | 36 | GIN-7727 | 19,500 ± 500 | 24,807 | 22,419 | 23,519 |
| 172 | Khotylevo 2 | 16 | GIN-12861 | 19,600 ± 450 | 24,753 | 22,534 | 23,624 |
| 173 | Cueto de la Mina E | 81 | OxA-10122 | 19,700 ± 500 | 25,055 | 22,593 | 23,753 |
| 174 | Kostenki 14 (Markina gora) | 75 | LE-5567 | 19,700 ± 1300 | 27,163 | 21,089 | 23,942 |
| 175 | Kostenki 3 (Glinishche) | 80 | GIN-8022 | 19,800 ± 210 | 24,358 | 23,323 | 23,834 |
| 176 | Novgorod-Severskii | 79 | OxA-698 | 19,800 ± 350 | 24,777 | 22,968 | 23,844 |
| 177 | Kraków Spadzista C2 | 14 | Poz-51334 | 19,840 ± 100 | 24,160 | 23,585 | 23,879 |
| 178 | Arrie | 78 | combined (Lu-887:E, Lu-887) | 19842 ± 362 | 23,897 | 23,457 | 23,010 |
| 179 | Böttstein | 77 | ETH-17250 | 19,850 ± 150 | 24,270 | 23,514 | 23,889 |
| 180 | Kostenki 1 | 17 | LE-2949 | 19,860 ± 200 | 24,389 | 23,425 | 23,901 |
| 181 | Hardtwald | 76 | Hv-14486 | 19,895 +1500/-1320 | 27,831 | 20,837 | 24,215 |
| 182 | Zaraysk | 48 | GIN-8486 | 19,900 ± 260 | 24,597 | 23,269 | 23,951 |
| 183 | Kostenki 14 (Markina gora) | 75 | GIN-8024 | 19,900 ± 850 | 26,048 | 22,259 | 24,066 |
| 184 | Binningen | 71 | Hv-13323 | 19,920 ± 140 | 24,326 | 23,606 | 23,971 |
| 185 | Højballegård | 74 | LuS-7415 | 19,940 ± 120 | 24,312 | 23,666 | 23,995 |
| 186 | Borshchevo 5 | 37 | LE-6947 | 20,000 ± 300 | 24,967 | 23,370 | 24,079 |
| 187 | Spytihněv-Duchonce | 73 | GrA-27416 | 20,030 ± 140 | 24,445 | 23,736 | 24,095 |
| 188 | Minsk “Mashinostroiteley” site | 72 | IGS-1370 | 20,167-72 ±330 | 25,210 | 23,527 | 24,296 |
| 189 | Binningen | 71 | Hv-14390 | 20,195 ± 140 | 24,656 | 23,884 | 24,269 |
| 190 | Kraków Spadzista C2 | 14 | OxA-635 | 20,200 ± 350 | 25,280 | 23,522 | 24,343 |
| 191 | Wróblowa-Ujazd | 70 | Poz-31463 | 20,320 ± 120 | 24,874 | 24,075 | 24,411 |
| 192 | Kraków Spadzista C2 | 14 | Poz-51333 | 20,360 ± 110 | 24,910 | 24,140 | 24,461 |
| 193 | Castlepook Cave | 69 | OxA-4233 | 20,360 ± 220 | 25,165 | 23,976 | 24,515 |
| 194 | Sungir | 18 | GIN-9585 | 20,360 ± 900 | 26,610 | 22,551 | 24,586 |
| 195 | Dresden | 68 | OxA-30176 | 20,390 ± 120 | 24,976 | 24,160 | 24,511 |
| 196 | Lukhnevschina | 67 | GrA-42214 | 20,450 ± 110 | 25,030 | 24,259 | 24,605 |
| 197 | Dolni Věstonice | 4 | Poz-76397 | 20,470 ± 130 | 25,100 | 24,255 | 24,646 |
| 198 | Wildscheuer Cave | 66 | OxA-7498 | 20,480 ± 360 | 25,575 | 23,865 | 24,692 |
| 199 | Kostenki 11 (Anasovka 2) | 65 | GIN-8080 | 20,500 ± 300 | 25,471 | 23,993 | 24,710 |
| 200 | Pushkari I | 57 | GIN-11311 | 20,500 ± 500 | 25,825 | 23,604 | 24,715 |
| 201 | Mellikon | 64 | UZ-2416 | 20,550 ± 250 | 25,409 | 24,124 | 24,762 |
| 202 | Valea Morilor, Chişinău | 60 | GrA-52425 | 20,560 ± 80 | 25,098 | 24,437 | 24,753 |
| 203 | Valea Morilor, Chişinău | 60 | GrA-52424 | 20,570 ± 80 | 25,110 | 24,450 | 24,766 |
| 204 | Nowy Targ | 63 | Poz-39513 | 20,590 ± 130 | 25,216 | 24,404 | 24,798 |
| 205 | Kostenki 5 (Svyatoy log) | 58 | GIN-7996 | 20,600 ± 140 | 25,243 | 24,397 | 24,810 |
| 206 | Kostenki 18 (Hvoikovskaya site) | 62 | GIN-8032 | 20,600 ± 140 | 25,243 | 24,397 | 24,810 |
| 207 | Avdeevo | 36 | GIN-9861 | 20,600 ± 700 | 26,376 | 23,203 | 24,822 |
| 208 | Avdeevo | 36 | GIN-9862 | 20,600 ± 800 | 26,649 | 23,005 | 24,829 |
| 209 | Kraków Spadzista B | 6 | Ly-631 | 20,600 ± 1050 | 27,262 | 22,646 | 24,862 |
| 210 | Pushkari I | 57 | GIN-8529 | 20,600 ± 1300 | 27,895 | 22,164 | 24,913 |
| 211 | Gagarino | 49 | LE-1432C | 20,620 ± 300 | 25,576 | 24,122 | 24,840 |
| 212 | Pushkari I | 57 | GIN-8529a | 20,700 ± 500 | 25,978 | 23,820 | 24,921 |
| 213 | Obolonnya | 61 | Ох-28035 | 20,730 ± 120 | 25,340 | 24,535 | 24,986 |
| 214 | Valea Morilor, Chişinău | 60 | GrA-46004 | 20,770 ± 90 | 25,350 | 24,620 | 25,060 |
| 215 | Molodova | 59 | GrN-24483 | 20,840 ± 310 | 25,781 | 24,347 | 25,091 |
| 216 | Pushkari I | 57 | GIN-11311a | 20,900 ± 600 | 26,470 | 23,788 | 25,131 |
| 217 | Kostenki 5 (Svyatoy log) | 58 | GIN-8029 | 20,900 ± 100 | 25,553 | 24,918 | 25,238 |
| 218 | Rond-du-Barry | 56 | Beta-232140 | 20,970 ± 110 | 25,613 | 25,020 | 25,324 |
| 219 | Zaraysk | 48 | GIN-8484 | 21,000 ± 430 | 26,098 | 24,240 | 25,251 |
| 220 | Paviland Cave | 2 | OxA-7112 | 21,100 ± 550 | 26,564 | 24,079 | 25,350 |
| 221 | Kostenki 6 | 55 | GIN-8023 | 21,100 ± 200 | 25,865 | 24,957 | 25,437 |
| 222 | Khotylevo 2 | 16 | GIN-8497 | 21,170 ± 260 | 26,007 | 24,854 | 25,488 |
| 223 | Sagaidak I | 54 | LE-1602B | 21,240 ± 200 | 25,936 | 25,156 | 25,571 |
| 224 | Pámanes | 26 | PAM 3253 | 21,255 ± 240 | 26,017 | 25,071 | 25,576 |
| 225 | Villefranche-sur-Saône | 53 | OxA-4093 (Lyon-16) | 21,330 ± 240 | 26,064 | 25,157 | 25,644 |
| 226 | Turžėnų Quarry | 52 | LuS 7528 | 21,400 ± 120 | 25,958 | 25,477 | 25,729 |
| 227 | Wil | 51 | ETH-17253 | 21,510 ± 160 | 26,081 | 25,515 | 25,809 |
| 228 | Myrup Banke | 50 | K-3703 | 21,530 ± 430 | 26,951 | 24,904 | 25,830 |
| 229 | Gagarino | 49 | GIN-7989 | 21,600 ± 140 | 26,114 | 25,630 | 25,879 |
| 230 | Zaraysk | 48 | GIN-8485 | 21,600 ± 300 | 26,533 | 25,278 | 25,887 |
| 231 | Kostenki 17 (Spicynskaya st.) | 27 | GIN-8228 | 21,600 ± 600 | 27,246 | 24,578 | 25,920 |
| 232 | Mezin | 47 | GIN-4 | 21,600 ± 2200 | 33,577 | 21,484 | 26,395 |
| 233 | Kraków Spadzista trench III | 46 | Poz-48407 | 21,620 ± 140 | 26,130 | 25,645 | 25,893 |
| 234 | Kostenki 1 | 17 | LE-3279 | 21,680 ± 700 | 27,455 | 24,500 | 26,013 |
| 235 | Krasnoborsk | 45 | GrA-42199 | 21,690 +120/-110 | 26,159 | 25,730 | 25,944 |
| 236 | Paviland Cave | 2 | OxA-17559 | 21,710 ± 120 | 26,179 | 25,743 | 25,958 |
| 237 | Khotylevo 2 | 16 | GIN-8495 | 21,720 ± 170 | 26,333 | 25,673 | 25,973 |
| 238 | Jenerálka | 44 | GrA-20004 | 21,910 ± 270 | 26,882 | 25,690 | 26,184 |
| 239 | Dolni Věstonice | 4 | Poz-76402 | 21,920 ± 150 | 26,511 | 25,866 | 26,142 |
| 240 | Kostenki 8 (Tel'manskaya st.) | 43 | GIN-7998 | 22,000 ± 160 | 26,618 | 25,904 | 26,223 |
| 241 | Kostenki 1 | 17 | GIN-8041 | 22,000 ± 300 | 27,049 | 25,756 | 26,287 |
| 242 | Zaraysk | 48 | GIN-3639 | 22,000 ± 300 | 27,049 | 25,756 | 26,287 |
| 243 | Tarnobrzeg - Machów | 42 | Poz-51433 | 22,010 ± 160 | 26,630 | 25,910 | 26,233 |
| 244 | Kostenki 1 | 17 | LE-3282 | 22,020 ± 310 | 27,081 | 25,762 | 26,311 |
| 245 | Kraków Spadzista B | 6 | Poz-58707 | 22,030 ± 110 | 26,544 | 25,982 | 26,234 |
| 246 | Kraków Spadzista C2 | 14 | Poz-51373 | 22,090 ± 110 | 26,609 | 26,023 | 26,294 |
| 247 | Hüntwangen | 41 | ETH-17255 | 22,190 ± 170 | 26,960 | 26,034 | 26,422 |
| 248 | Moravany-Podkovica | 32 | GrN-26750 | 22,200 ± 220 | 27,059 | 25,999 | 26,456 |
| 249 | Avdeevo | 36 | GIN-7729 | 22,200 ± 700 | 27,844 | 25,190 | 26,537 |
| 250 | Jarošov I | 24 | GrA-24741 | 22,330 + 130/ - 120 | 26,159 | 25,730 | 26,599 |
| 251 | Nilsiä | 40 | Hela-281 | 22,420 ± 315 | 27,359 | 26,060 | 26,717 |
| 252 | Tsuren, Prut River | 39 | Poz-51383 | 22,440 ± 120 | 27,144 | 26,372 | 26,756 |
| 253 | Lublin - Zemborzyce | 38 | Poz-39528 | 22,450 ± 140 | 27,176 | 26,344 | 26,766 |
| 254 | Borshchevo 5 | 37 | GIN-10239 | 22,500 ± 700 | 28,130 | 25,522 | 26,792 |
| 255 | Berdyzh | 11 | GIN-2695 | 22,500 ± 200 | 27,292 | 26,285 | 26,809 |
| 256 | Avdeevo | 36 | GIN-9860 | 22,500 ± 900 | 28,730 | 25,105 | 26,816 |
| 257 | Mokrzec,Wisłoka River | 35 | Poz-51398 | 22,540 ± 130 | 27,233 | 26,477 | 26,861 |
| 258 | Kostenki 1 | 17 | GIN-6249 | 22,600 ± 300 | 27,469 | 26,210 | 26,887 |
| 259 | Opole - Groszowice | 34 | Poz-39506 | 22,600 ± 150 | 27,307 | 26,505 | 26,920 |
| 260 | Sokmarskaya cave | 33 | LE-2303 | 22,630 ± 250 | 27,449 | 26,336 | 26,928 |
| 261 | Khotylevo 2 | 16 | GIN-8496 | 22,660 ± 170 | 27,375 | 26,530 | 26,983 |
| 262 | Moravany-Podkovica | 32 | GrN-26749 | 22,680 ± 400 | 27,644 | 26,137 | 26,944 |
| 263 | Kraków Spadzista C2 | 14 | Poz-51376 | 22,690 ± 120 | 27,350 | 26,625 | 27,040 |
| 264 | Sungir | 18 | GIN-10887 | 22,700 ± 600 | 28,020 | 25,850 | 26,951 |
| 265 | Khotylevo 2 | 16 | GIN-12859 | 22,700 ± 450 | 27,717 | 26,082 | 26,955 |
| 266 | Kostenki 1 | 17 | LE-2969 | 22,700 ± 250 | 27,501 | 26,418 | 27,001 |
| 267 | Khotylevo 2 | 16 | GIN-8406 | 22,700 ± 200 | 27,436 | 26,516 | 27,019 |
| 268 | Khotylevo 2 | 16 | OxA-27225 | 22,720 ± 150 | 27,399 | 26,611 | 27,064 |
| 269 | Kraków Spadzista C | 31 | Poz-51374 | 22,740 ± 120 | 27,394 | 26,678 | 27,104 |
| 270 | Kostenki 1 | 17 | LE-2800 | 22,760 ± 250 | 27,542 | 26,479 | 27,067 |
| 271 | Kraków Zwierzyniec | 29 | LuS-7421 | 22,800 ± 150 | 27,462 | 26,693 | 27,157 |
| 272 | Kostenki 4 (Alexandrovka) | 30 | GIN-7995 | 22,800 ± 120 | 27,447 | 26,773 | 27,170 |
| 273 | Hornbæk | 28 | LuS-7414 | 22,900 ± 150 | 27,554 | 26,866 | 27,250 |
| 274 | Khotylevo 2 | 16 | OxA-27002 | 22,900 ± 150 | 27,554 | 26,866 | 27,250 |
| 275 | Kostenki 8 (Tel'manskaya st.) | 43 | GIN-7997 | 22,900 ± 120 | 27,510 | 26,980 | 27,258 |
| 276 | Kostenki 17 (Spicynskaya st.) | 27 | GIN-8074 | 23,000 ± 800 | 28,880 | 25,796 | 27,253 |
| 277 | Kostenki 1 | 17 | LE-3276 | 23,010 ± 300 | 27,765 | 26,621 | 27,296 |
| 278 | Kraków Spadzista B | 6 | Poz-242 | 23,020 ± 180 | 27,665 | 26,994 | 27,340 |
| 279 | Pámanes | 26 | PAM 32530 | 23,050 ± 305 | 27,797 | 26,648 | 27,330 |
| 280 | Sandomierz | 25 | Poz-29293 | 23,070 ± 130 | 27,622 | 27,125 | 27,384 |
| 281 | Kostenki 2 | 23 | AA-27375 | 23,120 ± 460 | 28,224 | 26,379 | 27,358 |
| 282 | Jarošov I | 24 | GrA-20495 | 23,120 ± 200 | 27,730 | 27,066 | 27,414 |
| 283 | Willendorf II | 22 | GrA-5005 | 23,180 ± 120 | 27,685 | 27,235 | 27,464 |
| 284 | Khotylevo 2 | 16 | OxA-27001 | 23,240 ± 160 | 27,751 | 27,237 | 27,501 |
| 285 | Kostenki 1 | 17 | LE-3289 | 23,260 ± 680 | 28,809 | 26,124 | 27,495 |
| 286 | Khotylevo 2 | 16 | GIN-8497a | 23,300 ± 300 | 28,041 | 27,008 | 27,531 |
| 287 | Helsinki, Töölö | 21 | Hela-282 | 23,340 ± 350 | 28,270 | 26,930 | 27,560 |
| 288 | Berdyzh | 11 | LU-104 | 23,430 ± 180 | 27,876 | 27,346 | 27,615 |
| 289 | Jaksice II | 3 | Poz-42517 | 23,460 ± 150 | 27,855 | 27,399 | 27,633 |
| 290 | Khotylevo 2 | 16 | OxA-27000 | 23,470 ± 170 | 27,888 | 27,380 | 27,639 |
| 291 | Halych I | 13 | Ki-8932 | 23,500 ± 600 | 28,915 | 26,510 | 27,726 |
| 292 | Świlcza | 20 | Poz-31462 | 23,540 ± 150 | 27,912 | 27,440 | 27,682 |
| 293 | Pogon | 19 | OxA-11746 | 23,560 ± 140 | 27,916 | 27,462 | 27,694 |
| 294 | Kraków Spadzista B | 6 | Poz-58704 | 23,590 ± 120 | 27,914 | 27,502 | 27,712 |
| 295 | Sungir | 18 | GIN-8998 | 23,600 ± 500 | 28,822 | 26,921 | 27,806 |
| 296 | Kostenki 1 | 17 | LE-3282 | 23,640 ± 320 | 28,446 | 27,320 | 27,795 |
| 297 | Khotylevo 2 | 16 | LU-359 | 23,660 ± 270 | 28,353 | 27,386 | 27,795 |
| 298 | Żywiec, Koszarawa River | 15 | Poz-51434 | 23,670 ± 130 | 28,002 | 27,541 | 27,765 |
| 299 | Kraków Spadzista B | 6 | Poz-1248 | 23,750 ± 140 | 28,121 | 27,583 | 27,825 |
| 300 | Kraków Spadzista B | 6 | LuS 7417 | 23,750 ± 150 | 28,151 | 27,572 | 27,828 |
| 301 | Kraków Spadzista C2 | 14 | LuS 7418 | 23,750 ± 150 | 28,151 | 27,572 | 27,828 |
| 302 | Kraków Spadzista B | 6 | Poz-1251 | 23,770 ± 160 | 28,205 | 27,576 | 27,847 |
| 303 | Leski | 12 | LE-2946A | 23,770 ± 750 | 29,673 | 26,500 | 28,023 |
| 304 | Kraków Spadzista E1 | 1 | Poz-51414 | 23,780 ± 140 | 28,160 | 27,605 | 27,848 |
| 305 | Berdyzh | 11 | GrA-38918 | 23,790 ± 120 | 28,115 | 27,630 | 27,848 |
| 306 | Zastruże | 10 | Poz-16042 | 23,790 ± 160 | 28,230 | 27,591 | 27,863 |
| 307 | Copenhagen, Kamstrup | 9 | OxA-10662 | 23,810 ± 260 | 28,467 | 27,510 | 27,921 |
| 308 | Hochwacht | 8 | UtC-1292 | 23,900 ± 400 | 28,779 | 27,411 | 28,043 |
| 309 | Goyet, Third Cave | 7 | OxA-11292 | 23,940 ± 180 | 28,425 | 27,682 | 28,002 |
| 310 | Kraków Spadzista B | 6 | Poz-225 | 23,980 ± 280 | 28,629 | 27,625 | 28,072 |
| 311 | Kraków Spadzista B | 6 | Poz-268 | 24,000 ± 300 | 28,675 | 27,616 | 28,094 |
| 312 | Kostenki 12 | 5 | GIN-8019 | 24,000 ± 800 | 30,190 | 26,750 | 28,255 |
| 313 | Kraków Spadzista E1 | 1 | Poz-51415 | 24,010 ± 150 | 28,434 | 27,745 | 28,053 |
| 314 | Dolni Věstonice | 4 | Poz-76399 | 24,120 ± 180 | 28,575 | 27,794 | 28,163 |
| 315 | Jaksice II | 3 | Poz-51589 | 24,140 ± 180 | 28,592 | 27,807 | 28,181 |
| 316 | Paviland Cave | 2 | OxA-7111 | 24,140 ± 400 | 29,013 | 27,565 | 28,232 |
| 317 | Kraków Spadzista E1 | 1 | Poz-51416 | 24,150 ± 150 | 28,563 | 27,839 | 28,186 |
| 318 | Halych I | 13 | Ki-8931 | 24,200 ± 600 | 29,676 | 27,345 | 28,355 |

Table S3. Published direct radiocarbon dates of woolly mammoth from Europe (MIS 2).

AMS - 14C AMS date, AMS-U - 14C AMS date with ultrafiltration, conv. – conventional radiocarbon date, GPC - the gas proportional counter technique used in 14C dating.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Site | Country | Lab. reference | 14C Age | Conv./ AMS | Material/ Element | Reference | Final evaluation | Comments |
| Etiolles, Les Coudrays | France | Ly-1351 | 12,000 ± 220 | conv. | scapula | Evin et al., 1979 | Rejected | 1 |
| Gough’s Cave | UK | OxA-1890 | 12,170 ± 130 | AMS | pieces of worked tusk (ivory) | Hedges et al., 1990 | Rejected | 2 |
| Yudinovo | Russia | SPb-105 | 12,200 ± 200 | conv. | bone | Khlopachev, 2015 | Accepted |  |
| Timonovka 1 | Russia | IGAN-82 | 12,200 ± 300 | conv. | tooth | Soffer, 1985 | Accepted | 3 |
| Condover, Norton Farm Pit | UK | OxA-20129 | 12,230 ± 50 | AMS-U | adult tusk | Lister, 2009 | Accepted | 4 |
| Verberie, Buisson Campin | France | OxA-12018 | 12,235 ± 75 | AMS | bone | Barnes et al., 2007 suppl.; Lister 2009 | Accepted |  |
| Shatrishchi 2 | Russia | GIN-3753 | 12,270 ± 120 | conv. | bone | Sinitsyn et al., 1997 | Accepted | 5 |
| Praz-Rodet, Le Brassus | Switzerland | Ly-877 | 12,270 ± 210 | conv. | tusk fragment | Evin et al., 1976 | Rejected | 6 |
| Condover, Norton Farm Pit | UK | OxA-1316 | 12,300 ± 180 | AMS | adult molar | Hedges et al. 1989 | Accepted |  |
| Etiolles, Les Coudrays | France | OxA-12019 | 12,315 ± 55 | AMS | bone | Barnes et al., 2007 | Accepted | 1 |
| Robin Hood’s Cave | UK | OxA-1462 | 12,320 ± 120 | AMS | ivory/ tusk | Hedges et al. 1989 | Accepted |  |
| Breitenbach B | Germany | KN-3620 | 12,320 ± 200 | conv. | tusk | Richter, 1987 | Rejected | 7 |
| Condover,Norton Farm Pit | UK | OxA-1456 | 12,330 ± 120 | AMS | juvenile molar | Hedges et al. 1989 | Accepted | 8 |
| Yudinovo | Russia | SPb-107 | 12,350 ± 80 | conv. | bone | Khlopachev, 2015 | Accepted |  |
| Condover, Norton Farm Pit | UK | OxA-19903 | 12,375 ± 50 | AMS-U | juvenile cranium | Lister, 2009 | Accepted | 8 |
| Mamontovaya Kurya | Russia | LU-4008 | 12,380 ± 60 | conv. | bone | Svendsen & Pavlov, 2003 | Accepted |  |
| Condover, Norton Farm Pit | UK | OxA-1455 | 12,400 ± 160 | AMS | adult tusk | Hedges et al. 1989; Scourse et al. 2009 | Rejected | 4 |
| Pin Hole Cave | UK | OxA-1204 | 12,460 ± 160 | AMS | calcaneum | Hedges et al. 1988 | Accepted |  |
| Gough’s Cave | UK | OxA-17846 | 12,470 ± 55 | AMS | pieces of worked tusk (ivory) | Lister, 2009 | Accepted | 2 |
| Yudinovo | Russia | SPb-106 | 12,500 ± 95 | conv. | bone | Khlopachev, 2015 | Accepted |  |
| Dzierżysław | Poland | LuS-7739 | 12,585 ± 70 | AMS | molar | Arppe and Karhu, 2010 | Accepted |  |
| Condover, Norton Farm Pit | UK | Birm-1283 | 12,610 ± 220 | conv. (GPC) | adult tusk | Scourse et al., 2009 | Rejected | 4 |
| Cherepovets, Sheksna River | Russia | GIN-8676 | 12,620 ± 500 | conv. | no data | Stuart et al., 2002 | Accepted |  |
| Eliseevichi 1 (Yeliseevitichi 1) | Russia | GIN-4137 | 12,630 ± 360 | conv. | tooth | Tarasov, 1991; Sinitsyn et al., 1997 | Accepted |  |
| Pekárna | Czech Republik | GrN-14828 | 12,670 ± 80 | conv. |  | Lister 2009, Svoboda et al. 2000 (acc. to Lister 2009) | Rejected | 9 |
| Condover, Norton Farm Pit | UK | OxA-1021 | 12,700 ± 160 | AMS | adult tusk | Hedges et al. 1988 | Rejected | 4 |
| Dobranichivka (Dobranichevka) | Ukraine | OxA-700 | 12,700 ± 200 | AMS | tooth | Gowlett et al., 1987 | Accepted |  |
| Condover, Norton Farm Pit | UK | Birm-1273a | 12,720 ± 180 | conv. (GPC) | adult tusk | Scourse et al., 2009 | Rejected | 4 |
| Marolles-sur-Seine | France | OxA-12020 | 12,800 ± 65 | AMS | tooth | Barnes et al., 2007 suppl | Accepted |  |
| Rucava, Liepāja district | Latvia | LuS 7538 | 12,875 ± 70 | AMS | molar | Arppe and Karhu, 2010 | Accepted |  |
| Mezhirichi (Mezhirich) | Ukraine | OxA-709 | 12,900 ± 200 | AMS | tooth | Gowlett et al., 1987 | Accepted | 10 |
| Condiver, Norton Farm Pit | UK | Birm-1273 | 12,920 ± 390 | conv. (GPC) | adult tusk | Scourse et al., 2009 | Rejected | 4 |
| Eliseevichi | Russia | LU-102 | 12,970 ± 140 | conv. | bone char | Arslanov et al., 1972 | Rejected | 11 |
| Lockarp, Skåne [1939] | Sweden | Lu-796:2 | 13,090 ± 200 | conv. | tusk | Berglund et al., 1976 | Rejected | 12 |
| Lublin-Kalinowszczyzna | Poland | Poz-39516 | 13,120 ± 70 | AMS | vertebra | this paper | Accepted |  |
| la Grotte des Romains near La Balme | France | Lyon-1772 | 13,140 ± 80 | AMS | ivory | Oberlin & Pion, 2009 | Accepted | 13 |
| Wilczyce | Poland | OxA-26545 | 13,155 ± 65 | AMS | ivory | Schield, 2014 | Accepted |  |
| Dzierżysław | Poland | Poz-10135 | 13,180 ± 60 | AMS | tooth | Wojtal, 2007 | Accepted |  |
| Kopachiv | Ukraine | GIN-11200 | 13,200 ± 100 | conv. | bone | Nesin & Rekovets, 2003 | Accepted | 14 |
| Dzierżysław | Poland | GdA-70 | 13,220 ± 70 | AMS | no data | Ginter et al., 2002 | Accepted | 15 |
| Jičín | Czech Republik | GdA-538 | 13,230 ± 70 | conv. | tusk | Šída et al., 2006 | Accepted | 16 |
| Rosmos 1 | Denmark | K-3697B | 13,240 +760/-690 | conv. | tusk | Lagerlund & Houmark-Nielsen, 1993 | Rejected | 17 |
| Gönnersdorf | Germany | OxA-26361 | 13,250 ± 60 | AMS |  | Palkopoulou et al., 2013 | Accepted | 18 |
| Lockarp, Skåne [1939] | Sweden | Lu-865 | 13,260 ± 110 | conv. | tusk | Berglund et al., 1976 | Rejected | 12 |
| Lockarp, Skåne [1939] | Sweden | Poz-3941 | 13,310 ± 60 | AMS | tusk | Kjær et al. 2006 | Accepted | 12 |
| Csajág (Cs-1) | Hungary | GdA-2011 | 13,315 ± 35 | AMS | tooth | Katona et al., 2012 | Accepted |  |
| Uster-Oberuster | Switzerland | UZ-2346/ ETH-5522 | 13,350 ± 260 | AMS | ulna | Hajdas et al., 2007 | Accepted | 19 |
| Lockarp, Skåne [1939] | Sweden | Lu-796 | 13,360 ± 95 | conv. | tusk | Berglund et al., 1976 | Rejected | 12 |
| Dzierżysław | Poland | GdA-193 | 13,370 ± 80 | AMS | bone | Wojtal, 2007 | Accepted |  |
| La Colombière Rock shelter | France | Ly-433 | 13,390 ± 300 | conv. | bone | Evin et al., 1973 | Accepted |  |
| Gonsty (Gintsy) | Ukraine | QC-898 | 13,400 ± 185 | conv. | burned mammoth bone | Soffer, 1985 | Accepted | 20 |
| Dzierżysław | Poland | GdA-69 | 13,500 ± 80 | AMS |  | Ginter et al., 2002 | Accepted | 15 |
| Suponevo | Russia | GIN-3381 | 13,500 ± 100 | conv. | tooth | Sinitsyn et al., 1997 | Accepted | 21 |
| Yudinovo | Russia | LU-153 | 13,650 ± 200 | conv. | tooth | Arslanov et al., 1972 | Accepted |  |
| Sevsk | Russia | GIN-6209 | 13,680 ± 60 | conv. | tusk | Sinitsyn et al., 1997 | Accepted |  |
| Gontsy (Gintsy) | Ukraine | GIN-8410 | 13,700 ± 400 | conv. | burned bone | Sinitsyn et al., 1997 | Accepted | 22 |
| Praz-Rodet, Le Brassus | Switzerland | OxA-12982 | 13,705 ± 55 | AMS | tusk fragment | Lister, 2009 | Accepted | 6 |
| Jiesia River, Kaunas Region | Lithuania | LuS 7529 | 13,800 ± 80 | AMS | molar | Arppe and Karhu, 2010 | Accepted |  |
| Bzianka | Poland | Poz-39511 | 13,900 ± 70 | AMS | skull | this paper | Accepted | 23 |
| Avdeevo | Russia | IGAN-78 | 13,900 ± 200 | conv. | tooth | Tarasov, 1991; Sinitsyn et al., 1997 | Accepted |  |
| Suponevo | Russia | GIN-7729a | 13,920 ± 140 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Obukhiv (Obukhov) | Ukraine | OxA-11974 | 13,945 ± 50 | AMS | bone | Barnes et al., 2007 supl. | Accepted |  |
| Sevsk | Russia | GIN-5778 | 13,950 ± 70 | conv. | bones | Vasil'chuk, 1997; Maschenko et al., 2006 | Accepted | 24 |
| Kesslerloch Cave | Switzerland | OxA-10237 | 13,980 ± 110 | AMS | molar/ rib | Stuart et al., 2002 | Accepted | 25 |
| Yudinovo | Russia | ISGS-2085 | 13,980 ± 110 | conv. | bone | Svezhentsev, 1993 | Accepted |  |
| Yudinovo | Russia | IGAN-1266 | 13,980 ± 180 | conv. | bone | Khlopachev, 2015 | Accepted |  |
| Yudinovo | Russia | IGAN-1270 | 14,010 ± 230 | conv. | bone | Khlopachev, 2015 | Accepted |  |
| Risch-Rotkreuz | Switzerland | ETH-63071 | 14,047 ± 48 | AMS | pelvis | Huber and Reinhard, 2016 | Accepted | 26 |
| Bzianka | Poland | Lu-1346 | 14,080 ± 165 | conv. | skull | Kubiak, 1980 | Rejected | 23 |
| European Russia, center | Russia | OxA-20059 (P23375) | 14,095 ± 55 | AMS |  | Palkopoulou et al., 2013 | Accepted | 18 |
| Oelknitz | Germany | OxA-10240 | 14,100 ± 100 | AMS | tusk fragment | Stuart et al., 2002 | Accepted |  |
| Eliseevichi 1 (Yeliseevitichi 1) | Russia | GIN-4139 | 14,100 ± 400 | conv. | tooth | Tarasov, 1991; Sinitsyn et al., 1997 | Accepted |  |
| Risch-Rotkreuz | Switzerland | ETH-63072 | 14,115 ± 49 | AMS | rib | Huber and Reinhard, 2016 | Accepted | 26 |
| Gontsy (Gintsy) | Ukraine | OxA-7387 | 14,120 ± 90 | AMS | bone | Iakovleva & Djindjian 2005 | Accepted |  |
| Lublin-Kalinowszczyzna | Poland | Poz-28222 | 14,140 ± 70 | AMS | femur | Nadachowski et al., 2011 | Accepted |  |
| Dzierżysław | Poland | Poz-10136 | 14,150 ± 70 | AMS | tooth | Wojtal, 2007 | Accepted |  |
| Byzovaya | Russia | LE-3048 | 14,150 ± 150 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Semenivka 2 | Ukraine | Ki- 5509 | 14,200 ± 180 | conv. | rib | Nuzhnyi, 2006 | Accepted |  |
| Brno-Štýřice (Kamenná St.) | Czech Republik | OxA-24105 | 14,235 ± 60 | AMS | tusk | Nerudová et al., 2012 | Accepted |  |
| Suponevo | Russia | GIN-3719 | 14,260 ± 120 | conv. | tooth | Sinitsyn et al., 1997 | Accepted | 27 |
| Gonty (Gintsy) | Ukraine | OxA-8409 | 14,280 ± 110 | AMS | bone | Iakovleva & Djindjian 2005 | Accepted |  |
| Mezhirichi (Mezhirich) | Ukraine | QC-897 | 14,320 ± 270 | conv. | tooth/ burned mammoth bone | Soffer, 1985 | Accepted | 28 |
| La Croze | France | Ly-357 | 14,330 ± 260 | conv. | ivory | Oberlin & Pion, 2009 | Accepted | 29 |
| Zbranki | Ukraine | Poz-51401 | 14,340 ± 70 | AMS | tusk | This paper | Accepted | 30 |
| Gebenstorf | Switzerland | ETH-35484 | 14,345 ± 125 | AMS | bone | Huber and Reinhard, 2016 | Accepted |  |
| Buzhanka 2 | Ukraine | GrA-38555 | 14,350 ± 160 | AMS | long bone of young individual | Stupak, 2009 | Accepted |  |
| Shatrishchi 1 | Russia | GIN-2913 | 14,360 ± 150 | conv. | bone | Sinitsyn et al., 1997 | Accepted | 31 |
| Gönnersdorf | Germany | OxA-10239 | 14,380 ± 100 | AMS | femur | Stuart et al., 2002 | Accepted |  |
| Pekárna | Czech Republic | OxA-11353 | 14,400 ± 90 | AMS | no data | Brace, 2011 | Accepted | 32 |
| Gontsy (Gintsy) | Ukraine | OxA-5933 | 14,400 ± 110 | AMS | bone | Iakovleva & Djindjian, 2005 | Accepted | 33 |
| Mezhirichi (Mezhirich) | Ukraine | OxA-712 | 14,400 ± 250 | AMS | tooth | Gowlett et al., 1987 | Accepted | 34 |
| Gontsy (Gintsy) | Ukraine | OxA-7609 | 14,420 ± 100 | AMS | bone | Iakovleva & Djindjian, 2005 | Accepted |  |
| Mezhirichi (Mezhirich) | Ukraine | AA-1317 | 14,420 ± 190 | AMS | tooth | Svezhentsev, 1993 | Accepted | 35 |
| Eliseevichi 1 (Yeliseevitichi 1) | Russia | LU-126 | 14,470 ± 100 | conv. | tooth | Arslanov et al., 1972 | Accepted |  |
| Kniegrotte | Germany | OxA-4851 | 14,470 ± 140 | AMS | lumbar vertebra | Housley et al., 1997; Hedges et al., 1998a | Accepted |  |
| Yudinovo | Russia | Beta-199779 | 14,480 ± 80 | conv. | bone | Khlopachev, 2015 | Accepted |  |
| Zamość | Poland | Poz-28774 | 14,510 ± 70 | AMS | scapula | Nadachowski et al., 2011 | Accepted |  |
| Timonovka 1 | Russia | GIN-8414 | 14,530 ± 120 | conv. | bone/ tooth | Sinitsyn et al., 1997 | Accepted | 36 |
| Mezhirichi (Mezhirich) | Ukraine | GrN-29876 | 14,550 ± 70 | conv. | femur | Haesaerts et al., 2015 | Accepted |  |
| Gontsy (Gintsy) | Ukraine | OxA-5932 | 14,550 ± 150 | AMS | tooth | Iakovleva & Djindjian, 2005 | Accepted | 37 |
| Mezhirichi (Mezhirich) | Ukraine | GrN-29877 | 14,560 ± 70 | conv. | femur | Haesaerts et al., 2015 | Accepted\_Combined | 38 |
| Gönnersdorf | Germany | OxA-10199 | 14,570 ± 90 | AMS | tusk fragment/ worked ivory | Stuart et al., 2002 | Accepted |  |
| Mezhirichi (Mezhirich) | Ukraine | GrA-38787 | 14,590 ± 60 | AMS | femur | Haesaerts et al., 2015 | Accepted\_Combined | 39 |
| Eliseevichi 1 (Yeliseevitichi 1) | Russia | GIN-4136 | 14,590 ± 140 | conv. | tooth | Sinitsyn et al., 1997 | Accepted | 40 |
| Gontsy (Gintsy) | Ukraine | OxA-717 | 14,600 ± 200 | AMS | tooth | Gowlett et al., 1987 | Accepted |  |
| Engen | Germany | Hv-11569 | 14,610 ± 90 | conv. | tusk fragment | Geyh & Schreiner, 1984 | Accepted | 41 |
| Kostenki 11 (Anasovka 2) | Russia | LE-1637 | 14,610 ± 120 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Kawęczyn | Poland | Poz-28221 | 14,620 ± 80 | AMS | molar | Nadachowski et al., 2011 | Accepted |  |
| Gontsy (Gintsy) | Ukraine | OxA-8368 | 14,620 ± 100 | AMS | bone | Iakovleva & Djindjian, 2005 | Accepted |  |
| Gontsy (Gintsy) | Ukraine | OxA-6142 | 14,670 ± 110 | AMS | bone | Iakovleva & Djindjian, 2005 | Accepted |  |
| Chulatovo 1 (Khulatovo 1) | Ukraine | OxA-715 | 14,700 ± 250 | AMS | tooth | Gowlett et al., 1987 | Accepted |  |
| Mezhirichi (Mezhirich) | Ukraine | GIN-2593 | 14,700 ± 500 | conv. | tooth | Soffer, 1985 | Accepted |  |
| Bryansk Region | Russia | OxA-21004 (P24753) | 14,715 ± 65 | AMS |  | Palkopoulou et al., 2013 | Accepted | 18 |
| Mezhirichi (Mezhirich) | Ukraine | GrA-38810 | 14,750 ± 50 | AMS | bone | Nuzhnyi, 2014 | Accepted\_Combined | 42 |
| Timonovka 1 | Russia | GIN-8413 | 14,750 ± 120 | conv. | bone/ tooth | Sinitsyn et al., 1997 | Accepted | 43 |
| Mezhirichi (Mezhirich) | Ukraine | OxA-15587 | 14,790 ± 60 | AMS | femur | Haesaerts et al., 2015 | Accepted | 38 |
| Steißlingen | Germany | Hv-10654 | 14,800 ± 120 | conv. | bone fragment | Geyh & Schreiner, 1984 | Accepted | 41 |
| Mezhirichi (Mezhirich) | Ukraine | SacA-11177 | 14,810 ± 90 | AMS | bone | Haesaerts et al., 2015 | Accepted\_Combined | 42 |
| Pushkari IX ( Bugorok) | Ukraine | OxA-17799 | 14,820 ± 60 | AMS | tooth | Khlopatchev, 2011 | Accepted |  |
| Bryansk Region | Russia | OxA-21033 (P24757) | 14,820 ± 60 | AMS |  | Palkopoulou et al., 2013 | Accepted | 18 |
| Mezhirichi (Mezhirich) | Ukraine | SacA-12041 | 14,830 ± 90 | AMS | rib | Haesaerts et al., 2015 | Accepted\_Combined | 44 |
| Bryansk Region | Russia | OxA-21005 (P24754) | 14,840 ± 65 | AMS |  | Palkopoulou et al., 2013 | Accepted | 18 |
| Brno - Štýřice III | Czech Republic | OxA-28114 | 14,870 ± 90 | AMS | bone | Roblíčková et al. 2015 | Accepted | 45 |
| Yudinovo | Russia | LE-3835 | 14,870 ± 150 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Bryansk Region | Russia | OxA-21006 (P24755) | 14,910 ± 65 | AMS |  | Palkopoulou et al., 2013 | Accepted | 18 |
| Mezhirichi (Mezhirich) | Ukraine | SacA-14984 | 14,920 ± 90 | AMS | rib | Haesaerts et al., 2015 | Accepted\_Combined | 44 |
| Bryansk Region | Russia | OxA-21007 (P24756) | 14,955 ± 65 | AMS |  | Palkopoulou et al., 2013 | Accepted | 18 |
| Mezhirichi (Mezhirich) | Ukraine | SacA-12259 | 14,970 ± 90 | AMS | rib | Haesaerts et al., 2015 | Accepted\_Combined | 44 |
| Kesslerloch Cave | Switzerland | Oxa-10298 | 15,020 ± 180 | AMS |  | Napierala, 2008; Leesch et al., 2012 | Accepted | 46 |
| Mezhirichi (Mezhirich) | Ukraine | SacA-11176 | 15,030 ± 90 | AMS | femur | Haesaerts et al., 2015 | Accepted\_Combined | 39 |
| Mezin | Ukraine | OxA-719 | 15,100 ± 200 | AMS | tooth | Gowlett et al., 1987 | Accepted |  |
| Berdyzh | Belarus | OxA-716 | 15,100 ± 250 | AMS | tooth | Gowlett et al., 1987 | Accepted |  |
| Timonovka 2 | Russia | LU-358 | 15,110 ± 530 | conv. | tooth | Kurenkova, 1978 | Accepted | 47 |
| Borshchevo 1 (Borschevo 1) | Russia | GIN-11197 | 15,140 ± 100 | conv. | bone | Sulerzhitsky, 2004 | Accepted | 48 |
| Borshchevo 1 (Borschevo 1) | Russia | GIN-11199 | 15,200 ± 200 | conv. | bone | Sulerzhitsky, 2004 | Accepted | 48 |
| Obolonnya | Ukraine | SPb-442 | 15,200 ± 200 | conv. | bone | Stupak & Khlopatchev, 2014 | Accepted |  |
| Brno - Štýřice III | Czech Republic | OxA-28298 | 15,215 ± 70 | AMS | tooth | Nerudová, 2015; Roblíčková et al. 2015 | Accepted |  |
| Mezhirichi (Mezhirich) | Ukraine | QC-900 | 15,245 ± 1080 | conv. (GPC) | burned mammoth bone/ tooth | Soffer, 1985 | Accepted | 49 |
| Karacharovo | Russia | GIN-8567 | 15,250 ± 400 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Mezhirichi (Mezhirich) | Ukraine | SacA-14986 | 15,430 ± 90 | AMS | femur | Haesaerts et al., 2015 | Accepted\_Combined | 39 |
| Herttoniemi, Helsinki | Finland | Hel-1074 | 15,500 ± 200 | conv. | humerus | Donner et al., 1979 | Rejected | 50 |
| European Russia, center | Russia | OxA-17798 | 15,535 ± 70 | AMS |  | Palkopoulou et al., 2013 | Accepted | 18 |
| Schönberg am Kamp | Austria | GrA-4891 | 15,560± 200 |  |  | Ugan & Byers ,2007 | Rejected | 51 |
| Borshchevo 1 (Borschevo 1) | Russia | GIN-8085 | 15,600 ± 70 | conv. | bone | Sinitsyn et al., 1997 | Accepted | 52 |
| Izbica | Poland | Poz-38125 | 15,620 ± 100 | AMS | ulna | this paper | Accepted |  |
| Eliseevichi 2 (Yeliseevitichi 2) | Russia | IGAN-556 | 15,620 ± 200 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Brno - Štýřice III (Vídeňská St.) | Czech Republic | OxA-26961 | 15,625 ± 75 | AMS | molar | Nerudová & Neruda, 2014 | Accepted |  |
| Brno - Štýřice III (Vídeňská St. - Hospital grounds) | Czech Republic | GdA-459 | 15,650 ± 70 | AMS | molar | Škrdla et al. 2005 | Accepted |  |
| Yudinovo | Russia | LU-127 | 15,660 ± 180 | conv. | bone/ tooth | Arslanov et al., 1972 | Accepted | 53 |
| Gebenstorf | Switzerland | ETH-35485 | 15,780 ± 100 | AMS | tooth | Huber and Reinhard, 2016 | Accepted |  |
| Karacharovo | Russia | GIN-8412 | 15,800 ± 150 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Kelsterbach | Germany | Hv-1961 | 15,810 ± 410 | conv. | molar | Protsch & Weninger, 1984 | Rejected | 54 |
| Wustermark 22 | Germany | Ua-24105 | 15,825 ± 180 | AMS | fishhook, ivory | Gramsch et al., 2013 | Accepted |  |
| Karacharovo | Russia | GIN-8018 | 15,850 ± 150 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Karacharovo | Russia | GIN-8411 | 15,900 ± 150 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Herttoniemi, Helsinki | Finland | Hela-321 | 15,910 ± 155 | AMS | humerus | Ukkonen et al., 1999 | Rejected | 50 |
| Szeged–Öthalom | Hungary | Deb-3344 | 15,920 ± 170 | conv. | bone | Sümegi & Hertelendi, 1998 | Accepted | 55 |
| Esztergom–Gyurgyalag | Hungary | Deb-1160 | 16,160 ± 200 | conv. |  | Katona et al., 2011 | Rejected | 56 |
| Timonovka 1 | Russia | GIN-2002 | 16,300 ± 700 | conv. | tooth | Svezhentsev & Popov, 1993 | Rejected | 57 |
| Avdeevo | Russia | QC-886 | 16,565 ± 270 | conv. | bone | Svezhentsev, 1993 | Accepted |  |
| Avdeevo | Russia | GIN-9863a | 16,800 ± 1200 | conv. | tooth | Sulerzhitsky, 2004; Bulochnikova, 2008; | Accepted | 58 |
| Eliseevichi 1 (Yeliseevitichi 1) | Russia | GIN-4138 | 16,850 ± 120 | conv. | tooth | Tarasov, 1991; Sinitsyn et al., 1997 | Accepted |  |
| Avdeevo | Russia | QC-621 | 16,960 ± 420 | conv. | bone | Svezhentsev, 1993 | Accepted |  |
| Las Caldas – 4 | Spain | Ly-2422 | 17,050 ± 290 | conv. |  | Puzachenko et al., 2017 | Rejected |  |
| Borshchevo 1 (Borschevo 1) | Russia | LE-3727 | 17,200 ± 150 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Pushkari IX ( Bugorok) | Ukraine | Ki-11900 | 17,200 ± 250 | conv. | tooth | Khlopatchev, 2011 | Accepted | 60 |
| Pieny (Peny, Byki 1) | Russia | GIN-8408a | 17,200 ± 300 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Kostenki 2 (Kostienki 2) | Russia | GIN-8570 | 17,300 ± 160 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| L'Arbreda B Superior | Spain | Gif-6418 | 17,320 ± 290 |  |  | Lorenzen et al., 2011 | Rejected | 61 |
| Svobodné Dvory near Hradec Králové | Czech Republic | GrA-29390 | 17,340 ± 130 | AMS | tusk | Šída et al., 2006 | Accepted | 62 |
| Eliseevichi 1 (Yeliseevitichi 1) | Russia | LU-360 | 17,340 ± 170 | conv. | tooth | Kurenkova, 1978 | Accepted |  |
| Svobodné Dvory near Hradec Králové | Czech Republic | GdA-460 | 17,400 ± 80 | AMS | tusk | Šída et al., 2006 | Rejected | 62 |
| Borshchevo 5 (Borschevo 5) | Russia | LE-5571 | 17,400 ± 2000 | conv. | rib | Lisitsyn, 2015 | Rejected | 98 |
| Cosăuti 1 | Moldova | Oxa-12000 | 17,720 ± 80 | AMS | no data | Brace, 2011 | Accepted | 32 |
| Zók | Hungary | AA-80678 | 17,760 ± 200 | AMS | tusk | Konrád et al., 2010 | Accepted | 63 |
| L'Arbreda B Inferior | Spain | Gif-6419 | 17,720 ± 290 |  |  | Lorenzen et al., 2011 | Rejected | 61 |
| Hüntwangen | Switzerland | no data | 17,850 ± 265 | no data | femur | Hünermann, 1985 | Accepted | 64 |
| Gagarino | Russia | GIN-7991 | 17,900 ± 120 | conv. | tusk | Sinitsyn et al., 1997 | Accepted |  |
| Kostenki 18 (Kostienki 18, Hvoikovskaya stoyanka) | Russia | GIN-8028 | 17,900 ± 300 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Gagarino | Russia | LE-1432A | 17,930 ± 100 | conv. | tooth | Aslanov & Svezhentsev, 1993 | Rejected | 65 |
| Cae Gwyn Cave, Tremerchion near Ffynnon Beuno Farm | UK | Birm-146 | 18,000 +1400/-1200 | conv. | collagen from carpal bone | Rowlands, 1971; Shotton & Williams 1971 | Rejected |  |
| Mezhirichi (Mezhirich) | Ukraine | Ki-1055 | 18,020 ± 600 | conv. | burned mammoth tooth | Soffer, 1985; Svezhentsev, 1993 | Accepted |  |
| Turgi-Geelig | Switzerland | ETH-17256 | 18,150 ± 140 | AMS | molar | Huber and Reinhard, 2016 | Accepted |  |
| Obłazowa Cave | Poland | OxA-3694 | 18,160 ± 260 | AMS | ivory | Hedges et al., 1996,Valde-Nowak et al, 2003 | Rejected | 66 |
| Breitenbach B | Germany | KN-3332 | 18,100 ± 200 | conv. | mandible | Richter, 1987 | Accepted | 7 |
| Halych I (Halyč I, Halich I) | Ukraine | Gd-13092 | 18,200 ± 700 | conv. | no data | Hercman and Gorka, 2002 | Rejected |  |
| Hüntwangen | Switzerland | ETH-17254 | 18,240 ± 130 | AMS | femur | Huber and Reinhard, 2016 | Accepted | 64 |
| Archangelsk | Russia | GrA-42227 | 18,300 ± 70 | AMS | tooth | Ponomarev et al., 2012 | Accepted |  |
| Zaraysk (Zaraisk) | Russia | GIN-3727 | 18,300 ± 200 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Byzovaya (Komi Region) | Russia | TA-121 | 18,320 ± 280 | conv. | bones | Punning et al., 1968 | Accepted |  |
| Kostenki 1 (Kostienki 1) | Russia | LE-4351 | 18,400 ± 3300 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Avdeevo | Russia | GIN-9863 | 18,500 ± 600 | conv. | tooth | Sulerzhitsky 2004; Bulochnikova, 2008; | Accepted | 58 |
| Markelfingen | Germany | Hv-10655 | 18,530 ± 1045/925 | conv. | tusk | Geyh & Schreiner, 1984 | Accepted | 41 |
| Pogon | Ukraine | LU-361 | 18,690 ± 770 | conv. | tooth | Soffer ,1985 | Accepted | 67 |
| Kostenki 11 (Kostienki 11, Anasovka 2) | Russia | GIN-8079 | 18,700 ± 80 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Wrocław-Oporów | Poland | Gd-10412 | 18,700 ± 270 | conv. (GPC) | tusk | Bluszcz and Pazdur, 2003 | Accepted |  |
| Kostenki 19 (Kostienki 19 , Valukinsky site) | Russia | GIN-8577 | 18,700 ± 600 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Kraków Spadzista C2 | Poland | Poz-51375 | 18,950 ± 90 | AMS | bone | Wilczyński et al., 2015a | Accepted | 93 |
| Radomyshl | Ukraine | OxA-697 | 19,000 ± 300 | AMS | tooth | Gowlett et al., 1987 | Accepted |  |
| Toten, Oppland | Norway | U-4214 | 19,000 ± 1200 | conv. | tusk | Heintz, 1965; Vasilchuk et al. 1997 | Rejected | 68 |
| Kostenki 1 (Kostienki 1) | Russia | LE-2950 | 19,010 ± 120 | conv. | tooth | Svezhentsev, 1993 | Accepted |  |
| Arrie, Risebjär, Skåne, 1934 | Sweden | Lu-887:E | 19,150 ± 390 | conv. | tusk | Berglund et al., 1976 | Accepted | 69 |
| Gagarino | Russia | GIN-7990 | 19,160 ± 130 | conv. | tusk | Sinitsyn et al., 1997 | Accepted |  |
| Leski | Ukraine | LE-2946B | 19,200 ± 200 | conv.l | tooth | Arslanov & Svezhentsev, 1993 | Rejected | 70 |
| Kiev-Kirillovskaya | Ukraine | OxA-718 | 19,200 ± 250 | AMS | tooth | Gowlett et al., 1987 | Accepted |  |
| Mezhirichi (Mezhirich) | Ukraine | Ki-1058 | 19,280 ± 600 | conv. | bone/ tooth | Soffer, 1985 | Accepted | 71 |
| Kostenki 18 (Kostienki 18, Hvoikovskaya stoyanka) | Russia | GIN-8576 | 19,300 ± 200 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| English Channel |  | Gif-1110 | 19,300 ± 700 | conv. | tooth | Delibrias et al., 1971 | Accepted |  |
| Avdeevo | Russia | GIN-7727 | 19,500 ± 500 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Khotylevo 2 | Russia | GIN-12861 | 19,600 ± 450 | conv. | tooth | Gavrilov, 2015 | Accepted |  |
| Cueto de la Mina - E | Spain | OxA-10122 | 19,700 ± 500 | AMS | molar | Stuart et al., 2002 | Accepted |  |
| Kostenki 14 (Kostienki 14, Markina gora) | Russia | LE-5567 | 19,700 ± 1300 | conv. | bone | Haesaerts et al., 2004; Sinitsyn & Hoffecker, 2006; Sinitsyn, 2014 | Accepted |  |
| Kostenki 3 (Kostienki 3, Glinishche) | Russia | GIN-8022 | 19,800 ± 210 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Novgorod-Severskii | Ukraine | OxA-698 | 19,800 ± 350 | AMS | tooth | Gowlett et al., 1987 | Accepted |  |
| Kraków Spadzista C2 | Poland | Poz-51334 | 19,840 ± 100 | AMS | bone | Wojtal & Wilczyński, 2015 | Accepted |  |
| Böttstein | Switzerland | ETH-17250 | 19,850 ± 150 | AMS | tusk | Kock et al. 2009; Huber and Reinhard, 2016 | Accepted |  |
| Kostenki 1 (Kostienki 1) | Russia | LE-2949 | 19,860 ± 200 | conv. | tooth | Svezhentsev, 1993 | Accepted |  |
| Hardtwald near Geisslingen/Klettgau | Germany | Hv-14486 | 19,895 +1500/−1320 | conv. | tusk | de Jong et al., 2011 | Accepted |  |
| Zaraysk (Zaraisk) | Russia | GIN-8486 | 19,900 ± 260 | conv. | no data | Sulerzhitsky, 2004 | Accepted | 72 |
| Kostenki 11 (Kostienki 11, Anasovka 2) | Russia | GIN-2532 | 19,900 ± 350 | conv. |  | Levi et al., 2011 | Rejected | 73 |
| Kostenki 14 (Kostienki 14, Markina gora) | Russia | GIN-8024 | 19,900 ± 850 | conv. | rib | Sinitsyn et al., 1997; Sinitsyn, 2014 | Accepted |  |
| Binningen near Engen | Germany | Hv-13323 | 19,920 ± 140 | conv. | tusk | de Jong et al., 2011 (acc. to Schreiner, 1992) | Accepted |  |
| Højballegård, East Jutland | Denmark | LuS-7415 | 19,940 ± 120 | AMS | molar | Aaris-Sørensen, 2009 | Accepted |  |
| Boshchevo 5 | Russia | LE-6947 | 20,000 ± 300 | conv. | tooth | Lisitsyn, 2011 | Accepted |  |
| Trenčianske Bohuslavice - Pod Tureckom | Slovakia | no data | 20,000 ± 1000 | no data | tusk | Holec & Kernátsová, 1997 | Rejected | 74 |
| Spytihněv-Duchonce | Czech Republic | GrA-27416 | 20 030 ± 140 | AMS | molar | Škrdla et al., 2008 | Accepted |  |
| Gagarino | Russia | LE-1432B | 20,150 ± 300 | conv. | tooth | Aslanov & Svezhentsev, 1993 | Rejected | 65 |
| Minsk - “Mashinostroiteley” site | Belarus | IGS-1370 | 20,167 – 72 ± 330 | conv. | ribs | Motuzko, 2010 | Accepted |  |
| Binningen near Engen | Germany | Hv-14390 | 20,195 ± 140 | conv. | tusk | de Jong et al., 2011 (za Schreiner, 1992) | Accepted |  |
| Kraków Spadzista C2 | Poland | OxA-635 | 20,200 ± 350 | AMS | tusk | Gowlett et al., 1986 | Accepted |  |
| Sagaidak I | Ukraine | LE-1602A | 20,300 ± 200 | conv. | tooth | Arslanov & Svezhentsev, 1993 | Rejected | 75 |
| Wróblowa-Ujazd | Poland | Poz-31463 | 20,320 ± 120 | AMS | tusk | Nadachowski et al., 2011 | Accepted |  |
| Kraków Spadzista C2 | Poland | Poz-51333 | 20,360 ± 110 | AMS | bone | Wojtal & Wilczyński, 2015 | Accepted |  |
| Castlepook Cave | Ireland | OxA-4233 | 20,360 ± 220 | AMS | rib | Woodman et al., 1997, Hedges 1997 ??? | Accepted | 76 |
| Sungir | Russia | GIN-9585 | 20,360 ± 900 | conv. | bone | Sulerzhitski et al., 2000 | Accepted |  |
| Dresden | Germany | OxA-30176 | 20,390 ± 120 | AMS |  | Chang et al., 2017 | Accepted |  |
| Lukhnevschina, Northern Dvina River | Russia | GrA-42214 | 20,450 ± 110 | AMS | tooth | Puzachenko et al., 2017 | Accepted |  |
| Dolní Věstonice I | Czech Republic | Poz-76397 | 20,470 ± 130 | AMS | molar | this paper | Accepted |  |
| Wildscheuer Cave, layer III | Germany | OxA-7498 | 20,480 ± 360 | AMS | ivory | Hedges et al., 1998b | Accepted | 77 |
| Kostenki 11 (Anasovka 2) | Russia | GIN-8080 | 20,500 ± 300 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Pushkari I | Ukraine | GIN-11311 | 20,500 ± 500 | conv. | tooth | Beliaeva, 2015 (Belyaeva, 2015) | Accepted | 77 |
| Zók | Hungary | DEB-14677 | 20,500 ± 1500 | conv. | tusk | Konrád et al., 2010 | Rejected | 63 |
| Mellikon | Switzerland | UZ-2416 | 20,550 ± 250 | AMS | skull | Kock et al. 2009 | Accepted | 79 |
| The Valea Morilor, Chişinău | Moldova | GrA-52425 | 20,560 ± 80 | AMS | bone | Obada et al., 2012 | Accepted |  |
| The Valea Morilor, Chişinău | Moldova | GrA-52424 | 20,570 ± 80 | AMS | bone | Obada et al., 2012 | Accepted |  |
| Nowy Targ | Poland | Poz-39513 | 20,590 ± 130 | AMS | vertebra | this paper | Accepted |  |
| Kostenki 5 (Svyatoy log) | Russia | GIN-7996 | 20,600 ± 140 | conv. | rib | Sinitsyn et al., 1997 | Accepted |  |
| Kostenki 18 (Hvoikovskaya stoyanka) | Russia | GIN-8032 | 20,600 ± 140 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Avdeevo | Russia | GIN-9861 | 20,600 ± 700 | conv. | tooth | Sulerzhitsky, 2004 | Accepted | 58 |
| Avdeevo | Russia | GIN-9862 | 20,600 ± 800 | conv. | tooth | Sulerzhitsky, 2004 | Accepted | 58 |
| Kraków Spadzista B | Poland | Ly-631 | 20,600 ± 1050 | conv. | collagen from mammuth bone | Kozłowski et al., 1974; Evin et al., 1975 | Accepted |  |
| Pushkari I | Ukraine | GIN-8529 | 20,600 ± 1300 | conv. | tooth | Sinitsyn et al., 1997 | Accepted | 80 |
| Gagarino | Russia | LE-1432C | 20,620 ± 300 | conv. | tooth | Aslanov & Svezhentsev, 1993 | Accepted | 65 |
| Pushkari I | Ukraine | GIN-8529a | 20,700 ± 500 | conv. | tooth | Sulerzhitsky, 2004; Beliaeva, 2015 (Belyaeva, 2015) | Accepted | 81 |
| Obolonnya | Ukraine | Ох-28035 | 20,730 ± 120 | AMS | bone | Stupak & Khlopatchev, 2014 | Accepted |  |
| Valea Morilor, Chişinău | Moldova | GrA-46004 | 20,770 ± 90 | AMS | bone | Obada & van der Plicht, 2010 | Accepted |  |
| Molodova | Ukraine | GrN-24483 | 20,840 ± 310 | conv. | collagen from mammoth bone | van der Plicht, 2012 | Accepted | 82 |
| Kostenki 5 (Svyatoy log) | Russia | GIN-8029 | 20,900 ± 100 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Pushkari I | Ukraine | GIN-11311a | 20,900 ± 600 | conv. | tooth | Beliaeva, 2015 (Belyaeva, 2015) | Accepted | 83 |
| Rond-du-Barry | France | Beta-232140 | 20,970 ± 110 | AMS | metacarpal bone | Raynal et al, 2014 | Accepted | 84 |
| Zaraysk (Zaraisk) | Russia | GIN-8484 | 21,000 ± 430 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Kostenki 6 | Russia | GIN-8023 | 21,100 ± 200 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Paviland Cave | UK | OxA-7112 | 21,100 ± 550 | AMS | modified mammoth ivory | Aldhouse-Green & Pettitt, 1998 | Accepted |  |
| Kostenki 17 | Russia | GIN-8076 | 21,100 ± 600 | conv. | bone | Sinitsyn et al., 1997 | Rejected | 85 |
| Khotylevo 2 | Russia | GIN-8497 | 21,170 ± 260 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Sagaidak I | Ukraine | LE-1602B | 21,240 ± 200 | conv. | tooth | Arslanov & Svezhentsev, 1993 | Accepted | 75 |
| Pámanes (Cantabria) | Spain | PAM 3253 | 21,255 ± 240 |  | molar | Alvarez-Lao (personal com. 2016, Alvarez-Lao and Garcia 2010) | Accepted | 86 |
| Villefranche-sur-Saône | France | OxA-4093 (Lyon-16) | 21,330 ± 240 | AMS | tusk | Hedges et al., 1997 | Accepted |  |
| Turžėnų Quarry, Jonava Region, 1971 | Lithuania | LuS 7528 | 21,400 ± 120 | AMS | molar | Arppe and Karhu, 2010; | Accepted | 87 |
| Wil | Switzerland | ETH-17253 | 21,510 ± 160 | AMS | tusk | Huber and Reinhard, 2016 | Accepted |  |
| Myrup Banke, Sjælland | Denmark | K-3703 | 21,530 ± 430 | conv. | bone (pelvis) | Aaris-Sørensen, 2009 | Accepted |  |
| Gagarino | Russia | GIN-7989 | 21,600 ± 140 | conv. | tusk | Sinitsyn et al., 1997 | Accepted |  |
| Zaraysk (Zaraisk) | Russia | GIN-8485 | 21,600 ± 300 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Kostenki 17 | Russia | GIN-8076 | 21,600 ± 600 | conv. |  | Sulerzhitsky 2004 | Accepted | 85 |
| Mezin | Ukraine | GIN-4 | 21,600 ± 2200 | conv. | tooth | Soffer, 1985 | Accepted | 88 |
| Kraków Spadzista trench III | Poland | Poz-48407 | 21,620 ± 140 | AMS | bone | Wojtal & Wilczyński, 2015 | Accepted |  |
| Kostenki 1 | Russia | LE-3279 | 21,680 ± 700 | conv. | tooth | Svezhentsev, 1993 | Accepted | 89 |
| Krasnoborsk | Russia | GrA-42199 | 21,690 + 120/ -110 | AMS | tooth | Ponomarev et al., 2012 | Accepted |  |
| Paviland Cave | UK | OxA-17559 | 21,710 ± 120 | AMS-U | ivory | Jacobi & Higham, 2008 | Accepted | 90 |
| Khotylevo 2 | Russia | GIN-8495 | 21,720 ± 170 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Jenerálka | Czech Republic | GrA-20004 | 21,910 ± 270 | AMS | long bone | Verpoorte, 2003 | Accepted |  |
| Dolní Věstonice I | Czech Republic | Poz-76402 | 21,920 ± 150 | AMS | skull | this paper | Accepted |  |
| Kostenki 1 (Kostienki 1) | Russia | GIN-8041 | 21,950 ± 250 | conv. | tooth | Sinitsyn et al., 1997 | Rejected | 91 |
| Kostenki 8 (Tel'manskaya) | Russia | GIN-7998 | 22,000 ± 160 | conv. | rib | Sinitsyn et al., 1997 | Accepted |  |
| Kostenki 1 (Kostienki 1) | Russia | GIN-8041 | 22,000 ± 300 | conv. |  | Sulerzhitsky, 2004 | Accepted | 91 |
| Zaraysk | Russia | GIN-3698 | 22,000 ± 300 | conv. |  | Sulerzhitsky 2004 | Accepted | 92 |
| Arrie, Risebjär, Skåne, 1934 | Sweden | Lu-887 | 22,000+900/-800 | conv. | tusk | Berglund et al., 1976 | Accepted | 69 |
| Kostenki 1 (Kostienki 1) | Russia | GIN-2942 | > 22,000 | conv. | tusk | Sinitsyn & Hoffecker, 2006 | Rejected |  |
| Tarnobrzeg - Machów | Poland | Poz-51433 | 22,010 ± 160 | AMS | femur | this paper | Accepted | 30 |
| Kostenki 1 (Kostienki 1) | Russia | LE-3282 | 22,020 ± 310 | conv. | tooth | Svezhentsev, 1993 | Accepted |  |
| Kraków Spadzista B+B1 | Poland | Poz-58707 | 22,030 ± 110 | AMS | bone | Wojtal & Wilczyński, 2015 | Accepted |  |
| Kraków Spadzista C2 | Poland | Poz-51373 | 22,090 ± 110 | AMS | mammoth's burned bone | Wilczyński et al. 2015a | Accepted | 93 |
| Hüntwangen | Switzerland | ETH-17255 | 22,190 ± 170 | AMS | tibia | Kock et al. 2009; Huber and Reinhard, 2016 | Accepted |  |
| Moravany - Podkovica | Slovakia | GrN-26750 | 22,200 ± 220 | conv. | bone | Verpoorte, 2002 | Accepted |  |
| Avdeevo | Russia | GIN-7729 | 22,200 ± 700 | conv. | tooth | Sulerzhitsky, 2004 | Accepted | 94 |
| Paviland Cave | UK | OxA-16601 | 22,210 ± 160 | AMS-U | ivory | Jacobi & Higham, 2008 | Rejected | 90 |
| Zaraysk | Russia | GIN-3998 | 22,300 ± 300 | Conv. |  | Sinitsyn et al., 1997 | Rejected | 92 |
| Jarošov I, Uherské Hradiště | Czech Republic | GrA-24741 | 22,330 + 130/ - 120 | AMS | molar | Oliva, 2007 | Accepted | 95 |
| Nilsiä, Syväri | Finland | Hela-281 | 22,420 ± 315 | AMS | molar | Ukkonen et al., 1999 | Accepted | 96 |
| Tsuren, Prut River | Ukraine | Poz-51383 | 22,440 ± 120 | AMS | molar | this paper | Accepted | 30 |
| Lublin - Zemborzyce (Sand-pit) | Poland | Poz-39528 | 22,450 ± 140 | AMS | molar | this paper | Accepted |  |
| Berdyzh | Belarus | GIN-2695 | 22,500 ± 200 | conv. | tooth | Sinitsyn et al., 1997 | Accepted | 97 |
| Borshchevo 5 (Borschevo 5) | Russia | GIN-10239 | 22,500 ± 700 | conv. | rib | Lisitsyn, 2015; Sulerzhitsky, 2004 | Accepted | 98 |
| Avdeevo | Russia | GIN-9860 | 22,500 ± 900 | conv. | tooth | Sulerzhitsky, 2004 | Accepted | 58 |
| Mokrzec,Wisłoka River | Poland | Poz-51398 | 22,540 ± 130 | AMS | femur | this paper | Accepted | 30 |
| Opole - Groszowice | Poland | Poz-39506 | 22,600 ± 150 | AMS | innominate | this paper | Accepted |  |
| Kostenki 1 (Kostienki 1) | Russia | GIN-6249 | 22,600 ± 300 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Paviland Cave | UK | OxA-7108 | 22,620 ± 340 | AMS | ivory | Jacobi & Higham, 2008 | Rejected | 90 |
| Sokmarskaya cave | Russia | LE-2303 | 22,630 ± 250 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Khotylevo 2 | Russia | GIN-8496 | 22,660 ± 170 | conv. | tooth | Sinitsyn et al., 1997 | Accepted | 99 |
| Moravany- Podkovica | Slovakia | GrN-26749 | 22,680 ± 400 | conv. | bone | Verpoorte, 2002 | Accepted |  |
| Kraków Spadzista C2 | Poland | Poz-51376 | 22,690 ± 120 | AMS | mammoth's burned bone | Wilczyński et al. 2015 | Accepted | 93 |
| Khotylevo 2 | Russia | GIN-8406 | 22,700 ± 200 | conv. | tooth | Sinitsyn et al., 1997 | Accepted |  |
| Kostenki 1 (Kostienki 1) | Russia | LE-2969 | 22,700 ± 250 | conv. | tooth | Svezhentsev, 1993; Svezhentsev & Popov, 1993 | Accepted |  |
| Khotylevo 2 | Russia | GIN-12859 | 22,700 ± 450 | conv. | tooth | Gavrilov, 2015 | Accepted |  |
| Sungir | Russia | GIN-10887 | 22,700 ± 600 | conv. | no data | Sulerzhitsky, 2004 | Accepted |  |
| Kraków Spadzista C2 | Poland | Poz-51374 | 22,740 ± 120 | AMS | mammoth's burned bone | Wilczyński et al. 2015a | Accepted | 93 |
| Khotylevo 2 | Russia | OxA-27225 | 22,720 ± 150 | AMS | bone | Gavrilov et al., 2014 | Accepted | 100 |
| Kostenki 1 (Kostienki 1) | Russia | LE-2800 | 22,760 ± 250 | conv. | tooth | Svezhentsev, 1993; Svezhentsev & Popov, 1993 | Accepted |  |
| Kostenki 4 (Kostienki 4, Alexandrovka) | Russia | GIN-7995 | 22,800 ± 120 | conv. | rib | Sinitsyn et al., 1997 | Accepted |  |
| Kraków Zwierzyniec | Poland | LuS-7421 | 22,800 ± 150 | AMS | molar | Arppe & Karhu, 2010 | Accepted |  |
| Kostenki 8 (Kostienki 8, Tel'manskaya) | Russia | GIN-7997 | 22,900 ± 120 | conv. | tooth, rib | Sinitsyn et al., 1997 | Accepted | 101 |
| Hornbæk, N Sjælland | Denmark | LuS-7414 | 22,900 ± 150 | AMS | molar | Aaris-Sørensen, 2009 | Accepted |  |
| Khotylevo 2 | Russia | OxA-27002 | 22,900 ± 150 | AMS | bone | Gavrilov et al., 2015 | Accepted |  |
| Kostenki 17 (Kostienki 17, Spicynskaya st.) | Russia | GIN-8074 | 23,000 ± 800 | conv. | bone | Sinitsyn et al., 1997 | Accepted |  |
| Kostenki 1 (Kostienki 1) | Russia | LE-3276 | 23,010 ± 300 | conv. | tooth | Svezhentsev & Popov, 1993 | Accepted | 102 |
| Kraków Spadzista B | Poland | Poz-242 | 23,020 ± 180 | AMS | bone | Wojtal & Sobczyk, 2005 | Accepted |  |
| Pámanes (Cantabria) | Spain | PAM 32530 | 23,050 ± 305 |  | molar | Alvarez-Lao and Garcia 2010; Alvarez-Lao, 2016 personal com. | Accepted | 86 |
| Sandomierz | Poland | Poz-29293 | 23,070 ± 130 | AMS | mandible | Nadachowski et al., 2011 | Accepted |  |
| Jarošov I, Uherské Hradiště | Czech Republic | GrA-20495 | 23,120 ± 200 | AMS | bone | Oliva, 2007 | Accepted | 103 |
| Kostenki 2 (Kostienki 2) | Russia | AA-27375 | 23,120 ± 460 | AMS | pelvis bone | Vasil’chuk et al., 2000 | Accepted | 104 |
| Willendorf II | Austria | GrA-5005 | 23,180 ± 120 | AMS | scapula | Lorenzen et al.,2011 (suppl.; Verpoorte, 2001 | Acceped | 105 |
| Khotylevo 2 | Russia | OxA-27001 | 23,240 ± 160 | AMS | bone | Gavrilov et al., 2015 | Accepted |  |
| Kostenki 1 (Kostienki 1) | Russia | LE-3289 | 23,260 ± 680 | conv. | tooth | Svezhentsev, 1993; Svezhentsev & Popov, 1993 | Accepted |  |
| Khotylevo 2 | Russia | GIN-8497a | 23,300 ± 300 | conv. | tooth | Sinitsyn et al., 1997 | Accepted | 106 |
| Helsinki, Töölö | Finland | Hela-282 | 23,340 ± 350 | AMS | premolar | Ukkonen et al., 1999 | Accepted |  |
| Avdeevo | Russia | GIN-7729 | 23,400 ± 700 | conv. | tooth | Sinitsyn et al., 1997 | Rejected | 94 |
| Berdyzh (Podluzh'ye) | Belarus | LU-104 | 23,430 ± 180 | conv. | tooth | Arslanov et al., 1972 | Accepted |  |
| Jaksice II | Poland | Poz-42517 | 23,460 ± 150 | AMS | tooth | Wilczyński & Wojtal 2011; Wilczyński et al. 2015b | Accepted |  |
| Khotylevo 2 | Russia | OxA-27000 | 23,470 ± 170 | AMS | bone | Gavrilov et al., 2014 | Accepted | 100 |
| Halych I (Halyč I, Halich I) | Ukraine | Ki-8932 | 23,500 ± 600 | conv. | no data | Cyrek et al., 2002 | Accepted | 107 |
| Świlcza | Poland | Poz-31462 | 23,540 ± 150 | AMS | molar | Nadachowski et al. 2011 | Accepted |  |
| Pogon | Ukraine | OxA-11746 | 23,560 ± 140 | AMS-U | bone | Barnes et al., 2007 (suppl.) | Accepted | 108 |
| Spadzista B+B1 | Poland | Poz-58704 | 23,590 ± 120 | AMS | bone | Wojtal & Wilczyński, 2015 | Accepted |  |
| Sungir | Russia | GIN-8998 | 23,600 ± 600 | conv. | radius | Sulerzhitski et al., 2000 | Accepted | 109 |
| Kostenki 1 | Russia | LE-3282 | 23,640 ± 320 | conv. | tooth | Svezhentsev, 1993 | Accepted |  |
| Khotylevo 2 | Russia | LU-359 | 23,660 ± 270 | conv. | tooth | Soffer 1985?, Tarasov, 1991; Svezhentsev, 1993 | Accepted |  |
| Żywiec, Koszarawa River | Poland | Poz-51434 | 23,670 ± 130 | AMS | molar | this paper | Accepted | 30 |
| Kraków Spadzista B | Poland | Poz-1248 | 23,750 ± 140 | AMS | bone | Wojtal and Sobczyk, 2005 | Accepted |  |
| Kraków Spadzista B | Poland | LuS 7417 | 23,750 ± 150 | AMS | molar | Arppe and Karhu, 2010 | Accepted |  |
| Kraków Spadzista C2 | Poland | LuS 7418 | 23,750 ± 150 | AMS | molar | Arppe and Karhu, 2010 | Accepted |  |
| Kraków Spadzista B | Poland | Poz-1251 | 23,770 ± 160 | AMS | bone | Wojtal and Sobczyk, 2005 | Accepted |  |
| Leski | Ukraine | LE-2946A | 23,770 ± 750 | conv. | tooth | Arslanov & Svezhentsev, 1993 | Accepted | 70 |
| Spadzista E1 | Poland | Poz-51414 | 23,780 ± 140 | AMS | tooth | Wojtal & Wilczyński, 2015 | Accepted |  |
| Berdyzh (Podluzh'ye) | Belarus | GrA-38918 | 23,790 ± 120 | AMS | bone | Kalechits, 2013 | Accepted |  |
| Zastruże | Poland | Poz-16042 | 23,790 ± 160 | AMS | vertebra | Wiśniewski et al., 2009 | Accepted |  |
| Kostenki 2 (Kostienki 2) | Russia | GIN-7992 | 23,800 ± 150 | conv. | pelvis bone | Sinitsyn et al., 1997 | Rejected | 104 |
| Copenhagen, Kamstrup | Denmark | OxA-10662 | 23,810 ± 260 | AMS | no data | Brace, 2011 | Accepted | 32 |
| Gollwitz, Poel island, | Germany | KIA-35747 | 23,900 ± 130 | AMS | mandible | Sommer and Benecke, 2009 | Rejected | 110 |
| Hochwacht | Austria | UtC-1292 | 23,900 ± 400 | AMS | tusk | de Graaff, 1992; de Jong et al., 2011 | Accepted |  |
| Goyet, Third Cave | Belgium | OxA-11292 | 23,940 ± 180 | AMS | bone | Barnes et al., 2007 suppl | Accepted |  |
| Kraków Spadzista B | Poland | Poz-225 | 23,980 ± 280 | AMS | collagen from mammoth bone | Wojtal and Sobczyk, 2005 | Accepted |  |
| Kraków Spadzista B | Poland | Poz-268 | 24,000 ± 300 | AMS | collagen from mammoth bone | Wojtal and Sobczyk, 2005 | Accepted |  |
| Kostenki 12 (Kostienki 12) | Russia | GIN-8019 | 24,000 ± 800 | conv. | pelvis bone | Sinitsyn et al., 1997 | Accepted | 111 |
| Spadzista E1 | Poland | Poz-51415 | 24,010 ± 150 | AMS | tooth | Wojtal and Wilczyński, 2015 | Accepted |  |
| Dolní Věstonice I | Czech Republic | Poz-76399 | 24,120 ± 180 | AMS | molar | this paper | Accepted |  |
| Jaksice II | Poland | Poz-51589 | 24,140 ± 180 | AMS | mammoth's burned bone | Wilczyński et al. 2015b | Accepted |  |
| Paviland Cave | UK | OxA-7111 | 24,140 ± 400 | AMS | pendant of mammoth ivory | Aldhouse-Green & Pettitt, 1998 | Accepted |  |
| Spadzista E1 | Poland | Poz-51416 | 24,150 ± 150 | AMS | tooth | Wojtal and Wilczyński, 2015 | Accepted |  |
| Halych I (Halyč I, Halich I) | Ukraine | Ki-8931 | 24,200 ± 600 | conv. | no data | Cyrek et al., 2002 | Accepted | 107 |

**Comments:**

1. 12,000 ± 220, 12,315 ± 55 - The AMS date OxA-12019 (12,315 ± 55) replaces conventional date 12,000 ± 220, Ly-1351 (Lister, 2009). Lister (2009) incorrectly reports date OxA-12019 as 12,135 ± 55.
2. 12,170 ± 130, 12,470 ± 55 – Date OxA-17846 (12,470 ± 55) replaces OxA-1890, 12,170 ± 130 (Lister, 2009); date based on small pieces of worked tusk (ivory) that could conceivably have been brought by Late Upper Palaeolithic people from further afield (Lister, 2009).
3. 12,200 ± 300 - Soffer (1985), Tarasov (1991), Svezhentsev & Popov (1993), Sinitsyn et al. (1997), Sergin (2007) report laboratory number as IGAN-82; Svezhentsev (1993), Abramova et al. (2001), Velichko & Zelikson (2005) as IGAN-86; Stuart et al. (2002) as IGAN-282; Levi et al. (2011) as IGAN-?
4. 12,230 ± 50; 12,400 ± 160; 12,610 ± 220; 12,700 ± 160; 12,720 ± 180; 12,920 ± 390 – The six radiocarbon dates (Birm-1273a, Birm-1283, Birm-1273, OxA-1021, OxA-1455 and OxA-20129) have been obtained for the same ivory sample (Scourse et al., 2009). Date 12,230 ± 50 (OxA-20129, AMS with ultrafiltration) was used in our analysis.
5. 12,270 ± 120- Sinitsyn et al. (1997), Levi et al. (2011) report date as obtained from mammoth bone**.** Sulerzhitsky (2004) reports that radiocarbon dated bone belonged to large mammal (not necessarily to mammoth).
6. 12,270 ± 210, 13,705 ± 55 - AMS date (OxA-12982) 13,705 ± 55 replaces conventional date (Ly-877) 12,270 ± 210 (Lister, 2009). The age may be questioned due to contamination by preservatives and low collagen content (Huber & Reinhard 2016).
7. 12,320 ± 200, 18,100 ± 200 - Richter (1987) suggests methodological problems with sample preparation, and in his opinion two radiocarbon dates (KN-3620, 12,320 ± 200 and KN-3332,18,100 ± 200) from the Cologne lab certainly do not give a correct age.
8. 12,330 ± 120, 12,375 ± 50 - Two AMS dates: 12,330 ± 120 (OxA-1456, juvenile tooth) and 12,375 ± 50 (OxA-19903, AMS with ultrafiltration, piece of juvenile cranium) are very similar and may be obtained from the same individual (Lister, 2009).
9. 12,670 ± 80 - Lister (2009) listed (after Svoboda et al., 2000) the date 12,670 ± 80 (GrN-14828) from Pekárna Cave (Czech Republik) as directly dated mammoth. However, Svoboda et al. (2000) and Valoch (2001) report this date as obtained from mammal bone from the Magdalenian layer.
10. 12,900 ± 200 - Gowlett et al. (1987), Svezhentsev & Popov (1993), Sinitsyn et al. (1997), Abramova et al. (2001), Stuart et al. (2002), Levi et al. (2011), Iakovleva (2014) report date as obtained from a mammoth tooth. Svezhentsev (1993), Sergin (2007) report date as obtained from a mammoth bone.
11. 12,970 ± 140 - Date was obtained from bone char (Arslanov et al., 1972). Soffer (1985) and Stuart et al. (2002) report that the date was obtained from a mammoth tooth.
12. 13,090 ± 200, 13,260 ± 110, 13,360 ± 95, 13,310 ± 60 - The three conventional dates (13,090 ± 200 (LU-796.2), 13,260 ± 110 (LU-865) and 13,360 ± 95 (LU-796)) obtained from the same mammoth tusk fragment with different treatment methods for removal of shellac and collagen extraction (for further details see Berglund et al. 1976), were replaced by AMS date 13,310 ± 60, Poz-3941 (Ukkonen et al., 2007).
13. 13,140 ± 80 - Oberlin & Pion (2009) report the date with incorrect laboratory number (Ly-1772); the correct number is Lyon-1772 (see http://www.arar.mom.fr/banadora/echantillon.php?num=14776&cpt=1)
14. 13,200 ± 100 - Nesin & Rekovets (2003), Rekovets & Nesin (2009) report locality as Kopachiv, Sulerzhitsky (2004) reports locality as Obuchovo.
15. 13,220 ± 70, 13,500 ± 80 – Two AMS dates (13,220 ± 70, GdA-70 and 13,500 ± 80, GdA-69) from Dzierżysław (Poland), Ginter et al. (2002) and Wojtal (2007) report as obtained from large mammal. Nadachowski et al. (2011) report these dates as obtained from mammoth.
16. 13,230 ± 70 - Sample contained lower content of collagen - possibility of distortion (shift to a later date) (Šída et al., 2006).
17. 13,240 +760/-690 - A tusk from Rosmos 1 which yielded a date of 13,240 +760/-690 (K-3697B), has been re-dated at 33,270 ± 350 (OxA-10189) (Stuart et al., 2002).
18. 13,250 ± 60, 14,095 ± 55, 14,715 ± 65, 14,820 ± 60 (Bryansk Region), 14,840 ± 65, 14,910 ± 65, 14,955 ± 65, 15,535 ± 70 - Genetic analysis, clade I (Palkopoulou et al., 2013; suppl. mat.)
19. 13,350 ± 260 - Laboratory number and element dated according to Huber & Reinhard (2016).
20. 13,400 ± 185 - Soffer (1985) reports date 13,400 ± 185 (QC-898) as obtained from burned mammoth bone. Svezhentsev (1993) and Abramova et al. (2001) report date QC-898 13,400 ± 180 as obtained from mammoth tooth. Sergin (2007) reports date as obtained from bone char.
21. 13,500 ± 100 - Sinitsyn et al. (1997), Abramova et al. (2001), Sergin (2007), Levi et al. (2011) report date as obtained from mammoth tooth. Sulerzhitsky (2004) reports burned bone, Velichko & Zelikson (2005) – bone**.**
22. 13,700 ± 400 - Sinitsyn et al. (1997), Sergin (2007) report date as obtained from burned mammoth bones. Levi et al. (2011) report date as obtained from mammoth bone. Abramova et al. (2001), Sulerzhitsky (2004), Iakovleva & Djindjian (2005) report date as obtained from burned bone.
23. 13,900 ± 70, 14,080 ± 165 – AMS date 13,900 ± 70 (Poz-39511) replaces conventional date (Lu-1346), 14,080 ± 165 (this paper).
24. 13,950 ± 70 - Maschenko et al. (2006) report: “The radiocarbon age (GIN [Geochronological Laboratory, Geological Institute of the Russian Academy of Sciences] 5778) of the mammoth bones from the main bone-bearing layer (240–210 cm depth) is 13,950 ± 70 years BP.”
25. 13,980 ± 110 – Stuart et al., 2002 report date 13,980 ± 110 (OxA-10237) as obtained from mammoth rib. The material dated was mammoth molar (see Huber & Reinhard, 2016). Napierala (2008), Leesch et al. (2012), Nielsen (2013), Vermeersch (2017) report an incorrect laboratory number (OxA-10239) for the date.
26. 14,047 ± 48, 14,115 ± 49 – Both AMS dates (14,047 ± 48, ETH-63071, pelvis bone, and 14,115 ± 49, ETH-63072, rib) are obtained from the same mammoth individual (Huber and Reinhard, 2016). We used combined (Oxcal v4.2.4, R\_combine function) date 14,081 ± 35 (Huber and Reinhard, 2016) in our analysis.
27. 14,260 ± 120 - Sinitsyn et al. (1997), Abramova et al. (2001), Sergin (2007) report date as obtained from mammoth tooth. Sulerzhitsky (2004) reports that radiocarbon dated material belonged to large mammal (not necessarily to mammoth). Velichko & Zelikson (2005) report bone.
28. 14,320 ± 270 - Soffer (1985) reports date QC-897 (14,320 ± 270) as obtained from burned mammoth bone. Sinitsyn et al. (1997), Abramova et al. (2001), Velichko & Zelikson (2005), Levi et al. (2011) and Iakovleva (2014) report date as obtained from mammoth tooth. Sergin (2007) reports date as obtained from bone char.
29. 14,330 ± 260 - Evin et al. (1973) report date as obtained from mammoth bone (La Croze-sur-Suran 1).
30. 14,340 ± 70, 22,010 ± 160, 22,440 ± 120, 22,540 ± 130, 23,670 ± 130 - Dates mentioned by Nadachowski et al. (2015) without laboratory number and detailed description of the sample.
31. 14,360 ± 150 - Date was obtained from the ulna of young individual of mammoth (Sorokin et al., 2009).
32. 14,400 ± 90, 17,720 ± 80, 23,810 ± 260 – Brace (2011) (Lister, personal comm.) reports this date as obtained from mammoth.
33. 14,400 ± 110 - Abramova et al. (2001) and Sergin (2007) report date as obtained from a bone.
34. 14,400 ± 250 – Haesaerts et al. 2015 report date as obtained from a mammoth bone.
35. 14,420 ± 190 – Haesaerts et al. 2015 report date as obtained from a bone.
36. 14,530 ± 120 - Sinitsyn et al. (1997), Sergin (2007), Levi et al. (2011), Sinitsyna (2013) report material dated as a mammoth's bone. Abramova et al. (2001), Velichko & Zelikson (2005), Iakovleva & Djindjian (2005) as a tooth.
37. 14,550 ± 150 - Abramova et al. (2001) and Sergin (2007) report date as obtained from a bone.
38. 14,560 ± 70; 14,790 ± 60 - Haesaerts et al. (2015) report two dates obtained from the same mammoth femur: convencional 14,560 ± 70 (GrN-29877) and AMS 14,790 ± 60 (OxA-15587). We used combined (Oxcal 4.3 (online), R\_combine function) date 14,695± 46 in our analysis. Please note however that dates failed chi squared test for homogeneity (X-Test fails at 5%, X2-Test: df=1 T=6.194 (5% 3.8).
39. 14,590 ± 60; 15,030 ± 90; 15,430 ± 90 - The three AMS dates have been obtained from the same mammoth femur: 14,590 ± 60 (GrA-38787), 15,030 ± 90 (SacA-11176) and 15,430 ± 90 (SacA-14986) (Haesaerts et al., 2015). We used combined (Oxcal 4.3 (online), R\_combine function) date 14,914 ± 44 in our analysis. Please note however that dates failed chi squared test for homogeneity (X-Test fails at 5% X2-Test: df=1 T=6.194 (5% 3.8).
40. 14,590 ± 140 - Sinitsyn et al. (1997), Sulerzhitsky (2004), Levi et al. (2011) report date under laboratory number GIN-4136, Velichko & Zelikson (2005), Sergin (2007) as GIN-4186, Abramova et al. (2001) report the same date under two different laboratory numbers (GIN-4136 and GIN-4186).
41. 14,610 ± 90, 14,800 ± 120, 18,530 ± 1045/925 – glacial moraine deposit (Geyh & Schreiner, 1984).

### 14,750 ± 50; 14,810 ± 90 – Two AMS dates have been obtained from the same sample of mammoth bone: 14,810 ± 90 (SacA-11177) and 14,750 ± 50 (GrA-38810) (Haesaerts et al., 2015). We used combined (Oxcal 4.3 (online), R\_combine function) date 14,764 ± 44 in our analysis.

1. 14,750 ± 120 - Sinitsyn et al. (1997), Sergin (2007), Levi et al. (2011) report material dated as mammoth's bone, Abramova et al. (2001), Sinitsyna (2013) as a mammoth tooth, Velichko & Zelikson (2005) report date 14,750 ± 120 obtained from a mammoth's tooth as GIN-120.
2. 14,830 ± 90; 14,920 ± 90; 14,970 ± 90 - The three AMS dates have been obtained from the same mammoth rib: 14,830 ± 90 (SacA-12041), 14,920 ± 90 (SacA-14984) and 14,970 ± 90 (SacA-12259) (Haesaerts et al., 2015). We used combined (Oxcal 4.3 (online), R\_combine function) date 14,907 ± 52 in our analysis.
3. 14,870 ± 90 - Roblíčková et al. (2015), Roblíčková et al. (2016) report date as obtained from mammoth bone, Nerudová (2015) reports date as obtained from charred bone probably of a mammoth.
4. 15,020 ± 180 - The age may be questioned due to low collagen content (Napierala, 2008).
5. 15,110 ± 530 - Abramova et al. (2001) reports radiocarbon date as obtained from mammoth bone.
6. 15,140 ± 100, 15,200 ± 200 (Bor.1) - Sulerzhitsky (2004) reports radiocarbon date as obtained from mammoth. Bessudnov (2013) reports mammoth bone.
7. 15,245 ± 1080 - Soffer (1985) reports date (QC-900, 15,245 ± 1080) as obtained from burned mammoth bone. Svezhentsev & Popov (1993), Sinitsyn et al. (1997), Abramova et al. (2001), Velichko & Zelikson (2005), Levi et al. (2011) and Iakovleva (2014) report date as obtained from a mammoth tooth. Levi et al. (2011) reports QC-900 as 15,245 ± 270. Sergin (2007) and Haesaerts et al. (2015) report date as obtained from a bone char.
8. 15,500 ± 200, 15,910 ± 155 – Conventional date (Hel-1074, 15,500 ± 200) was obtained from mammoth humerus found in littoral sediments of Holocene age. Date replaced by AMS (Hela-321) 15,910 ± 155 (Ukkonen et al., 1999).
9. 15,560 +/- 200 - Lorenzen et al. (2011) in Suplementary Information (doi:10.1038/nature10574) listed after Ugan & Byers (2007) the date 15,560 +/- 200 (GrA-4891) from Schönberg am Kamp (Austria) as directly dated mammoth. However, this date is not from the mammoth sample (Fladerer, personal com. 2016).
10. 15,600 ± 70 - Sulerzhitsky (2004) reports date under laboratory number GIN-8086.
11. 15,660 ± 180 - Arslanov et al. (1972) report that radicarbon date has been obtained from unfused proximal epiphysis of mammoth femur. Soffer (1985), Svezhentsev (1993), Svezhentsev & Popov (1993) report mammoth tooth; Sinitsyn et al. (1997), Abramova et al. (2001), Sergin (2007) – mammoth bone. Sulerzhitsky (2004) reports that radicarbon dated bone belonged to a large mammal.
12. 15,810 ± 410 – The date is based on the dating of the apatite portion of the bone, it is probably contaminated with either recent or ancient radiocarbon (Protsch, 1991).
13. 15,920 ± 170 - Date also reported as 15,916 ± 168 (Krollop et al., 1995, Sümegi et al., 2007, Lengyel, 2009, Katona et al., 2012, Sümegi et al., 2015).
14. 16,160 ± 200 - Katona et al. (2011) listed after Vörös (1991) the date 16,160 ± 200 (Deb-1160) from Esztergom–Gyurgyalag (Hungary) as the date obtained on mammoth finding (bone sample). However, the date is not from mammoth sample but from charcoal (Hertelendi, 1991; Vörös, 1991).
15. 16,300 ± 700 - Svezhentsev & Popov (1993) probably incorrectly report date 16,300 ± 700 (GIN-2002) as obtained from mammoth tooth. The similar date (15,300 ± 700, GIN-2003), Sinitsyn et al. (1997) and Sulerzhitsky (2004) report as obtained from a bone not identified to species, Sinitsyna (2013) as obtained from bone char.
16. 16,800 ± 1200, 18,500 ± 600, 20,600 ± 700, 20,600 ± 800, 22,500 ± 900 - Sulerzhitsky (2004) reports that date was obtained from mammoth. Bulochnikova (2008) reports material dated as a mammoth tooth.
17. 17,050 ± 290 - Puzachenko et al. (2017) report date as the youngest direct date of mammoth in the Iberian Peninsula. This date is from layer with mammoth remains, but not from a mammoth sample (Alvarez-Lao, personal com. 2016).
18. 17,200 ± 250 - The date was accepted in spite of the opinion of Khlopatchev (2011) that this date does not fit well to the most of Upper Palaeolithic cultural layers in Desna River valley. We assumed that the date was obtained from a bone deposited before the formation of the occupation level. (Единственную древнюю дату в 17200±250 из верхнего горизонта культурного слоя мы не можем принять во внимание как заведомо удревненую. Костные образцы из нижнего горизонта этого же культурного слоя дали более привычные для памятников позднего верхнего палеолита Десны даты 14770±115 и 14820±60 (Khlopatchev, 2011)).
19. 17,320 ± 290, 17,720 ± 290 - Lorenzen et al. (2011) in Suplementary Information (doi:10.1038/nature10574) listed after Ugan & Byers (2007) two dates from L'Arbreda B Superior and L'Arbreda B Inferior (Spain) as directly dated mammoths. However, in available databases the material dated in unknown or indicated as charcoal.
20. 17,340 ± 130, 17,400 ± 80 - Two AMS dates have been obtained from the same piece of mammoth tusk. A sample which gave date 17,400 ± 80 (GdA-460) contained too little collagen for dating, and in opinion of Šída et al. (2006), the reliability of the second date 17,340 ± 130 (GrA-29390) is also less than optimal due to low carbon content and the possibility of preservation contamination.
21. 17,760 ± 200, 20,500 ± 1500 - AMS date 17,760 ± 200 (AA-8067) replaces conventional date (Deb-14677) 20,500 ± 1500 (Konrád et al., 2010).
22. 17,850 ± 265, 18,240 ± 130 – 17,850 ± 265- no lab numer (Hünermann, 1985). There is also another date from this locality (also femur) – see 18,240 ± 130 (Huber and Reinhard, 2016: ETH-17254).
23. 17,930 ± 100, 20,150 ± 300, 20,620 ± 300 - The dates LE-1432A (17,930 ± 100), LE-1432B (20 150 ± 300) and LE-1432C(v) (20,620 ± 300) have been obtained from the same mammoth tooth by different methods of bone collagen extraction. The last date (20,620 ± 300) is the most reliable in authors opinion (Arslanov & Svezhentsev, 1993) and was used in our analysis. Svezhentsev & Popov (1993), Sinitsyn & Praslov (1997), Levi et al. (2011-2) report this date as 20,820 ± 300, Svezhentsev (1993) as 20,620 ± 300.
24. 18,160 ± 260 - The age may be questioned due to low collagen content. The ivory boomerang from layer VIII is the only sample exhibiting a significantly different age from human thumb phalanx (31,000 ± 550 BP), the antler wedge (32,400 ± 650 BP) and the bone perforator (30,600 ± 550 BP) from the same layer (Housley, 2003).
25. 18,690 ± 770 - Soffer (1985), Tarasov (1991), Svezhentsev (1993), Vasil’chuk et al. (1997) report material dated as mammoth tooth. Sinitsyn et al. (1997) report material as a bone not identified to species. Tarasov (1991) reports date as 18,690 ± 700.
26. 19,000 ± 1,200 - Laboratoriet for Radioaktiv Datering in Trondheim: The determination is based on tooth proteins only, and the result is 19,000 ± 1,200 years before our time (1950). It is possible that the dating of the carbonate in the tooth will give another result. If organic acids have penetrated the tooth while it lay in the earth, they may have contaminated the proteins, thus giving too high a c14 activity. We cannot, however, say anything about the degree of contamination, without making a determination based on carbonates in the tooth (after Heintz, 1965). Vasil’chuk et al. (1997) report laboratory number as U-4214.
27. 19,150 ± 390, 22,000+900/-800 - Due to the partial dissolution of the collagen, the contamination by preservatives cannot be ruled out (for further details see Berglund et al., 1976). We used a combined date 19,842 ± 362 from (Lu-887:E and Lu-887).
28. 19,200 ± 200, 23,770 ± 750 - The dates LE-2946A (23,770 ± 750) and LE-2946B (19,200 ± 200) have been obtained from the same mammoth tooth by different collagen dating methods. The first date (23,770 ± 750) is more reliable in authors opinion (Arslanov & Svezhentsev, 1993). Svezhentsev (1993), Svezhentsev & Popov (1993), Sinitsyn et al. (1997), Velichko & Zelikson (2005), Demidenko (2008), Levi et al.(2011) report two dates obtained from mammoth tooth from Leski as 19,200 ± 200 (LE-2946) and 23,770 ± 1540 (LE-4456).
29. 19,280 ± 600 - Soffer (1985), Sergin (2007) and Svezhentsev (1993: erroneous laboratory number Ki-1056), Haesaerts et al. (2015) report that date has been obtained from the mammoth bone. Sinitsyn et al. (1997), Levi et al. (2011), Iakovleva & Djindjian (2005) report that date has been obtained from the mammoth tooth.
30. 19,900 ± 260 - Sulerzhitsky (2004) reports that date was obtained from mammoth. Sinitsyn et al. (1997), Velichko & Zelikson (2005) report material dated as bone not identified to species.
31. 19,900 ± 350 - Levi et al. (2011) report material dated as mammoth bone. Sinitsyn et al. (1997), Sulerzhitsky (2004), Velichko & Zelikson (2005), Sergin (2007) report date as obtained from bone char or charred bone. Svezhentsev (1993) reports a bone.
32. 20,000 ± 1,000 - Lack of basic information except date. The measurement was realized on mammoth tusk in Military High School, Liptovský Mikuláš (Holec and Kernátsová,1997).
33. 20,300 ± 200, 21,240 ± 200 - The dates LE-1602A (20,300 ± 200) and LE-1602B (21,240 ± 200) have been obtained from the same mammoth tooth by different methods of bone collagen extraction. The second date (21,240 ± 200) is more reliable in authors opinion (Arslanov & Svezhentsev, 1993).
34. 20,360 ± 220 - Woodman et al. (1997**)** report date OxA-4233 as 20,360 ± 220, Stuart et al. (2002) report incorrect date 20,630 ± 220.
35. 20,480 ± 360 - Street &Terberger (2000) comment: The youngest Wildscheuer AMS date (OxA-7498: 20,480 ± 360) was obtained on a specimen of ivory, a material which produced no result for a second Wildscheuer sample, and, in other contexts (e.g. Magdalenian samples from Gönnersdorf and Andernach-Martinsberg) has produced anomalously young results. Hedges et al. (1998b) comment: One sample of mammoth ivory (second series, sample 2) failed to yield a result and the age of a further sample of ivory (OxA-7498: 20 480 **f** 360) is clearly too young for an Aurignacian context. The possibility of it being an intrusive find from a younger layer might be considered; alternatively, dating results on ivory have been shown to be erroneous on several occasions, for example, unacceptably young Oxford dates on samples from the Magdalenian sites Gonnersdorf and Andernach (Street et al.1994, 3).
36. 20,500 ± 500 - Sulerzhitsky (2004) reports date under laboratory number GIN-11311b, as obtained from a mammoth.
37. 20,550 ± 250 – Date not reported by Huber & Reinhard (2016).
38. 20,600 ± 1300 - Demay et al. (2016) report GIN-8529 as 20,600 ± 1200.
39. 20,700 ± 500 - Sulerzhitsky (2004) reports date as obtained from mammoth, Beliaeva (2015) (Belyaeva, 2015) as obtained from mammoth tooth.
40. 20,840 ± 310 - Date GrA-14009 (13,420±60) has been obtained from the apatite of the same mammoth bone (van der Plicht, 2012).
41. 20,900 ± 600 - Sulerzhitsky (2004) reports date as obtained from mammoth, Beliaeva (2015) (Belyaeva, 2015) as obtained from mammoth tooth. Demay et al. (2016) report two different dates (20,900 ± 600 from mammoth tooth and 20,900 ± 900, a bone) as GIN-11311a.
42. 20,970 ± 110 - Minimum age probably due to collagen pollution by microfilament (Raynal et al., 2014).
43. 21,100 ± 600, 21,600 ± 600 - Sinitsyn et al. (1997), Levi et al. (2011) report date (GIN-8076) obtained from mammoth bone as 21,100 ± 600. Sulerzhitsky (2004) reports this date as 21,600 ± 600. The last date is correct (Zaretskaya 2017, personal comm.).
44. 21,255 ± 240, 23,050 ± 305 – Two radiocarbon dates from Pámanes 21,255 ± 240 (PAM 32531) and 23,050 ± 305 (PAM 32530) were directly dated on woolly mammoth molars from the same mandible in Uppsala laboratory (Álvarez-Lao and García, 2010; Álvarez-Lao and García, 2012; Álvarez-Lao, personal communication 2016).
45. 21,400 ± 120 - The material dated is a mammoth molar (Ukkonen et al., 2011).
46. 21,600 ± 2200 - Levi et al. (2011) report locality name as Dobranichevka.
47. 21,680 ± 700 - Svezhentsev (1993), Svezhentsev & Popov (1993), Sinitsyn et al. (1997), Levi et al. 2011 report date as obtained from mammoth tooth; Velichko & Zelikson (2005) from charred bone.
48. 21,710 ± 120, 22,210 ± 160, 22,620 ± 340 - Three AMS dates (OxA-7108, OxA- 16601, OxA-17559) were obtained from the same mammoth ivory sample by different methods (for further details see Jacobi & Higham, 2008). Date 21,710 ± 120 (OxA-17559) was used in our analysis.
49. 21,950 ± 250, 22,000 ± 300 - Sinitsyn et al. (1997), Levi et al. (2011) report GIN-8041 as 21,950 ± 250. Praslov & Sulerzhitsky (1999), Sulerzhitsky (2004) report date as 22,000 ± 300. We used date 22,000 ± 300 in our analysis.
50. 22,000 ± 300, 22,300 ± 300 - Sulerzhitsky (2004) reports date GIN-3698 obtained from mammoth as 22,000 ± 300. Sinitsyn et al. (1997), Velichko & Zelikson (2005), Levi et al. (2011) report date GIN-3998 as 22,300 ± 300. Amirkhanov (1997) reports GIN-3698, as 22,300 ± 300. We used date 22,000 ± 300 in our analysis.
51. 18,950 ± 90, 22,090 ± 110, 22,690 ± 120, 22,740 ± 120 - Wojtal & Wilczyński (2015) report material as carbonized bone, Wilczyński et al. (2015a) as mammoth's burned bone.
52. 22,200 ± 700, 23,400 ± 700 - Sulerzhitsky (2004) reports GIN-7729 (22,200 ± 700) as date obtained from a mammoth. Bulochnikova (2008) reports the material dated as mammoth's tooth. Sinitsyn et al. (1997) report incorrect date (23,400 ± 700, GIN-7729) as obtained from the mammoth's tooth.
53. 22,330 + 130/ - 120 – Škrdla et al. (2006) report GrA-24741 (26,860 ± 430 calibrated yBP) as obtained from mammoth bone from locality Jarošov II - Kopaniny
54. 22,420 ± 315 – Dated mammoth molar was found in the glaciogenic gravel/till (Ukkonen et al., 1999).
55. 22,500 ± 200 - Sulerzhitsky (2004) reports the laboratory number of date as GIN-3695.
56. 22,500 ± 700, 17,400 ± 2,000 - Date GIN-10239, 22,500 ± 700 replaces LE -5571, 17,400 ± 2,000 obtained from the same mammoth rib fragment (Lisitsyn, 2015, Reynolds et al., 2015). Sulerzhitsky (2004) reports laboratory number of this date as GIN-10293.
57. 22,660 ± 170 - Sinitsyn et al. (1997), Levi et al. (2011) and Gavrilov (2015) report GIN-8496 as 22,660 ± 170. Abramova et al. (2001) reports GIN-8496 as 22,660 ± 120, Sulerzhitsky (2004) as 22,600 ± 120.
58. 22,720 ± 150, 23,470 ± 170 - Gavrilov et al. (2014) and Gavrilov (2015) report that radiocarbon date has been obtained from the bone of mammoth. Gavrilov et al. (2015) reports that radicarbon dated bone belonged to a large mammal (not necessarily to mammoth).
59. 22,900 ± 120 - Date probably obtained from two different samples, from mammoth’s rib and tooth (Sinitsyn et al., 1997). Reynolds et al. (2015 ) report date as obtained from tooth.
60. 23,010 ± 300 - Svezhentsev & Popov (1993), Sinitsyn et al. (1997), Velichko & Zelikson (2005), Levi et al. (2011) report material dated as a mammoth tooth. Svezhentsev (1993) reports material dated as burned mammoth tooth.
61. 23,120 ± 200 - Škrdla et al. (2006) for date GrA-20495 (27,930 ± 240 calibrated yBP) report locality as Jarošov II – Kopaniny.
62. 23,120 ± 460, 23,800 ± 150 – AMS date AA-27375, 23,120 ± 460 replaces conventional GIN-7992, 23,800 ± 150 (Vasil’chuk et al., 2000).
63. 23,180 ± 120 - Date is considered slightly too young due to recent preservative contamination (Verpoorte, 2001).
64. 23,300 ± 300 - Sulerzhitsky (2004) reports GIN-8497a as 23,300 ± 260.
65. 23,500 ± 600, 24,200 ± 600 – Cyrek et al (2002), Łanczont and Boguckyj (2002), Sytnyk et al. (2005), Bogucki et al. (2009) report two conventional dates from Halych I (Ki-8932, 23,500 ± 600 BP and Ki-8931, 24,200 ± 600 BP) as obtained from bones without taxonomic identification. In the opinion of Madeyska (personal inf., 2017) the date was obtained from a mammoth bone.
66. 23,560 ± 140 - Ultrafiltered gelatin bone pretreatment method; the same bone dated in conventional laboratory (using modified Longin method) gave date 23,800 ± 400 (Bronk Ramsey et al., 2004).
67. 23,600 ± 500, 23,600 ± 600 – Sulerzhitsky et al. (2000) report date GIN-8998 as 23,600 ± 600, Sulerzhitsky (2004) reports the same date as 23,600 ± 500. The second date was used in our analysis.
68. 23,900 ± 130 – Date 23,900 ± 130 (KIA-35747, AMS) was replaced by AMS OxA-30177, 25,160 ± 210 (Chang et al., 2017).
69. 24,000 ± 800 - Sinitsyn et al. (1997) report material dated as mammoth pelvis bone. Sulerzhitsky (2004) reports material dated as a mammoth remain. Sinitsyn & Hoffecker (2006) report material dated as bone without taxonomic identification.

**References:**

Aaris-Sørensen K. 2009: Diversity and dynamics of the mammalian fauna in Denmark throughout the last glacial–interglacial cycle, 115–0 kyr BP. Fossils and Strata, No. 57, pp. 1–59. ISSN 0024-1164.

Abramova Z. A., Grigorieva G. V., Zaitseva G. I. 2001. The age of Upper Paleolithic sites in the Middle Dnieper River basin of Eastern Europe. Radiocarbon 43 (2B): 1077–1084, Proceedings of the 17th International 14C Conference, edited by I. Carmi and E. Boaretto.

Aldhouse-Green S. & Pettitt P. 1998. Paviland Cave: contextualizing the “Red Lady”. Antiquity 72: 756-772. DOI: https://doi.org/10.1017/S0003598X00087354

Álvarez-Lao D. J. & García N. 2010. Chronological distribution of Pleistocene cold-adapted large mammal faunas in the Iberian Peninsula. Quaternary International 212: 120–128. doi:10.1016/j.quaint.2009.02.029

Amirkhanov Kh. A. 1997. **[**Амирханов Х.А. 1997.] О проблемах датировки и стратиграфии культурных отложений Зарайской стоянки. Российская археология, 4: 5-16.

Arppe L. & Karhu J.A. 2010. Oxygen isotope values of precipitation and the thermal climate in Europe during the middle to late Weichselian ice age. Quaternary Science Reviews 29: 1263-1275. doi:10.1016/j.quascirev.2010.02.013

Arslanov I. A. et al. 1972. [ Арсланов I.A., Вознячук М.Н., Калечиц Е.Г., Колесников B.C. 1972]. Радиоуглеродные датировки палеолитических стоянок Поднепровья - Бюллетень Комиссии по изучению четвертичного периода, 1972, № 39, с. 162-165.

Arslanov Kh. A. & Svezhentsev Yu. S. 1993. An improved method for radiocarbon dating fossil bones. Radiocarbon 35 (3): 387-391.

Barnes I., Shapiro B., Lister A., Kuznetsova T., Sher A., Guthrie D., Thomas M.G. 2007. Genetic structure and extinction of the woolly mammoth, *Mammuthus primigenius*. Current Biology 17 (12): 1072–1075. Supplemental Data. https://doi.org/10.1016/j.cub.2007.05.035

Beliaeva V. I. 2015. [Беляева В. И. 2015].Археологические аспекты климатических изменений второй половины вюрма. Древние культуры Восточной Европы: эталонные памятники и опорные комплексы в контексте современных археологических исследований. Замятнинский сборник. Выпуск 4. СПб. М АЭ РАН, 2015. С .1 13-127 — 0,7п.л.// V. I. Beliaeva. Archaeological aspects of climate change in the second half of Wurm. Электронная библиотека Музея антропологии и этнографии им. Петра Великого (Кунсткамера) РАН; <http://www.kunstkamera.ru/lib/rubrikator/05/978-5-88431-282-1/>; © МАЭ РАН

Berglund B.E., Håkansson S., Lagerlund E. 1976. Radiocarbon dated mammoth (*Mammuthus primigenius* Blumenbach) finds in south Sweden. Boreas 5: 177-191.

Bluszcz A., Pazdur A. 2003. Luminiscence and radiocarbon dating of sediments in the area of archaeological sites in Wrocław Oporów. 2485. In: Studia Archeologiczne, vol. XXXIII. Acta Universitatis Wratislaviensis. 263-279. (in Polish).

Boguckyi A. et al., 2009. [А. Богуцький, М. Ланчонт, О. Ситник, Т. Мадейська, Я. Кусяк, С. Федорович, Р. Дмитрук, А. Яцишин, І. Думас, Б. Голуб. 2009]. Палеолітична стоянка Галич ІІ: проблеми стратиграфії та хронології. Матеріали і дослідження з археології Прикарпаття і Волині. Львів, 2009. Вип. 13. – С. 17–46 .

Boguckyj A., Łanczont M. 2002. Stratygrafia lessówNaddniestrza halickiego. In: Madeyska T. (ed). 2002. Lessy i paleolit Naddniestrza halickiego (Ukraina). Loess and Palaeolithic of the Dniester River basin, Halič region (Ukraine). Studia Geologica Polonica 119: 315-327.

Brace S. 2011 (2010). Investigating evolutionary processes using ancient and historical DNA of rodent species. Thesis submitted for the degree of Doctor of Philosophy (PhD) University of London, pp. 1-205. https://core.ac.uk/download/pdf/28894923.pdf

Bronk Ramsey C., Higham T., Bowles A., Hedges R. 2004. Improvements to the Pretreatment of Bone at Oxford. Radiocarbon 46 (1): 155–163.

Bulochnikova E. V. 2008. [Булочникова Е.В. 2008]. Хронология верхнепалеолитических стоянок в системе археологических и естественнонаучных данных. Материалы 1-х замятнинских чтений. «Хронология, периодизация и кросс-культурные связи в каменном веке». Санкт-Петербург, Наука, 2008. – Стр. 63-73.

Chang D., Knapp M., Enk J., Lippold S., Kircher M., Lister A., MacPhee R. D. E., Widga Ch, Czechowski P., Sommer R., Hodges E., Stümpel N., Barnes I., Dalén L., Derevianko A., Germonpré M., Hillebrand-Voiculescu A., Constantin S., Kuznetsova T., Mol D., Rathgeber T., Rosendahl W., Tikhonov A. N., Willerslev E., Hannon G., Lalueza-Fox C., Ulrich Joger U., Poinar H., Hofreiter M. & Shapiro B. 2017. The evolutionary and phylogeographic history of woolly mammoths: a comprehensive mitogenomic analysis. Scientific Reports 7, 44585. DOI: 10.1038/srep44585

Cyrek K., Łanczont M., Madeyska T., Sytnyk A., Wrzesińska A. 2002. Górnopaleoiltyczne obozowisko łowców mamutów nad środkowym Dniestrem (wyniki badań w latach 2000-2001). In: Gancarski J. (ed.). Starsza i środkowa epoka kamienia w Karpatach Polskich, Krosno, 2002, 97-109. (in Polish)

de Graaff, L. W. S. 1992. Zur Altersbestimmung eines Mammut-Stoßzahns (Kiesgrube Hochwacht) und ihre Bedeutung für die morphostratigraphische Einstufung der Quartärablagerungen zwischen Bregenz und Langen, Schriften des Vorarlberger Landesmuseums, Bregenz, in: Landschaftsgeschichte und Archäologie Bd.5: Archäologie im Gebirge, edited by: Reihe, A., 23–28.

De Jong M. G. G., de Graaff L. W. S., Seijmonsbergen A. C., and Böhm A. R. 2011. Correlation of Greenland ice-core isotope profiles and the terrestrial record of the Alpine Rhine glacier for the period 32–15 ka. Climate of the Past Discussions 7: 4335–4373. doi:10.5194/cpd-7-4335-2011

Delibrias G., Guillier M. T. and Labeyrie J. 1971. Gif Natural Radiocarbon Measurements VI. Radiocarbon 13 (2): 213-254.

Demay L., Péan S., Belyaeva V. I., Vasil'ev P. M., Patou-Mathis M. 2016. Zooarchaeological study of an Upper Palaeolithic site with mammoth remains, Pushkari I–excavation VII (Chernigov oblast, Ukraine). Quaternary International 406, Part B: 183-201. http://dx.doi.org/10.1016/j.quaint.2015.08.014

Demidenko Y.E. 2008. The Early and Mid-Upper Palaeolithic of the North Black Sea region: an overview. Quartär 55: 99 – 114.

Donner J., Jungner H. and Kurten B. 1979. Radiocarbon dates of mammoth finds in Finland compared with radiocarbon dates of Weichselian and Eemian deposits. Bull. Geol. Soc. Finland 51, 45—54.

Evin J., Marien G., Pachiaudi Ch. 1973. Lyon Natural Radiocarbon Measurements III. Radiocarbon 15 (1): 134-155.

Evin J., Marien G., Pachiaudi Ch. 1975. Lyon Natural Radiocarbon Measurements V. Radiocarbon 17 (1): 4-34.

Evin J., Marien G., Pachiaudi Ch. 1976. Lyon Natural Radiocarbon Measurements VI. Radiocarbon 18 (1): 60-88.

Evin J., Marien G., Pachiaudi C. 1979. Lyon Natural Radiocarbon Measurements VIII. Radiocarbon 21 (3): 405-452.

Gavrilov K. N. 2015**. [**Гаврилов К. Н. 2015]. Археологический контекст новых радиоуглеродных датировок стоянки Хотылево 2, пункт В. Хлопачев Г. А. (ред.). Древние культуры Восточной Европы: эталонные памятники и опорные комплексы в контексте современных археологических исследований. СПб.: МАЭ РАН, 2015. С. 103–112. <http://www.kunstkamera.ru/lib/rubrikator/05/978-5-88431-282-1/> © МАЭ РАН

Gavrilov K. N. et al. 2014. [К. Н. Гаврилов, Е. В. Воскресенская, К. Дука, Е. Н. Мащенко. 2014]. Стоянка Хотылёво 2 – Пункт В: Новые данные o возрасте и пространственной организации культурного слоя. Каменный век 235: 130-151.

Gavrilov K.N., Voskresenskaya E.V., Maschenko E.N., Douka K. 2015. East Gravettian Khotylevo 2 site: Stratigraphy, archeozoology, and spatial organization of the cultural layer at the newly explored area of the site. Quaternary International 359-360: 335-346. http://dx.doi.org/10.1016/j.quaint.2014.08.020

Geyh M. A. & Schreiner A. 1984. 14C-Datierungen an Knochen- und Stoßzahn-Fragmenten aus würmeiszeitlichen Ablagerungen im westlichen Rheingletschergebiet (Baden-Württemberg). Eiszeitalter u. Gegenwart 34: 155 - 161.

Ginter B., Połtowicz M., Pawlikowski M., Skiba S, Trąbska J., Wacnik, A. Winiarska-Kabacińska M., Wojtal P., 2002. Dzierżysław 35 - Magdalenian site on the foreland of the Moravian Gate. In: Ginter B., Połtowicz M., Pawlikowski M., Skiba S., Trąbska J., Wacnik A., Winiarska-Kabacińska M., Wojtal P. (Eds.), Starsza i środkowa epoka kamienia w Karpatach polskich. Muzeum Podkarpackie w Krośnie, Krosno, pp. 112-145 (in Polish).

Gowlett J.A.J., Hedges R.E.M., Law I.A. and Perry C., 1987. Radiocarbon dates from the Oxford AMS system: datelist 5. Archaeometry, 29: 125-155.

Gramsch B., Beran J., Hanik S., Sommer R. S. 2013. A Palaeolithic fishhook made of ivory and the earliest fishhook tradition in Europe. Journal of Archaeological Science 40: 2458-2463. http://dx.doi.org/10.1016/j.jas.2013.01.010

Haesaerts P., Damblon F., Sinitsyn A. and Van der Plicht J. 2004. Kostienki 14 (Voronezh, central Russia): new data on stratigraphy and radiocarbon chronology. Acts of the XIVth UISPP Congress, Liège Belgium, 2-8 september 2001. BAR Int. Ser. 1240:169-180.

Haesaerts P., Péan S., Valladas H., Damblon F, Nuzhnyi D. 2015. Contribution à la stratigraphie du site paléolithique de Mezhyrich (Ukraine). L’anthropologie 119: 364–393. http://dx.doi.org/10.1016/j.anthro.2015.07.002

Hajdas I., Bonani G., Furrer H., Mäder A., Schoch W. 2007. Radiocarbon chronology of the mammoth site at Niederweningen,Switzerland: Results from dating bones, teeth, wood, and peat. Quaternary International 164–165: 98–105. doi:10.1016/j.quaint.2006.10.007

Hedges R. E. M., Housley R. A., Law I. A. and Perry C. 1988. Radiocarbon dates from the Oxford AMS system: Archaeometry Datelist 7. Archaeometry30 (1): 155-164. DOI: 10.1111/j.1475-4754.1988.tb00443.x

Hedges R. E. M., Housley R. A., Law I. A. and Bronk C. R. 1989. Radiocarbon Dates from the Oxford AMS System: Archaeometry Datelist 9. Archaeometry 31 (2): 207-234.

Hedges R. E. M., Housley R. A., Law I. A. and Bronk C. R. 1990. Radiocarbon Dates from the Oxford AMS System: Archaeometry Datelist 10. Archaeometry 32 (1): 101-108.

Hedges R. E. M., Housley R. A., Pettitt P. B., Bronk Ramsey C. and Van. Klinken G. J. 1996. Radiocarbon dates from the Oxford AMS System: Archaeometry datelist 21. Archaeometry 38 (1): 181-207.

Hedges R. E. M.,. Pettitt P. B, Bronk Ramsey C. and Van Klinken G. J. 1997. Dates from the Oxford AMS System: Archaeometry Datelist 24. Archaeometry 39 (2): 445-471.

Hedges R. E. M.,. Pettitt P. B, Bronk Ramsey C. and Van Klinken G. J. 1998a. Dates from the Oxford AMS System: Archaeometry Datelist 25. Archaeometry 40 (1): 227-239.

Hedges R. E. M.,. Pettitt P. B, Bronk Ramsey C. and Van Klinken G. J. 1998b. Dates from the Oxford AMS System: Archaeometry Datelist 26. Archaeometry 40 (2): 437-455.

Heintz A. 1965. A new mammoth-find from Norway and a determination of the age of the tusk from Toten by means of C14. Norsk Geologisk Tidsskrift, 45: 227-230.

Hercman H., Górka, P. 2002. Analizy kości ze stanowisk Halyč i Mezigircy metodą uranowo- torową. In: Madeyska, T. (ed.). Lessy i paleolit Naddniestrza halickiego (Ukraina). Loess and Palaeolithic of the Dniester River basin, Halyč region (Ukraine). Studia Geologica Polonica, 119, 199-205. (in Polish with English summary)

Hertelendi E. 1991. Radiocarbon dating of a wood sample from an excavation near Esztergom-Gyurgyalag. Acta Archaeologica Academiae Scientiarum Hungaricae 43:256-7.

Holec P. & Kernátsová J. 1997. Cicavce (Mammalia) a ulitníky (Gastropoda) vrchného pleistocénu mladopaleolitického táboriska v Trenčianskych Bohuslaviciach. [Mineralia Slovaca 29 (3): 234-236.](http://www.geology.sk/new/sk/node/817)

Housley R.A, Gamble C.S., Street M., Pettitt P. 1997. Radiocarbon evidence for the Lateglacial Human Recolonisation of Northern Europe. Proceedings of the Prehistoric Society 63: 25-54.

Huber R. & Reinhard J. 2016. Das letzte Zuger Mammut? Eine Baugrube als Fenster in die späte Eiszeit. Tugium 32: 103-110.

Hünermann K. A. 1985. Eiszeit-Säugetiere aus dem Kanton Zürich. Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich: 130 (3): 229-250.

Iakovleva L. 2014. Les nouvelles découvertes archéologiques sur les sites du Paléolithique supérieur d’Ukraine – 2007/2013. [In:] Pierre Noiret & Denise Leesch (Éds.), Union Internationale des Sciences Préhistoriques & Protohistoriques – Commission 8. Le Paléolithique Supérieur d’Eurasie – Sous la présidence de Marcel Otte. Bilan 2014. ERAUL 142 – 2014 – 234 p., N/B: 1-17.

Iakovleva L. & Djindjian F. 2005. New data on Mammoth bone settlements of Eastern Europe in the light of the new excavations of the Gontsy site (Ukraine). Quaternary International 126–128: 195–207. https://doi.org/10.1016/j.quaint.2004.04.023

Jacobi R.M., Higham T.F.G. 2008. The “Red Lady” ages gracefully: new ultrafiltration AMS determinations from Paviland. Journal of Human Evolution 55: 898–907. doi:10.1016/j.jhevol.2008.08.007

Kalechits E. G. 2013. [Калечиц Е. Г. 2013]. История изучения палеолита Беларуси. [In:] Проблемы заселения Северо-Запада Восточной Европы в верхнем и финальном палеолите (культурно-исторические процессы), Сборник научных статей под редакцией к.и.н. Г.В. Синицыной: 33-85.

Katona L., Kovács J., Kordos L., Szappanos B., Linkai I. 2012. The Csajág mammoths (*Mammuthus primigenius*): Late Pleniglacial finds from Hungary and their chronological significance. Quaternary International 255: 130-138. doi:10.1016/j.quaint.2011.01.048

Kjær, K.H., Lagerlund, E., Adrielsson, L., Thomas, P.J., Murray, A. & Sandgren, P., 2006: The first independent chronology of Middle and Late Weichselian sediments from southern Sweden and the island of Bornholm. *GFF*, Vol. 128 (Pt. 3, September), pp. 209–220. Stockholm. ISSN 1103-5897.

Khlopatchev G. A. 2011. [Хлопачев Г.А. 2011]. Палеолитическая стоянка Пушкари IX (Бугорок): новые данные об абсолютном и относительном возрасте. Радловский сборник: научные исследования и музейные проекты МАЭ РАН в 2010 г. / Российская академия наук, Музей антропологии и этнографии им. Петра Великого (Кунсткамера); [отв. ред: Ю. К. Чистов, М. А. Рубцова]. - Санкт-Петербург: МАЭ РАН, 2011: 234-239.

Khlopachev G. A. 2015. [Хлопачев Г.А. 2015]. Юдиновская верхнепалеолитическая стоянка и ее значение для изучения поздней поры верхнего палеолита бассейна р. Десны. Замятнинский сборник. Вып. 4. СПб.: МАЭ РАН. С. 128-149.

Kock S., Huggenberger P., Preusser F., Rentzel P. & Wetzel A. 2009. Formation and evolution of the Lower Terrace of the Rhine River in the area of Basel. Swiss Journal of Geoscience 102: 307–321. DOI 10.1007/s00015-009-1325-1.

Konrád G., Kovács J., Halász A., Sebe, K. & Pálffy, H. 2010: Late Quaternary woolly mammoth (*Mammuthus primigenius* Blum) remains from southern Transdanubia, Hungary. Comptes Rendus Palevol 9 (1-2): 47-54.

Kubiak H. 1980. The skulls of *Mammuthus primigenius* Blumenbach from Dębica and Bziankanear Rzeszów, south Poland. Folia Quaternaria 51: 31-45.

Kurenkova E. I. 1978. [Куренкова Е.И. 1978]. Радиоуглеродные датировки и палеогеография некоторых стоянок позднего палеолита в бассейне среднего течения Десны. Отдельный оттиск из `Известий Академии наук СССР. Серия географическая`. 1978. № 1. М. Наука 1978г. С.102-110с.

Lagerlund E. & Houmark-Nielsen M. 1993. Timing and pattern of the lastdeglaciation in the Kattegat region, southwest Scandinavia. Boreas 22: 337-347.

Leesch D., Müller W., Nielsen E., Bullinger J. 2012. The Magdalenian in Switzerland: Re-colonization of a newly accessible landscape. Quaternary International 272-273 (2012) 191-208. doi:10.1016/j.quaint.2012.04.010.

Levi K. G. et al. 2010. [К. Г. Леви, Н. В. Задонина, С. А. Язев. 2010]. Радиоуглеродная хронология природных и социальных феноменов Северного полушария .– Иркутск : Изд-во Иркут. гос. ун-та, 2010. – Т. 1. – 716 с.

Levi K. G. et al. 2011a. [К. Г. Леви, Н. В. Задонина, С. А. Язев. 2011]. Радиоуглеродная хронология природных и социальных феноменов Северного полушария. – Иркутск: Изд-во Иркут. гос. ун-та, 2011. – Т. 2. – 527 с.

Levi K. G. et al. 2011b. [К. Г. Леви, Н. В. Задонина, С. А. Язев. 2011]. Радиоуглеродная хронология природных и социальных феноменов Северного полушария / К. Г. Леви, Н. В. Задонина, С. А. Язев. – Иркутск : Изд-во Иркут. гос. ун-та, 2011. – Т. 3. – 847 с.

Lister A. M. 2009. Late-glacial mammoth skeletons (*Mammuthus primigenius*) from Condover (Shropshire, UK): anatomy, pathology, taphonomy and chronological significance. Geological Journal 44: 447–479. DOI: 10.1002/gj.1162

Lisitsyn S. 2015. The late Gravettian of Borshevo 5 in the context of the Kostenki-Borshevo sites (Don basin, Russia). Quaternary International 359-360: 372-383. http://dx.doi.org/10.1016/j.quaint.2014.10.043

Lorenzen E.D., Nogués-Bravo D., Orlando L., Weinstock J., Binladen J., Marske K.A., Ugan A., Borregaard., M.K., Gilbert M.T.P., Nielsen R., Ho S.Y.W., Goebel T., Graf K.E., Byers D., Stenderup J., Rasmussen M., Campos P., Leonard J.A., Koepfli K.-P., Froese D., Zazula., G, Stafford T.W., Aaris-Sørensen K., Batra P., Haywood A.M., Singarayer J.S., Valdes P.J., Boeskorov G., Burns J.A., Davydov S.P., Haile J., Jenkins D.L., Kosintsev P., Kuznetsova T., Lai X., Martin L.D., McDonald H.G., Mol D., Meldgaard M., Munch K., Stephan E., Sablin M., Sommer R.S., Sipko T., Scott E., Suchard M.A., Tikhonov A., Willerslev R., Wayne R.K., Cooper A., Hofreiter M., Sher A., Shapiro B., Rahbek C. & Willerslev E. 2011. Species-specific responses of Late Quaternary megafauna to climate and humans. Nature*,* 479, 7373, pp. 359-64. DOI: 10.1038/nature10574.

Maschenko E.N., Gablina S.S., Tesakov A.S., Simakova A. N. The Sevsk woolly mammoth (*Mammuthus primigenius*) site in Russia: Taphonomic, biological and behavioral interpretations. Quaternary International 142-143: 147-165. doi:10.1016/j.quaint.2005.03.013

Motuzko A. 2010. Discovery of the herd of Late Pleistocene mammoths in Belarus // Quaternary stratigraphy and paleontology of the Southern Russia: connections between Europe, Africa and Asia**:** Abstracts of the International INQUA-SEQS Conference (Rostov-on-Don, June 21–26, 2010). Rostov-on- Don, 2010. P.103-105.

Nadachowski A., Lipecki G., Wojtal P., Miękina B. 2011. Radiocarbon chronology of woolly mammoth (*Mammuthus primigenius*) from Poland. Quaternary International 245: 186-192.

Nadachowski A., Krajcarz M., Krajcarz M.T., Madeyska T., Ridush B., Valde-Nowak P., Wojtal P., Zarzecka-Szubińska K. 2015. Fauna kręgowców z wybranych stanowisk strefy pery- i metakarpackiej w młodszym plejstocenie [In:] M. Łanczont, T. Madeyska (Eds) "Paleolityczna ekumena strefy pery- i metakarpackiej". Wyd. UMCS, Lublin: 597-642. ISBN: 978-83-7784-674-2

Napierala H. 2008. Die Tierknochen aus dem Kesslerloch. Neubearbeitung der paläolithischen Fauna. Beiträge zur Schaffhauser Archäologie 2. Baudepartement des Kantons Schaffhausen, Schaffhausen, 128p.

Nerudová Z. 2015. On site settlement activities: The example of the Epigravettian Site of Brno-Štýřice III (Czech Republic)*.* Anthropologie (Brno) 53: 245–256.

Nerudová Z., Neruda P., Lisá L., Roblíčková M. 2012. Záchranný výzkum mladopaleolitických lokalit v Brně-Štýřicích v kontextu osídlení Brněnska (Rescue excavation of the Upper Palaeolithic sites in Brno-Štýřice in the context of Brno region). Archeologické rozhledy LXIV–2012: 591–627.

Nerudová, Z., Neruda, P. 2014: Štýřice III (Koněvova St. or Vídeňská St.) - Epigravettian site in Brno city (Czech Republic). IANSA, Vol. 5, Issue 1, 7-18.

Nesin V., Rekovets L. 2003.Kopachiv – a new paleolithic camp of Mammoth hunters in Ukraine. Occasional Papers in Earth Sciences No. 5. 3rd Int. Mammoth Conf., 2003. – Yukon, 2003. Pp. 116–118.

Nielsen E. 2013. Response of the Lateglacial fauna to climatic change. Palaeogeography, Palaeoclimatology, Palaeoecology 391: 99–110. http://dx.doi.org/10.1016/j.palaeo.2012.12.012

Nuzhnyi D. 2006. The Latest Epigravettian Assemblages of the Middle Dnieper Basin (Northern Ukraine). Archaeologia Baltica 7: 58-93.

Nuzhnyi D. Yu. 2014. [Нужний Д. Ю. 2014]. Крем`яний комплекс другого житла верхньопалеолітичного поселення Межиріч (The lithic assemblage of the second dwelling of Mezhirich Upper Palaeolithic site). Епіграветські пам`ятки середнього Подніпров`я. Эпиграветтские памятники среднего Поднепровья /Epigravettian Sites of Midlle Dnipro Region/. Археологічний альманах № 31: 69-80, Kyiv.

Obada T., van der Plicht J., 2010. The Valea Morilor layer (Chisinau, Republic of Moldova) e a new station of mammoth hunters/Le gisement Valea Morilor (Chişinău, République de Moldova) e une nouvelle station de chasseurs de mammouths. Quaternaire, Hors-série (3): The Vth International Conference on mammoth and their relatives/Ve Conférence Internationale sur les mammouths et leur famille, 30th aout - 4 september 2010 Le Puy-en-Velay (Direction: Frederic Lacombat & Dick Mol), Paris, 139.

Obada T., van der Plicht J., Markova A., Prepelitsa A. 2012. Preliminary results of studies of the Valea Morilor Upper Palaeolithic site (Chişinău, Republic of Moldova): A new camp of mammoth hunters. Quaternary International 276-277: 227-241. doi:10.1016/j.quaint.2012.04.015

Oberlin C., Pion G. 2009. Le corpus des datations radiocarbone et la disparition du Renne, in G. Pion et L. Mevel (coord.), La fin du Paléolithique supérieur dans les Alpes du Nord, le Jura méridional et les régions limitrophes. Approches culturelles et environnementales, Paris, Société préhistorique française (Mémoire, 50), p. 51-58.

Oliva, M. 2007. 1. Část. Charakteristika lokalit a inventářů. In Oliva, M., Klápště, J., Měřínský, Z. eds.: *Gravettien na Moravě*. Brno: [Masarykova univerzita, Filozofická fakulta], Dissertationes archaeologicae Brunenses/Pragensesque, 54.

Palkopoulou E., Dalén L., Lister A.M., Vartanyan S., Sablin M., Sher A., Edmark V.N., Brandström M.D., Germonpré M., Barnes I., Thomas J.A. 2013 Holarctic genetic structure and range dynamics in the woolly mammoth. Proc. R. Soc. B, 280: 20131910. http://dx.doi.org/10.1098/rspb.2013.1910

Ponomarev D. V., MarkovaA. K., van KolfschotenT., and van der Plicht J. 2012. Radiocarbon Dates of Late Quaternary Mammals in the Archangelsk Region and Their Contribution to Reconstructions of the Last Glaciation in Eastern Europe. ISSN 1028\_334X, Doklady Earth Sciences, 2012, Vol. 444, Part 2, pp. 706–710. © Pleiades Publishing, Ltd., 2012. Original Russian Text © D.V. Ponomarev, A.K. Markova, T. van Kolfschoten, J. van der Plicht, 2012, published in Doklady Akademii Nauk, 2012, Vol. 444, No. 6, pp. 635–639.

Praslov N. D. & Sulerzhitsky L. D. 1999. [Праслов Н.Д., Сулержицкий Л.Д. 1999]. Новые данные по хронологии палеолитических стоянок в Костенках на Дону . Доклады РАН. Сер. «Геология». М., 1999. Т. 365. №. 2. С. 236–240.

Protsch R. 1991. Dating of bones in archaeology and anthropology. In Golksu, H.U, M. Oberhofer, and D. Regulla (eds), Scientific Dating Method. Advanced Science and technology Vol 1: Netherlands:271-300. Kluwer Academic Publishers.

Protsch R. and Weninger B. 1984. Frankfurt Radiocarbon Dates I. Radiocarbon 26 (2): 185-195.

Punning J. M., Liiva A. and Ilves E. 1968. Tartu Radiocarbon Dates III. Radiocarbon 10 (2): 379-383.

Puzachenko A. Yu., Markova A.K., Kosintsev P.A.,. van Kolfschoten T., van der Plicht J., Kuznetsova T.V., Tikhonov A.N., Ponomarev D.V., Kuitems M., Bachura O.P. 2017. The Eurasian mammoth distribution during the second half of the Late Pleistocene and the Holocene: Regional aspects. Quaternary International 445: 71-88. http://dx.doi.org/10.1016/j.quaint.2016.05.019

Raynal J-P., Lafarge A., Rémy D., Delvigne V., Guadelli J-L., Costamagno S., Le Gall O., Daujeard C., Vivent D., Fernandes P., Le Corre-le Beux M., Vernet G., Bazile F., Lefèvre D. 2014. Datations SMA et nouveaux regards sur l’archéo-séquence du Rond-du-Barry (Polignac, Haute-Loire). C. R. Palevol (Comptes Rendus Palevol) 13: 623–636. http://dx.doi.org/10.1016/j.crpv.2014.03.010

Rekovets L. I. & Nesin V.A. 2009. [Рековец Л. И., Несин В.А. 2009]. Новая стоянка людей позднего палеолита у села Копачив в Украине. Збірка наукових статей. — К.: ВПЦ «Київський університет», 2009, No 7-8: 74-78.

Reynolds, N., Lisitsyn, S.N., Sablin, M.V., Barton, N. and Higham, T.F.G. 2015. Chronology of the European Russian Gravettian: New radiocarbon dating results and interpretation. Quartär 62: 121-132. doi: 10.7485/QU62\_5.

Richter J. 1987. Jungpaläolithische Funde aus Breitenbach/Kr. Zeitz im Germanischen Nationalmuseum Nürnberg. Quartär 37/38: 63-96.

Roblíčková M., Nerudová Z., Nývltová Fišáková M. 2015. Analýza zvířecích kostí z epigravettienské lokality Brno-Štýřice III, výzkumné sezóny 2012–2014 (Analysis of animal bones from the Epigravettian open-air site Brno-Štýřice III (2012–2014)). Archeologické rozhledy LXVII–2015: 627–653.

Rowlands M. B. 1971. Radiocarbon Evidence of the Age of an Irish Sea Glaciation in the Vale of Clwyd. Nature Physical Science 230: 9-11.

Schild R. (ed). 2014. Wilczyce. A Late Magdalenian Winter Hunting Camp in Southern Poland. Warszawa. 448 Pp. ISBN/ISSN 9788363760250

Scourse J. D., Coope G. R., Allen J. R. M., Lister A. M., Housley R. A., Hedges R. E. M., Jones A. S. G., Watkins R. 2009. Late-glacial remains of woolly mammoth (*Mammuthus primigenius*) from Shropshire, UK: stratigraphy, sedimentology and geochronology of the Condover site. Geological Journal 44: 392–413. DOI: 10.1002/gj.1163

Sergin V. Ya. 2007. [1pixСергин В. Я. 2007]. К радиокарбоновой хронологии палеолитических поселений среднеднепровского типа . Российская археология No 4: 72-81.

Shotton F. W. and Williams R. E. G. 1971. Birmingham University Radiocarbon Dates V. Radiocarbon 13 (2): 141-156.

Sinitsyn A. A. 2014. [Синицын А.А. 2014]. Прерывистость и преемственность в палеолите Костенок. Верхнедонской археологический сборник. Вып. 6. Липецк: ЛГПУ. С. 66-76.

Sinitsyn, A.A. and Hoffecker, J.F. 2006. Radiocarbon dating and chronology of the early Upper Paleolithic at Kostenki. Quaternary International 152-153: 175-185. doi:10.1016/j.quaint.2005.12.0

Sinitsyn A. A. et al. 1997. [Синицын А.А., Праслов Н.Д., Свеженцев Ю.С., Сулержицкий Л.Д. 1997]. Радиоуглеродная хронология верхнего палеолита Восточной Европы, pp 21-66. [In:] А.А. Синицын, Н.Д. Праслов (eds). Радиоуглеродная хронология палеолита Восточной Европы и Северной Азии. Проблемы и перспективы. Санкт-Петербург.

Sinitsyna G. V. 2013. **[**Синицына Г. В. 2013 ed.]. О миграциях и автохтонном развитии культур финального палеолита на северо-западе Русской равнины. (In:) Проблемы заселения Северо-Запада Восточной Европы в верхнем и финальном палеолите (культурно-исторические процессы) - 152-181.

Soffer O. 1985. The Upper Palaeolithic of the Central Russian Plain. Orlando, FL: Academic Press, 539 pp.

Sommer R. S. and Benecke N. 2009. First radiocarbon dates on woolly mammoth (*Mammuthus primigenius*) from northern Germany. Journal of Quaternary Science 24: 902–905. ISSN 0267-8179. DOI: 10.1002/jqs.1343

Sorokin A. N. et al. 2009. [Сорокин А.Н., Ошибкина С.В., Трусов А.В. 2009]. На переломе эпох.— М: Гриф и К, 2009.— 388 с., илл**.** <http://www.academia.edu/9303719/On_the_turning-point_of_Epochs>

Street M. & Terberger, T., 2000. The German Upper Palaeolithic 35,000 – 15,000 bp. New dates and insights with emphasis on the Rhineland. In: W. Roebroeks, M. Mussi, J. Svoboda, K. Fennema (eds.), Hunters of the Golden Age: the Mid Upper Palaeolithic of Eurasia 30,000 – 20,000 BP. Leiden University Press, Leiden, Analecta Praehistorica Leidensia 31 (1999), pp. 281-298.

Stuart A.J., Sulerzhitski L.D., Orlova L.A., Kuzmin Y.V., Lister A.M. 2002. The latest woolly mammoths (*Mammuthus primigenius* Blumenbach) in Europe and Asia: a review of the current evidence. Quaternary Science Reviews, 21: 1559-1569. https://doi.org/10.1016/S0277-3791(02)00026-4

Stupak D. V. 2009. [Ступак Д.В. 2009]. Кам’яні комплекси верхньопалеолітичної стоянки Бужанка 2. Варіанти використання сировини. Археологический альманах 20, Донецк: 219—230.

Stupak D. V. & Khlopatchev G. A. 2014. [Ступак Д.В., Хлопачев Г.А. 2014]. Оброблений бивень із стоянки Оболоння. Археологія і давня історія України, 2014, вип. 1 (12): 127-136.

Sulerzhitsky L. D. 2004. [Сулержицкий Л.Д. 2004]. Время существования некоторых позднепалеолитических поселений по данным радиоуглеродного датирования костей мегафауны. Российская археология, No 3: 103 –112.

Sulerzhitsky L. D. et al., 2000. [Sulerzhitski L. D., Pettitt P., Bader, N. O. 2000]. Radiocarbon dates on the remains from the settlement Sunghir (in Russian with English summary). In: T. I. Alexeeva, N. O. Bader, R. M. Munchaev, A. P. Buzhilova, M. V. Kozlovskaya and M. B. Mednikova (eds.): *Homo Sungirensis*. Upper Palaeolithic Man: Ecological and Evolutionary Aspects of the Investigation. Scientific World, Moscow, 30-33.

Sümegi P. & Hertelendi E. 1998. Reconstruction of microenvironmental changes in the Kopasz Hill loess area at Tokaj (Hungary) between 15 and 70 ka Bp. Radiocarbon 40 (2): 855-863.

Svendsen J. I. & Pavlov P. 2003. Mamontovaya Kurya: an enigmatic, nearly 40 000 years old Paleolithic site in the Russian Arctic. Trabalhos de Arqueologia 33: 109-120.

Svezhentsev Y.S. 1993 Radiocarbon chronology for the Upper Palaeolithic sites on the East European Plain. In: O. Soffer and N.D. Praslov (eds), From Kostenki to Clovis: Upper Palaeolithic Paleo-lndian adaptations, 23-30, New York: Plenum Press. DOI 10.1007/978-1-4899-1112-4\_3

Svezhentsev, Yu.S., Popov, S.G., 1993. Late paleolithic chronology of the East European Plain. Radiocarbon 35 (3), 495–501.

Svoboda J., Horáček I., Ložek V., Svobodová H., Šilar J. 2000. The Pekárna Cave. Magdalenian stratigraphy, environment, and the termination of the loess formation in Moravian Karst. Sborník geologických věd, Antropozoikum 24: 61-79. Praha.

Sytnyk O. et al., 2005. [Ситник O., Цирек K., Коропецький P., Вжесіньска A. 2005]. Граветська пам’ятка Галич І. Матеріали і дослідження з археології Прикарпаття і Волині. – Вип. 9. – Львів, 2005: 32-82.

Šída P., Nývltová Fišáková M., Verpoorte A. 2006. Svobodné Dvory near Hradec Králové: an Upper Palaeolithic hunting site and its dating. Archeologické rozhledy 58, 2006, 772-780.

Škrdla P. 2005. The Upper Paleolithic on the Middle Course of the Morava River. The Dolní Věstonice Studies, Volume 13 (Dolnověstonické studie, svazek 13), Brno, Academy of Science on the Czech Republic, Institute of Archeology at Brno, 229 s., ISBN 80-86023-70-2.

Škrdla P., Nývltová Fišáková M., Nývlt D. 2008. Gravettské osídlení Napajedelské brány (The Gravettian Occupation of the Napajedla Gate). Přehled výzkumů 49: 47-82, Brno.

Tarasov L. M. 1991.[ Тарасов Л.М. 1991]. Палеолит бассейна Десны: Автореферат. Исторические Науки — 07.00.06. — Археология, диссертации на соискание ученой степени доктора исторических наук, Ленинград 1991.

Ugan A. & Byers D. 2007. Geographic and temporal trends in proboscidean and human radiocarbon histories during the late Pleistocene. Quaternary Science Reviews 26: 3058–3080. doi:10.1016/j.quascirev.2007.06.024

Ukkonen P., Lunkka J. P., Jungner H. and Donner J. 1999. New radiocarbon dates from Finnish mammoths indicating large ice-free areas in Fennoscandia during the Middle Weichselian. Journal Of Quaternary Science ,14 (7): 711–714.

Ukkonen P., Arppe L., Houmark-Nielsen M., Kjær K.H., Karhu J.A. 2007. MIS 3 mammoth remains from Sweden—implications for faunal history, palaeoclimate and glaciation chronology. Quaternary Science Reviews 26: 3081–3098. doi:10.1016/j.quascirev.2007.06.021

Ukkonen P., Aaris-Sørensen K., Arppe L., Clark P.U., Daugnora L., Lister A.M., Lõugas L., Seppä H., Sommer R.S., Stuart A.J., Wojtal P., Zupiņš I. 2011. Woolly mammoth (*Mammuthus primigenius* Blum.) and its environment in northern Europe during the last glaciation. Quaternary Science Reviews 30: 693-712.

Valde-Nowak, P., Nadachowski, A., Madeyska, T. (Eds.). 2003. Obłazowa Cave: Human Activity, Stratigraphy and Palaeoenvironment. Institute of Archaeology and Ethnology Polish Academy of Sciences, Kraków, pp. 1-176.

van der Plicht H. 2012. Radiocarbon and fossil bones: what’s in a date. Analecta Praehistorica Leidensia 43/44: 283-292.

Valoch K. 2001. Das Magdalénien in Mähren. 130 Jahre Forschung. Jahrbuch das Römisch-Germanischen Zentralmuseums Mainz 48 (1): 103-159. DOI: http://dx.doi.org/10.11588/jrgzm.2001.1.23439.

Vasil’chuk Y.K., Vasil’chuk A. C., Long A., Jull A. J. T., Donahue D. J. 2000. AMS dating mammoth bones: Comparison with conventional dating. Radiocarbon 42, (2): 281–284.

Velichko A.A., Zelikson E.M. 2005. Landscape, climate and mammoth food resources in the East European Plain during the Late Paleolithic epoch. Quaternary International 126–128: 137–151. https://doi.org/10.1016/j.quaint.2004.04.019

Vermeersch, P.M., 2017*.* Radiocarbon Palaeolithic Europe Database, Version 21*.* Available at: http://ees.kuleuven.be/geography/projects/14c-palaeolithic/index.html.

Verpoorte A. 2001. Places of art, traces of fire: A contextual approach to anthropomorphic figurines in the Pavlovian (Central Europe, 29–24 kyr BP). Leiden: Faculty of Archaeology, University of Leiden.

Verpoorte A. 2002. Radiocarbon dating the Upper Palaeolithic of Slovakia. Results, problems and prospects, Archäologisches Korrespondenzblatt 32/3, 311–325.

Verpoorte A. 2003. Absolute dates for the Bohemian Middle Upper Palaeolithic. Archeologické rozhledy LV–2003: 3–9.

Vörös I. 1991. Large mammal remains from the Upper Palaeolithic site at Esztergom-Gyurgyalag. Acta Archaeologica Hungarica (Acta Archaeologica Academiae Scientiarum Hungaricae) 43: 261-263.

Wilczyński J., Wojtal P. 2012. Jaksice II – a new Gravettian site in southern Poland. Přehled výzkumů 52: 37-41.

Wilczyński J., Wojtal P., Sobieraj D., Sobczyk K. 2015a. Kraków Spadzista trench C2: New research and interpretations of Gravettian settlement. Quaternary International 359-360: 96-113. http://dx.doi.org/10.1016/j.quaint.2014.08.025.

Wilczyński, J., Wojtal, P., Łanczont, M., Mroczek, P., Sobieraj, D., & Fedorowicz, S. 2015b. Loess, flints and bones: Multidisciplinary research at Jaksice II Gravettian site (southern Poland). Quaternary International 359-360: 114-130. http://dx.doi.org/10.1016/j.quaint.2014.04.002

Wiśniewski A., Wojtal P., Krzemińska A., Zych J., Przybylski B., Badura J., Ciszek D. 2009. Unikalne stanowisko szczątków mamuta na Dolnym Śląsku. Przegląd Geologiczny, 57(3): 234-242.

Wojtal P. 2007. Zooarchaeological studies of the Late Pleistocene sites in Poland. Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Kraków, 189 pp. ISBN: 978-83-919407-6-1

Wojtal P., Sobczyk K. 2005. Man and woolly mammoth at the Kraków Spadzista Street (B) – taphonomy of the site. Journal of Archaeological Science 32: 193–206. http://dx.doi.org/10.1016/j.jas.2004.08.005

Wojtal P., Wilczyńsk, J., 2015. Zooarchaeological studies of large mammal remains from Kraków Spadzista site - trench C2 and trech E1 (2011-2012 excatations). In: A Gravettian site in Southern Poland: Kraków Spadzista (eds. P. Wojtal, J. Wilczyński and G. Haynes): 93-111. ISEA PAS.

Woodman, P.C.; McCarthy, M.; Monaghan, N. 1997. The Irish Quaternary Fauna Project. Quaternary Science Reviews 16: 129-159.