Table 1: Comparison of CCSM3 TraCE-21 and HadCM3 paleoclimate simulations for 21,000 BP

Climate variable	Year	Correlation	RMSE	AWME
January temp.	21,000 BP	0.991	3.812 °C	-0.796 °C
July temp.	21,000 BP	0.978	6.425 °C	-2.664 °C
Temp. season.	21,000 BP	0.961	218.35 SD×100	-19.739 SD×100
Summer precip	21,000 BP	0.832	1.362 mm/day	-0.286 mm/day
Annual precip.	21,000 BP	0.905	0.891 mm/day	-0.225 mm/day
January temp.	20,000 BP	0.989	4.047 °C	-0.641°C
July temp.	20,000 BP	0.979	6.197 °C	-2.509 °C
Temp. season.	20,000 BP	0.999	20.76 SD×100	3.66 SD×100
Summer precip	20,000 BP	0.832	1.36 mm/day	-0.273 mm/day
Annual precip.	20,000 BP	0.907	0.889 mm/day	-0.222 mm/day

Comparison metrics are Pearson correlation coefficient (Correlation), root mean square error (RMSE) and area weighted mean absolute error (AWME). The climate variables are: (i) average minimum daily temperature in January (January temp.); (ii) average maximum daily temperature in July (July temp.); (iii) standard deviation mean monthly temperature × 100 (Temp. season); (iv) average daily precipitation in June to August (Northern Hemisphere Summer precip.) and (v) across the entire year (Annual precip).

Table 2: Dispersal function parameters for the population model

b	D_{max}
144.27	100
84.88	140
76.12	200
68.75	220
66.88	240
66.22	300
65.28	316
64.85	360
64.77	424

Combinations of values for b and D_{max} used to calculate a fixed proportion of individuals that should move to a given cell based on Supplementary Material eq 2.

Table 3: Latin hypercube parameters used in the model.

Parameter	Lower	Upper
R0 max. (generational *Pop. growth*)	1.28	6.84
Environmental variation (*Var. growth*)	0	0.175
Allee effect (*Allee*)	0	500
Proportion of dispersers (*Mean disp.)*	5%	25%
Maximum dispersal distance (*Long disp.)*	100 km	500 km
Niche marginality (*Marginality*)	0.001	21.45
Niche tolerance (*Breadth*)	0.042	2.10
Hunting mortality (Harvest)	0%	35%
Harvest function (z) (Function response)	1	2
Human abundance (*Hum. dens.)*	- 1 SD	+ 1 SD
Maximum mammoth N (*Density*) per cell	625	10,000

Where R0 max = maximum population growth rate per generation; Environmental (env.) variation = standard deviation of population growth rate; Allee effect = a threshold number of individuals, below which the population is assumed to be extinct (population size is set to zero); Proportion (prop.) dispersers = the percentage of the population in cell that leaves that cell at a given time step; Maximum (max.) dispersal = maximum dispersal that individuals can move in a dispersal event; Niche marginality = distance between average conditions of the occupied niche and the average condition in the study region; Niche tolerance = breadth of climatic conditions the species can occupy; Hunting mortality = the percentage of the population that is harvested per generational time step; Harvest function = strength of the z constant, allowing harvest to range from Type II to a Type III functional response; Human abundance = cell based estimate of human abundance at a given point in time (± 1 SD); Max. mammoth N = maximum number of mammoths in a grid cell with a climate suitability of 1. Names in italics match names shown in Fig. S1 and Table S2.

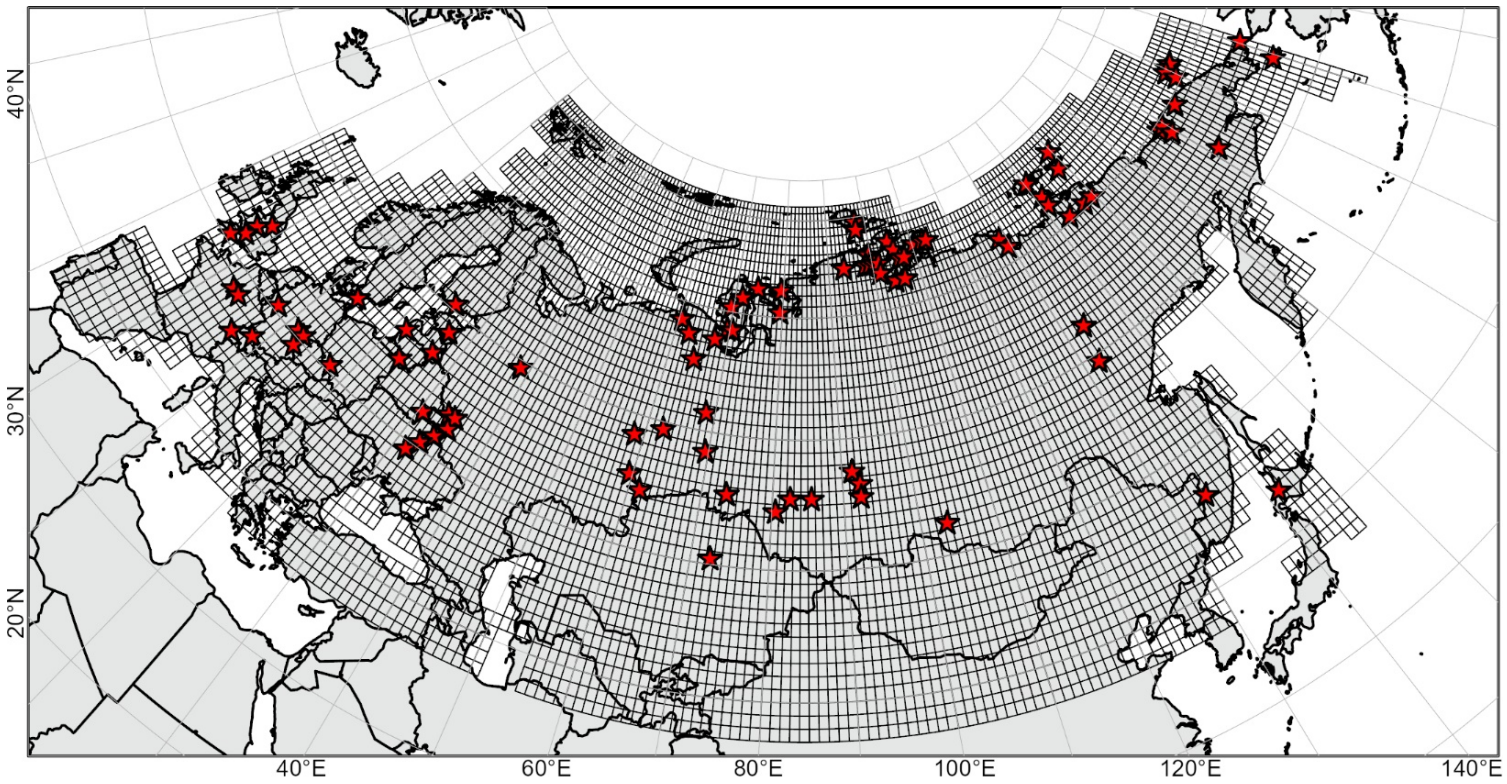

Fig. 1: Map of the study extent across Eurasia.

Map of the Eurasian study region with locations of radiocarbon dated fossils (red stars), overlaid with a fishnet of 1° x 1° cells which were used for modelling populations. Details on fossils can be found in Appendix 2.

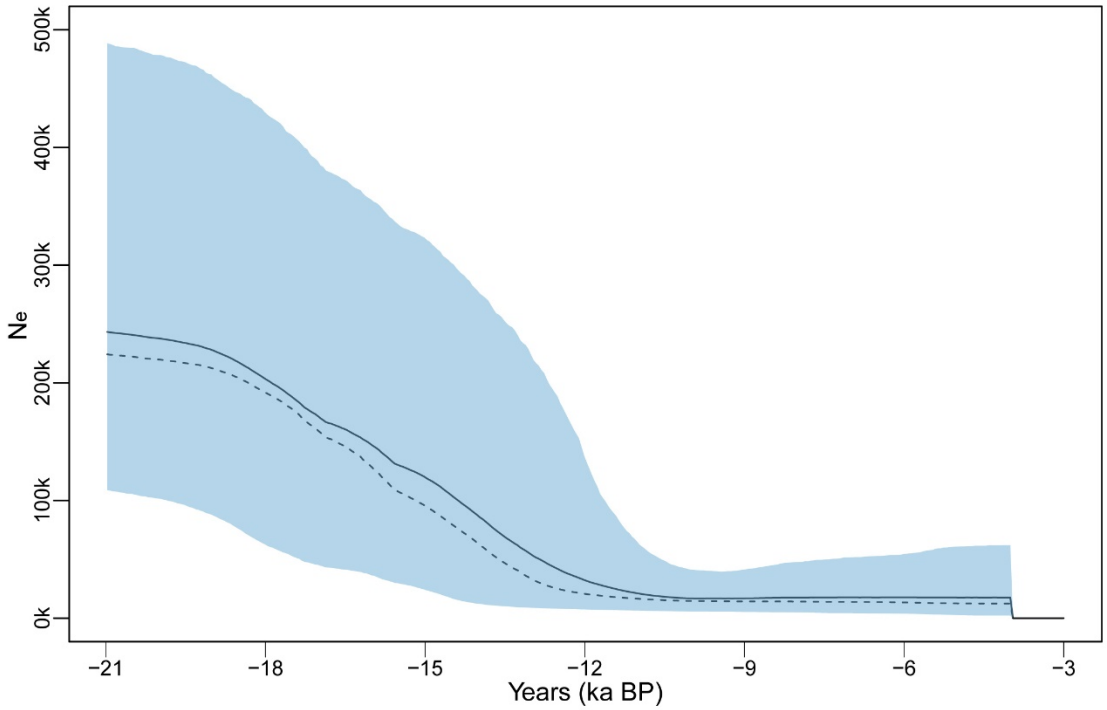

Fig. 2: Woolly mammoth population trends from ancient DNA.

Change in mean effective population size (N_e; solid line), median effective population size (N_e; dashed line), and upper and lower 95% confidence intervals between 21 ka BP and 3 ka BP as estimated from ancient DNA (see above). Time is shown in thousands of years before present (ka BP).

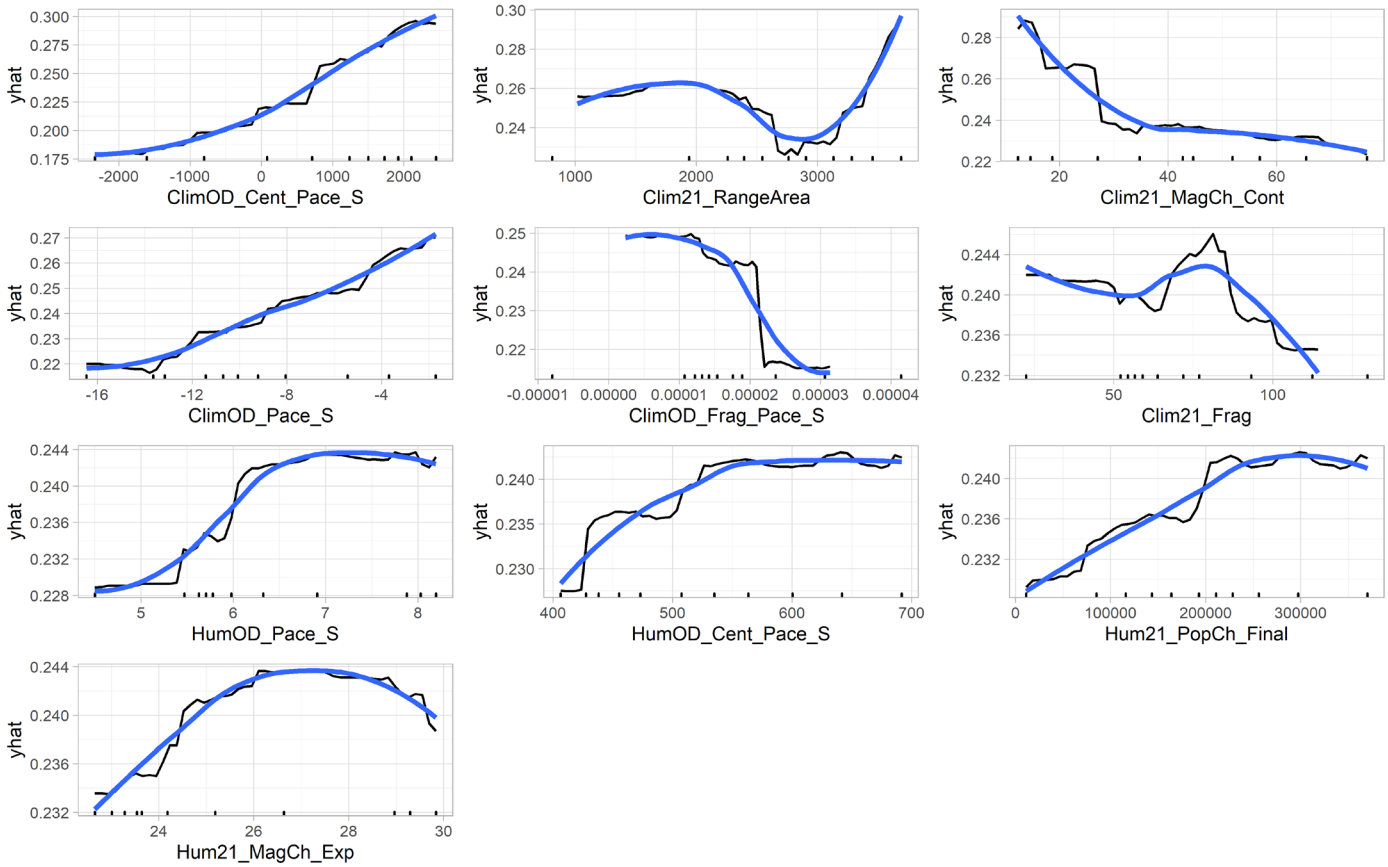

Fig. 3: Accumulated Local Effects plot of the predictor variables for expected minimum abundance for Eurasia for the period 21 ka – 15 ka BP.

Tick marks inside the x-axis represent deciles of the distribution of the x-variable. Relationships between the variables below the 10th and above the 90th decile should be interpreted carefully. The blue line show a LOESS curve fitted to the data. The variables are described in detail in Appendix 1. In short: *ClimOD_Cent_Pace_S* represents the pace of movement of the climate suitability centroid between 17.5 ka BP and 15 ka BP, with negative values indicating a southerly movement caused by the loss of suitable conditions in northern parts of the range; *Clim21_RangeArea* is the area of occupied habitat at the start of the period; *Clim21_MagCh_Cont* is the % change in range area between 21 ka BP and 15 ka BP; *ClimOD_Pace_S* is the slope between the number of climatically suitable cells for woolly mammoths and time between 17.5 ka BP and 15 ka BP; *ClimOD_Frag_Pace_S* is the slope between the amount of habitat fragmentation and time between 17.5 ka BP and 15 ka BP; *Clim21_Frag* is the magnitude of fragmentation between 21 ka BP and 15ka BP; *HumOD_Pace_S* is the slope between the number of climatically suitable cells for humans and time between 17.5 ka BP and 15 ka BP; *HumOD_Cent_Pace_S* represents the pace of movement of the climate suitability centroid between 17.5 ka BP and 15 ka BP; *Hum21_PopCh_Final* is the absolute change in human abundance between 21 ka BP and 15 ka BP; *Hum21_MagCh_Exp* is the % change in human occupied range between 21 ka BP and 15 ka BP.

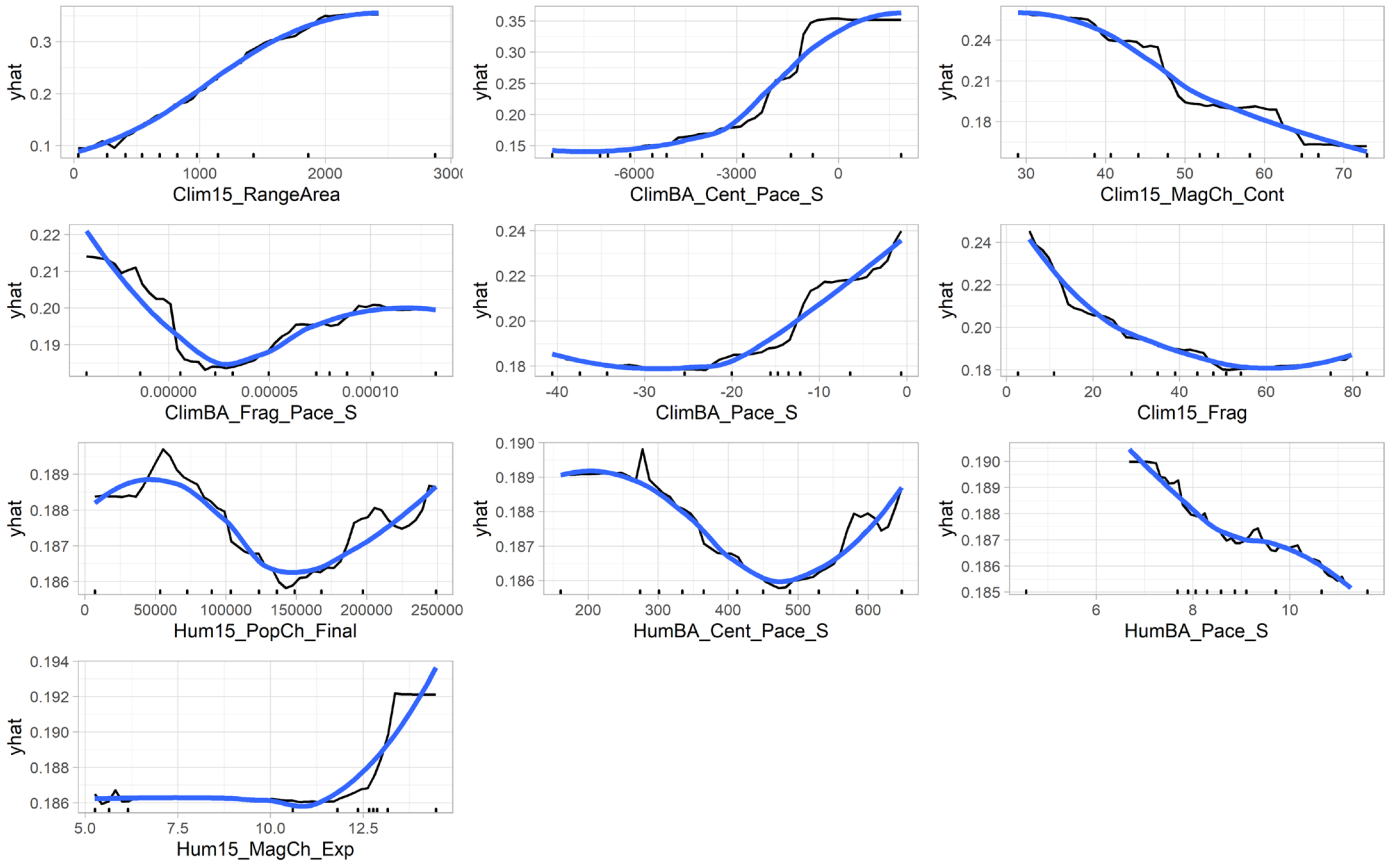

Fig. 4: Accumulated Local Effects plot of the predictor variables for expected minimum abundance for Eurasia for the period 15 ka – 11 ka BP.

Tick marks inside the x-axis represent deciles of the distribution of the x-variable. Relationships between the variables below the 10th and above the 90th decile should be interpreted carefully. The blue line show a LOESS curve fitted to the data. Variables are as described in Appendix 1 Fig. 3, except Clim15/Hum15 represent variables calculated between 15ka BP and 11 ka BP, and ClimBA/HumBA represent variables calculated between 12.9 ka BP and 11.7 ka BP (Bølling–Allerød). The variables are described in detail in Appendix 1.

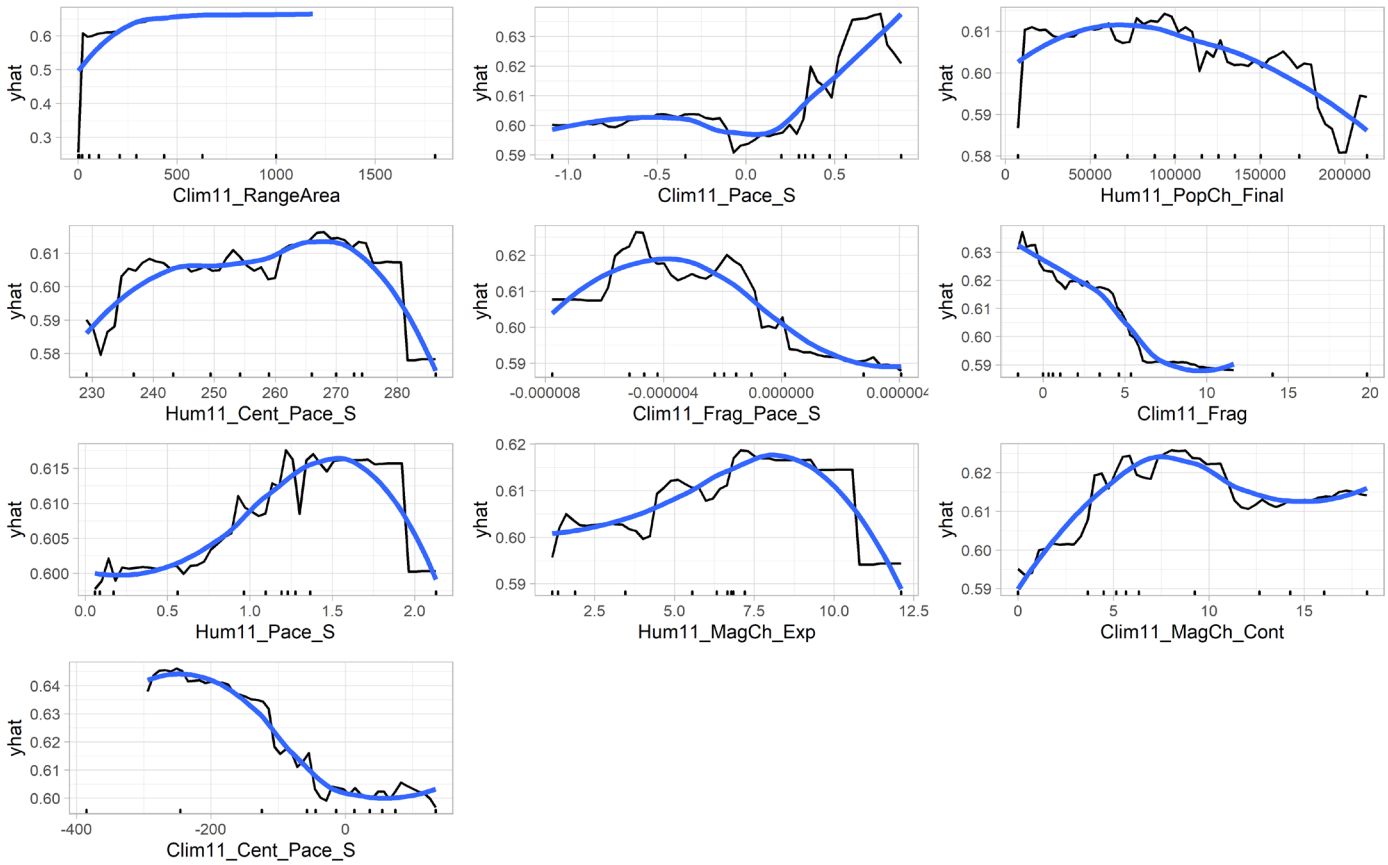

Fig. 5: Accumulated Local Effects plot of the predictor variables for expected minimum abundance for Eurasia for the period 11 k – 5 k BP.

Tick marks inside the x-axis represent deciles of the distribution of the x-variable. Relationships between the variables below the 10th and above the 90th decile should be interpreted carefully. The blue line show a LOESS curve fitted to the data. Variables are as described in Appendix 1 Fig. 3, except Clim11/Hum11 represent variables calculated between 11ka BP and 5 ka BP. The variables are described in detail in Appendix 1.

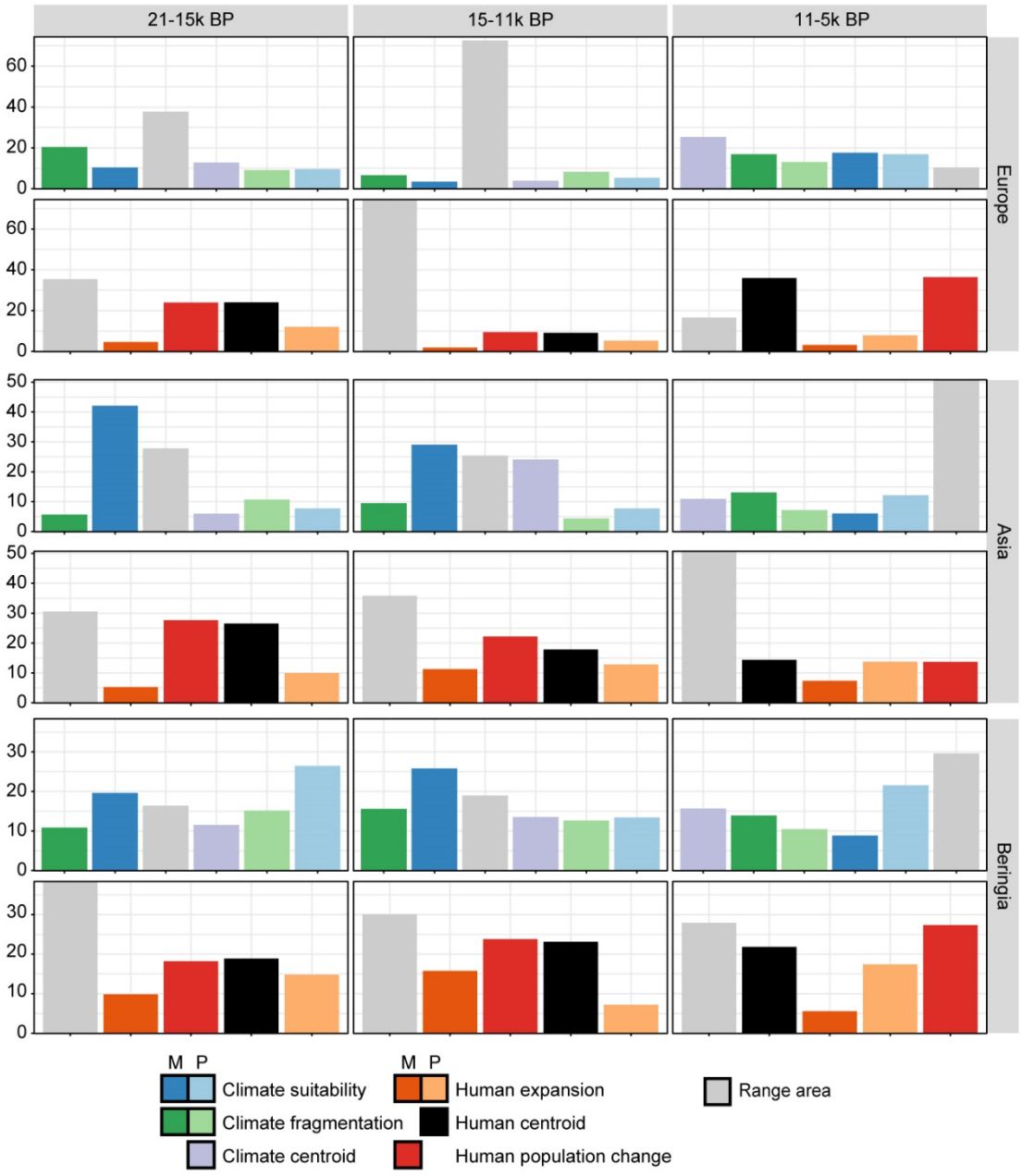

Fig. 6: Independent effects of humans and climate at regional scales.

Variable importance for models examining the effects of climate (top row of each panel) and humans (bottom row of each panel) on expected minimum abundance (EMA) for three separate regions (Europe, Asia, Beringia) during three periods: 21 ka – 15 ka BP; 15 ka – 11 ka BP; 11 ka – 5 ka BP. Models are EMA ~ *f*(climate, range area) and EMA ~ *f*(humans, range area). The legend shows which variables represent magnitudes (M) or paces of change (P) in climate and human impact. Range area is the area of occupancy at the start of a given period. The variables are described in detail in Appendix 1.

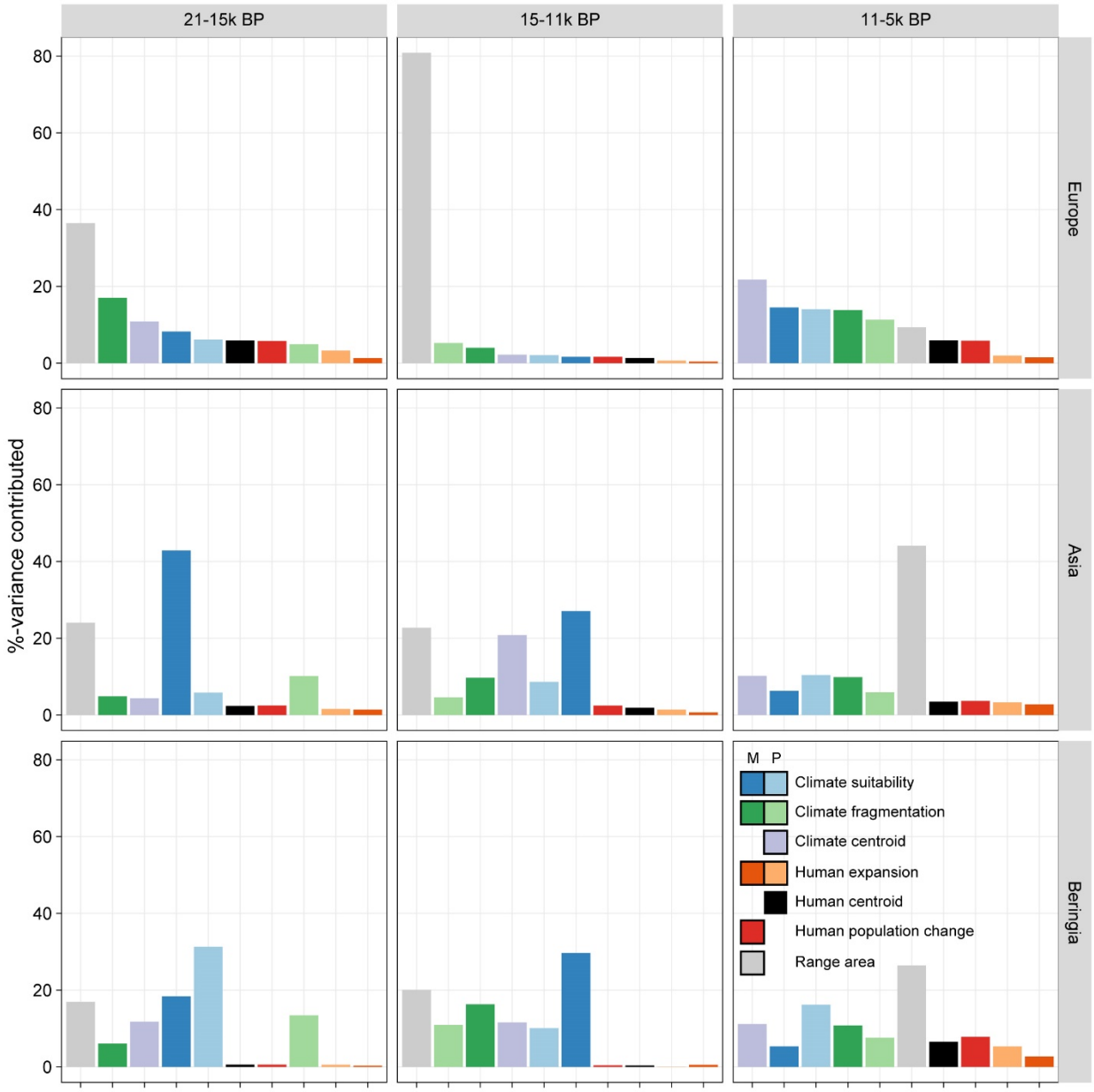

Fig. 7: Effects of humans and climate at regional scales.

Percentage contribution (calculated from raw variable importance) of each of the variables to the combined model (EMA ~ *f*(climate, humans, range) for each region (Europe, Asia, Beringia) at three periods: 21 ka – 15 ka BP; 15 ka – 11 ka BP; 11 ka – 5 ka BP. The legend shows which variables represent magnitudes (M) or paces of change (P) in human and climate impact. Range area is the area of occupancy at the start of a given period. The variables are described in detail in Appendix 1.